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Geotechnical Engineering
and Applied Sciences

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UNION STATION AREA AQUIFER PUMP TESTS METRO RAIL PROJECT

BY

CONVERSE CONSULTANTS, INC.
EARTH SCIENCES ASSOCIATES
GEO/RESOURCE CONSULTANTS

CCI Project No. 83-1140-06

November, 1986

Funding for this Project is provided by grants to the Southern California Rapid Transit District from the United States Department of Transportation, the State of California, and the Los Angeles County Transportation Commission.

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Converse Consultants, Inc.
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Pasadena, California 91105
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Converse Consultants

Geotechnical Engineering
and Applied Sciences

November 11, 1986

Metro Rail Transit Consultants
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Los Angeles, California 90013

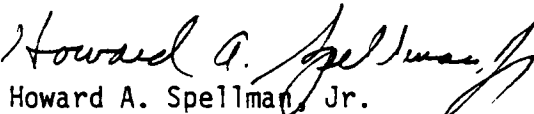
83-1140-06

Attention: Howard J. Chaliff,
Project Director

This letter transmits our final investigation report entitled "Union Station Area Aquifer Pump Tests". These tests were performed under Contract No. 503, Amendment No. 10, dated February 10, 1986, between Converse Consultants, Inc. and Metro Rail Transit Consultants (MRTC). This report provides information about the hydraulic parameters and performance characteristics of the ground-water aquifer underlying each test site. Although this report may be used by contractors in designing dewatering systems for site construction, it is not intended to provide all the geotechnical information that may be required to design and construct the project.

Our study team appreciated the assistance provided by Dr. James Monsees of MRTC, Dr. Dennis Kasper of Engineering-Science and Bob Bush of R.Y. Bush, Consulting Engineer, Inc. We also want to acknowledge the dedicated efforts of each member of the Converse team, especially Mark Schluter, Dr. Dave Sommers, Mike King, Gary Lowe, and Mark Shaffer.

CONVERSE CONSULTANTS, INC.


Howard A. Spellman, Jr.
Vice President

HAS:83j

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1.0 INTRODUCTION

This report presents the results of aquifer pump tests performed at two separate sites located in Union Station Area. The purpose of the pump tests is to provide information about the hydraulic parameters and performance characteristics of the groundwater aquifer underlying each test site. This report supersedes the previous 1983 pump test performed near Union Station. Although this report may be used by contractors in designing dewatering systems for site construction, it is not intended to provide all the geotechnical information that may be required to design and construct the project. The work performed for this investigation included subsurface borings, installation and development of observation and pump wells, pump testing, geologic and engineering analyses, and presentation of test results.

Additional geotechnical information on the project is included in the following reports:

- "Geotechnical Report, Metro Rail Project, Design Unit A135", prepared by Converse Consultants, Earth Sciences Associates, and Geo/Resource Consultants, submitted to SCRTD in September 1983. This report presents geotechnical information and recommendations for the proposed Union Station terminal and crossover structure.
- "Geotechnical Investigation Report, Metro Rail Project," Volume I - Report, and Volume II - Appendices, prepared by Converse Ward Davis Dixon, Earth Sciences Associates, and Geo/Resource Consultants, submitted to SCRTD in November 1981: This report presents preliminary geologic and geotechnical data for the entire project. The report also comments on tunneling and shoring experience and practices in the Los Angeles area.
- "Seismological Investigation & Design Criteria Metro Rail Project", prepared by Converse Consultants, Lindvall, Richter & Associates, Earth Sciences Associates, and Geo/Resource Consultants, submitted to SCRTD in May 1983: This report presents the results of a seismological investigation and establishes seismic design criteria for the project.
- "Geologic Aspects of Tunneling in the Los Angeles Area" (USGS Map No. MF866, 1977), prepared by the U.S. Geological Survey in cooperation with the U.S. Department of Transportation. This publication includes a compilation of boring data in the general vicinity of the proposed Metro Rail Project.

2.0 GENERAL SITE AND PROJECT DESCRIPTION

The pump test sites are located along the western and eastern ends of the Union Station Train Terminal as shown on Figure 1, Site Location Map. This area is bounded by Alameda Street to the west, Macy Street to the north, Vignes and Ramirez Streets to the east and the Santa Ana Freeway to the south. Located within this area is the existing Union Station passenger terminal building, bus terminal, freight buildings, surface parking, train tracks, unimproved areas and the El Monte Busway currently under construction.

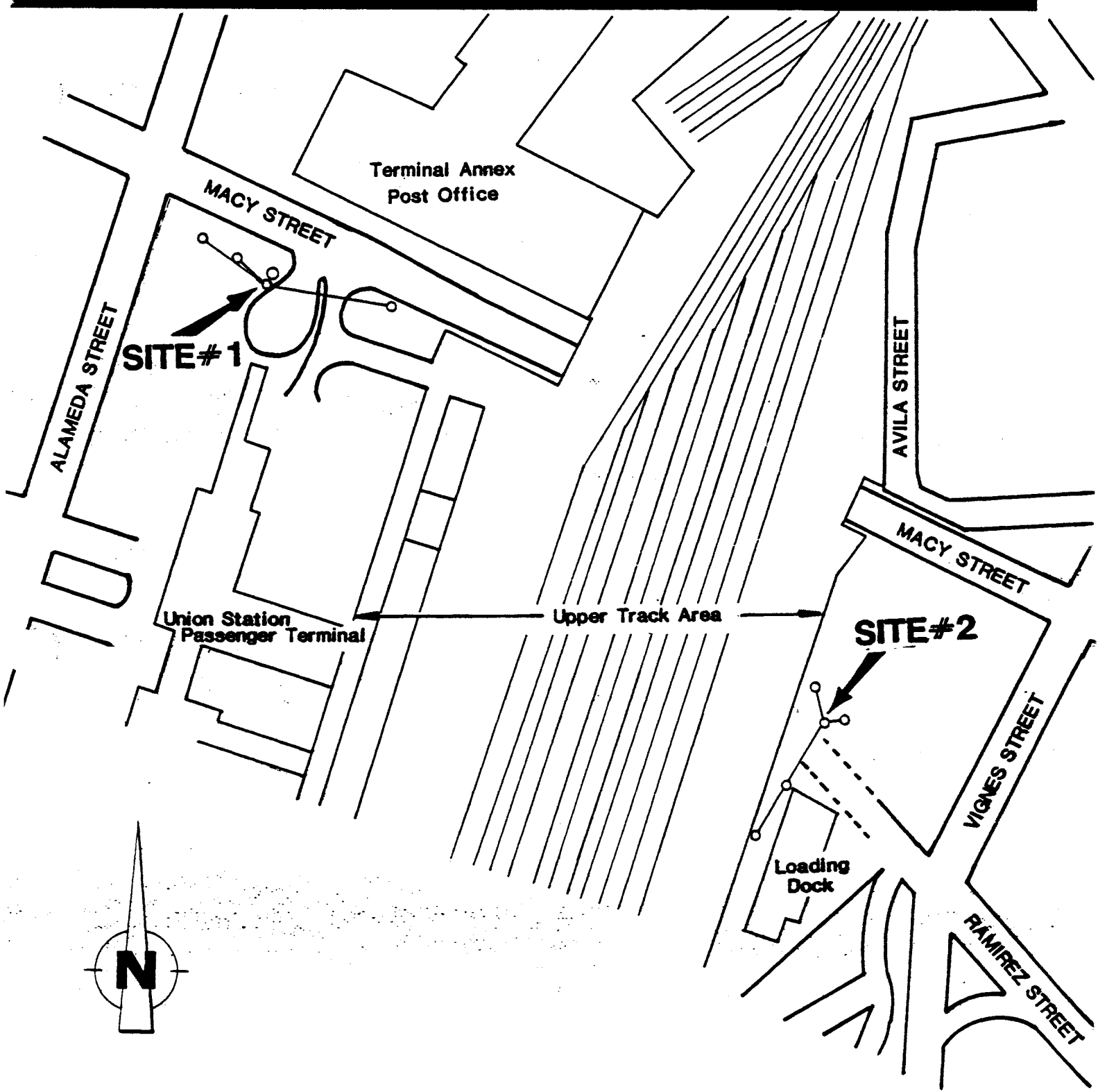
The proposed Union Station structures, consisting of a subway station terminal and track crossover, will be located below the currently operating railroad yards northeast of the existing Union Station Passenger Building. These structures will be about 1000 feet long, 65 feet wide, and will require excavating 46 to 60 feet below the existing ground surface.

2.1 Pump Test Site #1 Description

The Site #1 pump test was located on the southeast corner of Macy and Alameda Streets within the Union Station parking lot, as shown on Figure 2, Site #1 Well Location Map. An earlier pump test was performed at this site in 1983 (Appendix E - 1983 Pump Test Results). The test wells were located in the parking lots which border Macy Street. These paved areas were relatively level at an elevation of 278 feet to 280 feet. The area was heavily trafficked by pedestrians and vehicular activity related to the daily operation of the Union Station Train Terminal.

2.2 Pump Test Site #2 Description

The Site #2 Pump Test was located east of the elevated track area on the northwest corner of Ramirez and Vignes Streets as shown on Figure 3, Site #2 Well Location Map. This site occupies a vacant, unimproved area located east of the elevated central track and rail yard area. Several unused structures including a loading dock, metal building and a fenced area with abandoned concrete slabs were located on the site. The test wells were located north and south of Ramirez Street which bisects the Site #2 well field. The area was relatively level at an elevation of 278 feet to 281 feet.



SITE LOCATION MAP

**Union Station Area Aquifer Pump Tests
Metro Rail Project**

Scale **1" = 200'**

Project No.

Date **9-2-86**

83-1140-06

Prepared by

Figure

Checked by

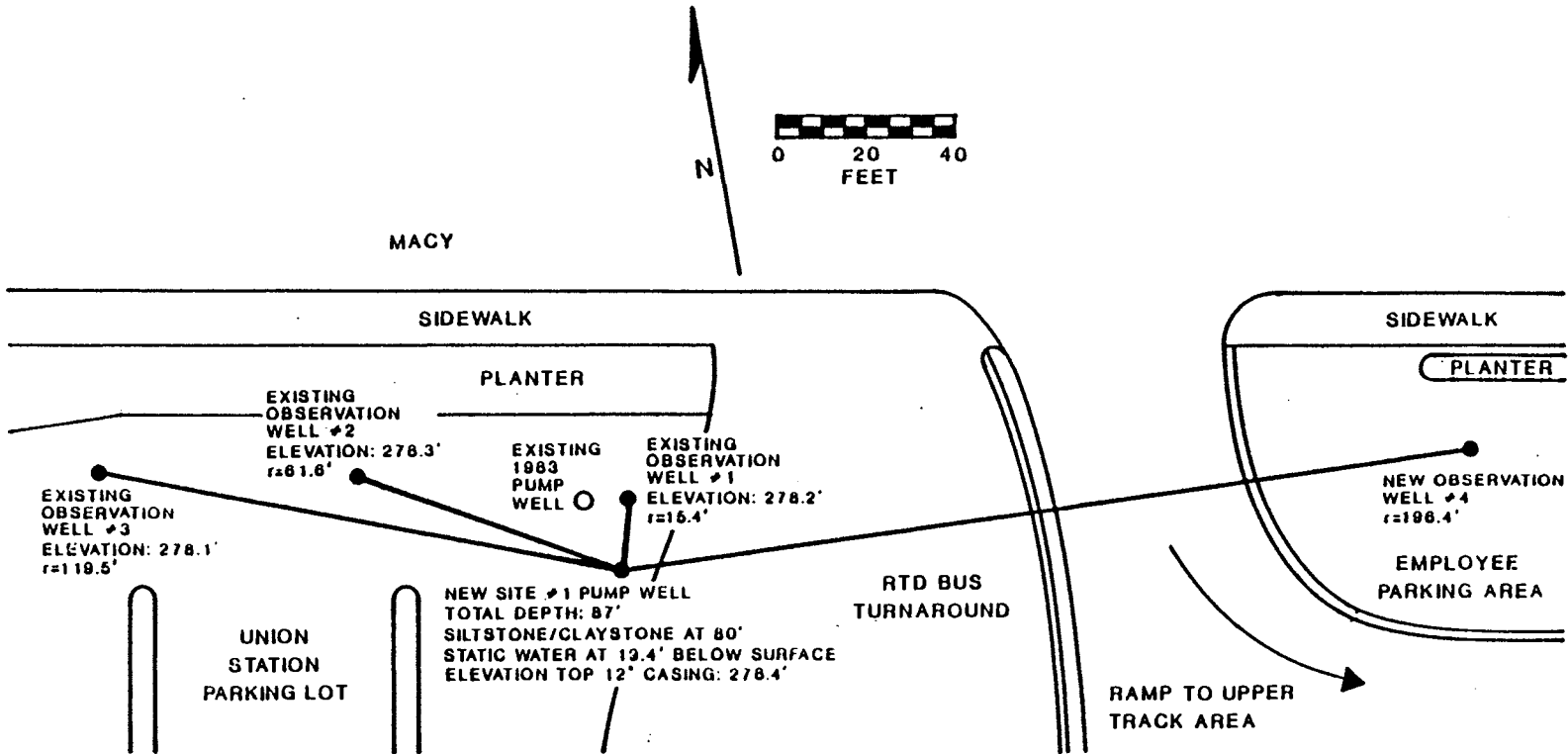
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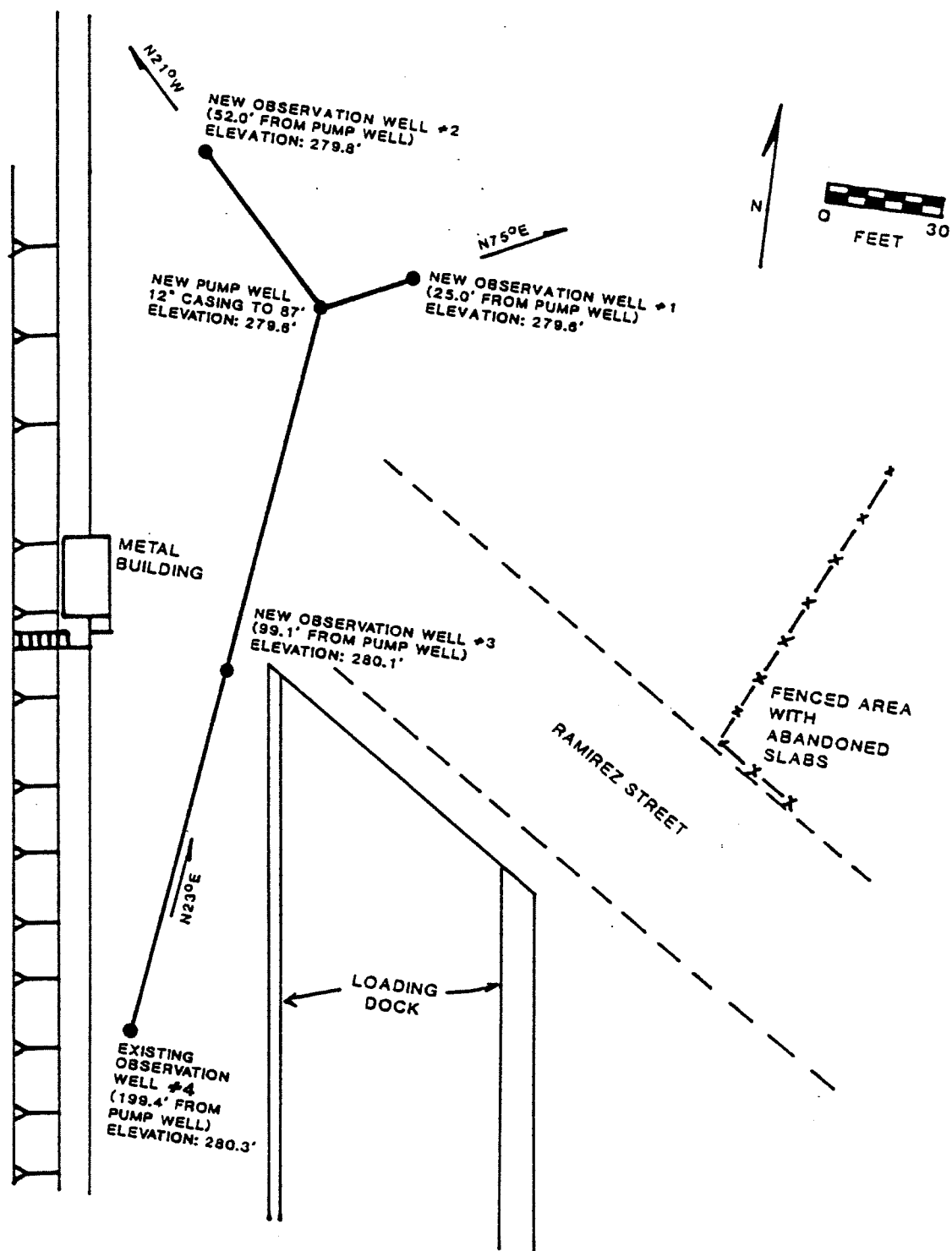
Approved By **MBS**



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SITE #2
WELL LOCATION MAP

FIGURE
3

3.0 WELL CONSTRUCTION AND DEVELOPMENT

Ground water tests wells used during this investigation include wells installed during the (1983) Design Unit A-135 geotechnical investigation and additional wells installed for this investigation. Four existing ground water observation wells (Site #1: OW-1, OW-2, OW-3 and Site #2: OW-4) installed during the 1983 investigation, were "air-lifted" to clean and develop the wells for re-use during the subject tests. Two pump wells (Site #1 and Site #2) and four additional ground water observation wells (Site #1: OW-4 and Site #2: OW-1, OW-2, OW-3) were drilled and installed during this 1986 investigation. Locations of these wells are shown on Figure 2, Site #1 Well Location Map, and Figure 3, Site #2 Well Location Map. Appendix B - Field Exploration, presents boring logs for test wells drilled during the 1983 geotechnical investigation and those drilled for this investigation.

3.1 Site #1 Well Construction and Development

- Pump Well(s): The existing Site #1 Pump Well was drilled during the 1983 geotechnical investigation. This well was drilled by the cable tool method, driving 12-inch double walled casing to a depth of 82.5 feet. The steel casing was then perforated by hydraulic louvers in place from 21 feet to 77 feet with staggered rows of punched slots measuring $1\frac{1}{2}$ inches long by $\frac{5}{32}$ inches wide. There are 12 slots per lineal foot.

During the present investigation an attempt was made to develop the existing Site #1 Pump Well and to remove accumulated sediments and improve hydraulic communication with the aquifer. The well was surged and air-lifted several times in attempts to free the slotted perforations of caked fines and corrosive materials and to remove accumulated sediments to a depth of 83.4 feet below the ground surface. Then a 10-hp submersible pump was placed at 77 feet below the ground surface to develop the well. The existing well was pumped dry to a depth of 77 feet in 4 minutes at an average discharge rate of 112 gallons per minute.

The performance of the existing Site #1 Pump Well had significantly deteriorated since the 1983 Pump Test. This well was determined to be

inadequate for re-use due to uncorrectable damages. Well failure was believed to have resulted from corrosion and incrustation of the steel casing slots.

The new Site #1 Pump Well was located approximately 13 feet south of the existing pump well in the Union Station Parking Lot area. This pump well was drilled with a Gus Pech 24-inch bucket auger drill rig. The 24-inch diameter bucket was equipped with hinged flaps which prevented excavated materials from washing out as the bucket was removed from the boring. The well boring was kept full of water during drilling to minimize caving. Approximately one 50 pound bag of Supercol[®] Guar Gum was used to drill the entire well boring.

The new pump well installation consisted of a 2-inch diameter monitoring well fastened to the exterior of the 12-inch diameter pump well casing. The 2-inch diameter pump monitoring well consisted of machine slotted (0.02 inch slot width) schedule 40 PVC casing. The 12-inch diameter pumping well consisted of machine slotted (0.05-inch full flow slots with 50.548 square inches of open filter area per 2 linear feet) schedule 160 PVC well casing with perforated intervals from 7 to 87 feet below the ground surface. The bottom of the pump bowls were set at a depth of 76 feet below the ground surface. Metal centralizers were used to position the casing within the boring. The annulus between the well casing and the 24-inch well bore was backfilled with design filter sand mix and sealed with 5 feet of bentonite and concrete above the perforations. A cast-iron well cover was installed over the completed well installation. The new pump well was developed using "air-lift" methods to initially clean the well followed by pumping to insure good hydraulic communication with the aquifer. During this development operation, a preliminary pump test was performed to evaluate well performance and determine pumping rates for the actual pump test.

- Observation Wells: Site #1 Observation Wells No. 1, 2 and 3 were drilled and installed during the 1983 geotechnical investigation. Information concerning the design and construction of these observation wells is presented in Table A - Site #1 Well Information and Appendix E - 1983 Pump Test Results. These observation wells, constructed of thermoplastic

materials (PVC) were "air-lifted" to remove accumulated sediments and develop the wells for re-use during this investigation. Approximately 1300 to 1600 gallons of water were removed from each well during development.

Observation Well No. 4, located approximately 196 feet east of the pump well, was drilled and installed during this investigation. A Failing 1500 rotary wash drill rig was used to drill and sample observation well No. 4. The boring was drilled to a depth of 84 feet then flushed with clean water to dilute the Revert[®] drilling additive. A 2-inch machine slotted PVC well casing was installed with perforations from 10 to 79 feet. The annulus between the 2-inch casing and the 6-inch well bore was backfilled with No. 3 Monterey Sand and sealed with 4.5 feet of bentonite and concrete. The well was again flushed with clean water.

A summary of the Site #1 groundwater test well information is presented in Table A - Site #1 Well Information.

3.2 Site #2 Well Construction and Development

- Pump Well: The Site #2 Pump Well is located in the vacant, unimproved lot located east of the main Union Station complex. This pump well was drilled with an Ingersol Rand Model TH60 direct rotary drill rig. The rotary wash well boring was advanced using a combination of 10-inch, 12-inch and modified 24-inch diameter tri-cone drill bits. The boring was started with a drilled 10-inch pilot hole which was successively reamed out to a 24-inch diameter boring using repeated passes from the 12-inch and 24-inch tri-cone bits. The boring was drilled to a depth of 110 feet then flushed with clean water to dilute the Supercol[®] Guar Gum drilling additive used during the drilling operation.

The pump well installation consisted of a 2-inch diameter monitoring well fastened to the exterior of the 2-inch diameter pump well casing. The 2-inch pump monitoring well was machine slotted (0.02-inch slot width) schedule 40 PVC casing. The 12-inch diameter pumping well was machine slotted (0.05-inch full flow slots with 50.548 square inches of open filter area per 2 linear feet) schedule 160 PVC well casing. Metal

TABLE A
SITE #1 - WELL INFORMATION

1986 Pump Test Well Number	Depth to Aquiclude (feet) (Bedrock Puente Formation)	Depth To Static Groundwater Date (feet)	Saturated Thickness of Aquifer b (feet)	Static Groundwater Elevation 6/23-24/86	Distance (r) From Pump Well (feet)	Surface Casing Elevation	Casing Diameter (inches)	Open Slot Interval Below Surface (feet)	Total Depth Drilled Below Surface (feet)
New Site #1 Pump Well	80	19.1 (6/24/86)	60.9	259.3'	--	278.4'	12/2	7-87	88
Observation Well No. 1 (1983 - No. 5-1)	79.5	19.4 (6/24/86)	60.1	258.8'	$r_1 = 15.4$	278.2'	2	45-85	85
Observation Well No. 2 (1983 - OW-1)	79*	19.0 (6/24/86)	60	259.3'	$r_2 = 61.6$	278.3'	4	5-70	84
Observation Well No. 3 (1983 OW-2)	79*	18.5 (6/24/86)	60.5	259.6'	$r_3 = 119.5$	278.1'	4	5-75	85
Observation Well No. 4	79	20.1 (6/24/86)	58.9	258.9'	$r_4 = 196.2$	279'	2	10-79	84

* Estimated Value

Average Static Ground Water Elevation on 6/24/86: 259 feet

Average Saturated Thickness of the Site #1 Aquifer on 6/24/86: 60 feet

centralizers were used to position the casings within the boring. The annulus between the well casing and the 24-inch well bore was backfilled with design filter sand mix and sealed with 7 feet of bentonite and concrete above the perforations. A cast-iron well cover was installed over the completed well installation. The pump well was developed using "air-lift" methods to initially clean the well followed by pumping to insure good hydraulic communication with the aquifer. During this development operation, a preliminary pump test was performed to evaluate well performance and determine pumping rates for the actual pump test.

- Observation Wells: Site #2 Observation Wells Nos. 1, 2 and 3 were drilled and installed during this investigation. A Failing 1500 drill rig was used to drill and sample each observation well. The borings were drilled to depths ranging between 84 feet and 94 feet below existing ground surface as shown on Table B. Each well boring was then flushed with clean water to dilute the Revert[®] drilling additive used during the drilling operation. A 2-inch machine slotted PVC casing was then installed to intervals shown on Table B. The annulus between the 2-inch casings and the 6-inch well bore of each well was backfilled with No. 3 Monterey Sand and sealed with bentonite and concrete. The wells were again flushed with clean water to dilute any remaining Revert[®] drilling additive and establish good hydraulic communication with the aquifer.

Site #2 Observation Well No. 4 was drilled and installed during the 1983 geotechnical investigation (1983 observation well No. 5-5). Information concerning the design and construction of this well is presented in Table B - Site #2 Well Information and Appendix E - 1983 Pump Test Results. This observation well, constructed of thermoplastic material (PVC), was "air-lifted" to remove accumulated sediments and develop the well for re-use during this investigation. Approximately 1300 to 1600 gallons of water were removed from this well during development.

A summary of the Site #2 groundwater test well information is presented in Table B - Site #2 Well Information.

TABLE B
SITE #2 - WELL INFORMATION

1986 Pump Test Well Number	Depth to Aquiclude (feet) (Bedrock Puente Formation)	Depth To Static Groundwater Date (feet)	Saturated Thickness of Aquifer b (feet)	Static Groundwater Elevation 6/6/86	Distance (r) From Pump Well (feet)	Surface Casing Elevation	Casing Diameter (inches)	Open Slot Interval Below Surface (feet)	Total Depth Drilled Below Surface (feet)
Site #2 Pump Well	84.5	24.9 (6/6/86)	59.6	254'	--	278.9'	12/2	7-87	110
Observation Well No. 1	84.5	25.0 (6/6/86)	59.5	254.1'	$r_1 = 25.0$	279.1'	2	10-89	94
Observation Well No. 2	84.5*	25.3 (6/6/86)	59.2	254.2'	$r_2 = 52.0$	279.5'	2	12-81	84
Observation Well No. 3	84	26.1 (6/6/86)	57.9	253.8'	$r_3 = 99.1$	279.9'	2	10-79	85
Observation Well No. 4 (1983-No. 5-5)	90	27.1 (6/6/86)	62.9	253.2'	$r_4 = 199.4$	280.3'	2	60-100	100

* Estimated Value

Average Static Ground Water Elevation on 6/6/86: 254 feet

Weighted Average Saturated Thickness of the Site #2 Aquifer on 6/6/86: 59.5 feet

4.0 PUMP TEST PROCEDURES

4.1 Site #1 - Pump Test Procedures

Site #1 (Macy and Alameda Streets) Aquifer Pump Test was conducted between June 24 and June 26, 1986. During this pump test operation a 15-hp submersible pump intake was positioned approximately 76 to 77 feet below the ground surface. Test activities performed during this period include the following:

- 1) Stage 1: 9-minute test at an average rate of 341 gpm. (The pump's circuit breaker shut off prematurely due to electrical overloads. Water levels were permitted to recover for 40 minutes to static conditions before Stage 2 was started).
- 2) Stage 2: 49-hour, 58-minute constant rate pump test at an average of 362 gpm.
- 3) Recovery: 4-hour, 19 minute well recovery test was performed following pump test Stage 2.

4.2 Site #2 - Pump Test Procedures

The Site #2 (Ramirez and Vignes Streets) Aquifer Pump Test was conducted between June 6 and June 9, 1986. During this test operation the 15-hp submersible pump intake was positioned approximately 76 to 77 feet below the ground surface. Test activities performed during this period include the following:

- 1) Stage 1: 48-hour variable rate pump test at an average rate of 295 gpm. (Variations in pumping rate were observed during the early stages of the pump test, the 4-inch gate valve was adjusted periodically to attempt to maintain a constant flow rate. The pump's circuit breaker shut off after 48 hours of pumping as the 4-inch gate valve was adjusted to the Stage 2 flow rate of 572 gpm. This shut off was believed to have resulted from a drop in pump back-pressure causing excessive pump motor speeds as the gate valve was opened. The duration of time between the Stage 1 and Stage 2 tests was 1 hour and 56 minutes. The water level within the pump well had recovered to approximately 80% of the initial static level within this recovery period.
- 2) Stage 2: 24-hour constant rate pump test at an average rate of 572 gpm.
- 3) Recovery: 2-hour, 20 minute well recovery test was performed following pump test Stage 2.

4.3 Instrumentation

The pump test flow rates were controlled by adjusting a 4-inch diameter gate valve positioned in the discharge line near the well head. These controlled flow rates were monitored with a 4-inch diameter McCrometer® flow meter which displayed flow rate and cumulative flow volume. The 4-inch gate valve was periodically adjusted to maintain a relatively constant flow rate.

Fluctuations in ground water levels were measured and recorded with programmable data loggers. An Enviro Lab® DL 120 data logging system, using 50 and 25 psig transducers, recorded water level fluctuations in the pumping wells and observation wells 1, 2 and 3. A Hermit® Model SE1000B environmental data logger, using a 50 psig transducer, recorded water level fluctuations in observation well 4, data was processed in the field with a Compaq® computer system.

5.0 GROUNDWATER CONDITIONS

5.1 Regional

The Union Station pump test sites are located in the northern portion of the Central Ground Water Basin of Los Angeles in an area identified as the Los Angeles Forebay. This forebay area lies in a zone of transition between the Los Angeles River Narrows to the north and the Central Ground Water Basin to the south. The area is bounded by the low-lying Elysian Park Hills to the west and the Repetto Hills to the east.

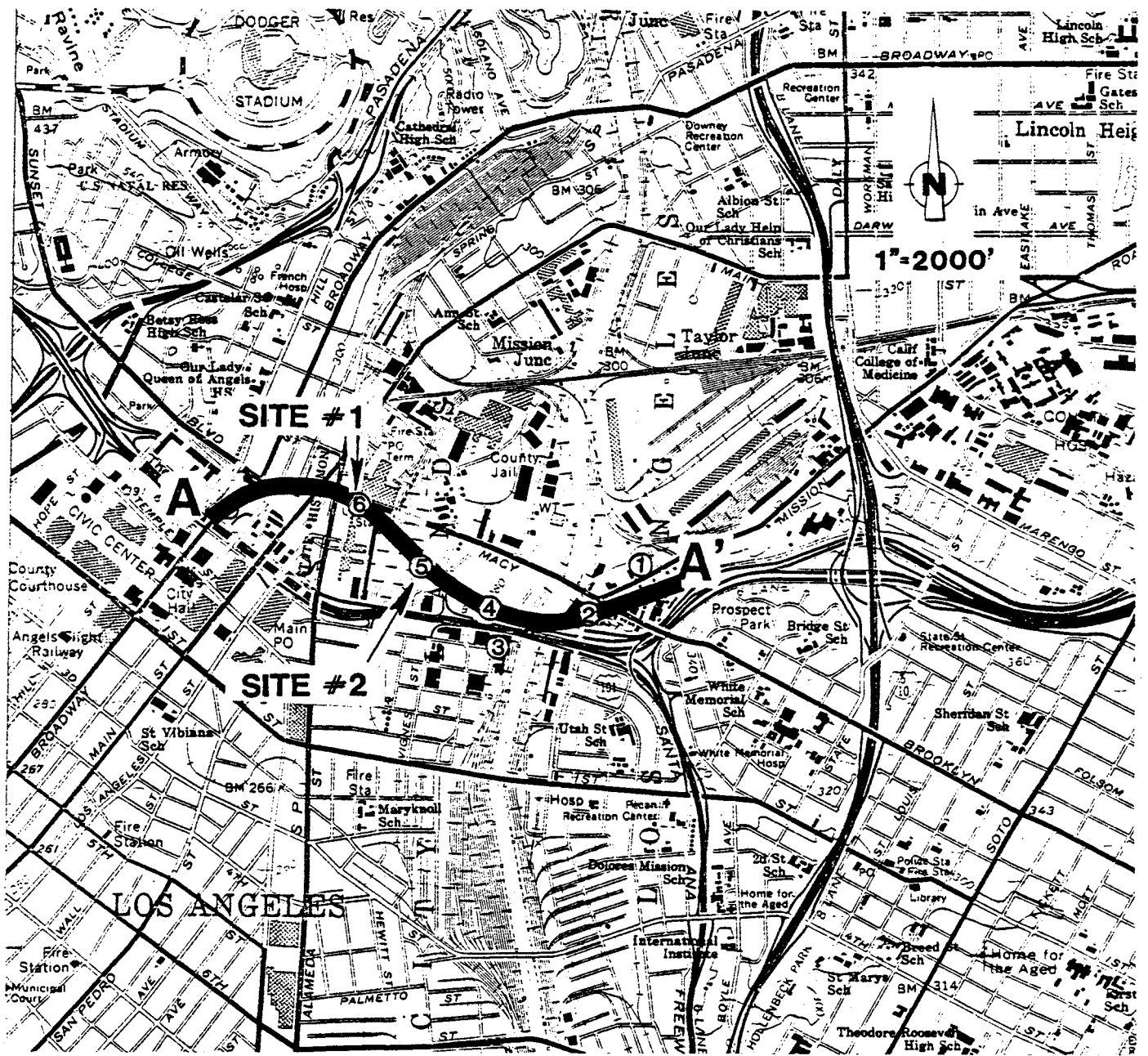
The groundwater aquifers within the Los Angeles Forebay consist predominantly of water-bearing alluvial sediments deposited over time by the Los Angeles River. These deposits have mixed with finer sediments contributed by merging local streams from the surrounding Elysian Park-Repetto Hills. These aquifer sediments which comprise the Los Angeles Forebay are considered to have a large available groundwater storage capacity (Department of Water Resources, Bulletin No. 104, Appendix A, p. 175). Bedrock of the middle Miocene Puente Formation underlies these sediments in the vicinity of the Los Angeles River Narrows and is exposed at various places in the low-lying hills which surround the area.

The groundwater recharge in the Los Angeles Forebay area is by surface and subsurface inflow through the Los Angeles River Narrows which drains the upper Los Angeles River area, by percolation of precipitation and local runoff, and by artificial recharge of either local or imported water.

5.2 Local Aquifer Hydrogeology

The groundwater table in the vicinity of the Union Station area occurs well above the projected track elevation. This section discusses aquifer characteristics interpreted from the exploratory drilling and well testing.

The aquifer materials that will require dewatering for this project comprise mainly well-graded alluvial gravels and sands overlying relatively impermeable siltstone bedrock of the Puente Formation (Figures 4, 5 and 5A). Depth to groundwater ranges from about 20 to 30 feet over the area proposed for excavation.



REFERENCE:
 U.S.G.S. Los Angeles Quad.
 1966, Photorevised 1981

Location of Geologic Section
 (See Figure 5)





























ENGINEERING GEOLOGY PROFILE LOCATION

METRO RAIL PROJECT
 UNION STATION AREA AQUIFER PUMP TESTS

Project No.
 83-1140-06

 **Converse Consultants** Geotechnical Engineering and Applied Sciences

Figure No.
 4

	SILT		INTERBEDDED SAND WITH SILTSTONE OR CLAYSTONE
	CLAY		CEMENTED ZONE
	SANDY SILT		TAR SAND
	SANDY CLAY		TAR SILT & CLAY
	CLAYEY SILT		FILL
	SILTY CLAY		GRAVELLY CLAY
	SILTY SAND		SANDSTONE
	CLAYEY SAND		SAND, CONGLOMERATE
	SAND		SHEAR ZONE
	GRAVELLY SAND		BASALT
	SANDY GRAVEL		BRECCIA
	GRAVEL		META-SANDSTONE
	SILTSTONE		
	CLAYSTONE		

CEG 38 CONVERSE WARD DAVIS DIXON EARTH SCIENCES ASSOCIATES AND GEO/RESOURCE CONSULTANTS BORINGS (1981)

NRC 4630 NUCLEAR REGULATORY COMMISSION (1980); SHOWING STREET ADDRESS ON WILSHIRE

W-C-1 WOODWARD-CLYDE BORING (1977)

K-54 KAISER ENGINEERING BORING (1982)

Qal..... YOUNG ALLUVIUM

Qalo..... OLD ALLUVIUM

SP..... SAN PEDRO FORMATION

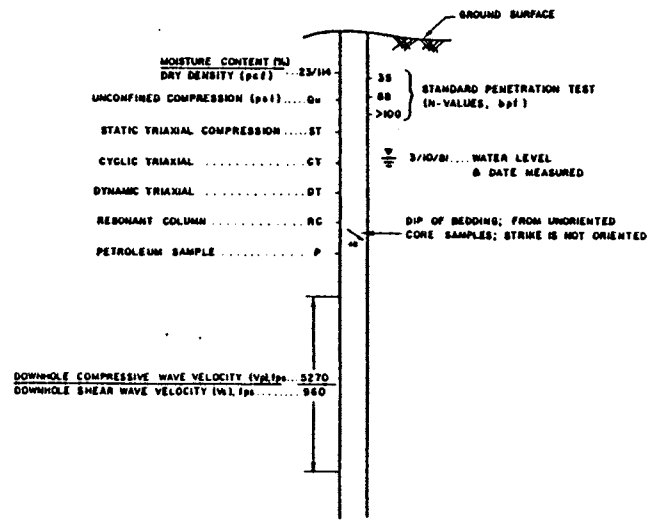
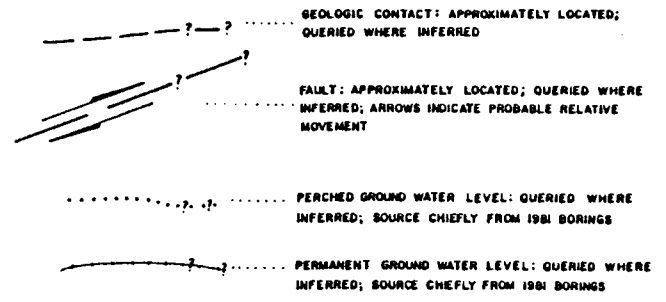
Tf..... FERNANDO FORMATION

Tp..... PUENTE FORMATION

Tt..... TOPANGA FORMATION

Tb..... BASALT

P..... PETROLEUM/GAS



- NOTES:
- 1) These Engineering Geology Profiles are based on interpolation between borings and were prepared as an aid in developing design recommendations. Actual conditions encountered during construction may be different.
 - 2) The location of these profiles is the presently Proposed Metro Rail Project alignment shown on Drawing 1.
 - 3) Borings projected more than 300' to the profile line were considered in the interpretation of subsurface conditions, and are noted on Drawing 2. However, final interpretation is based on numerous factors and may not reflect the boring logs as presented in Appendix A.
 - 4) Refer to report for specific description of geologic units.
 - 5) Refer to Drawing 2 for expanded classification and description of geologic symbols.
 - 6) Refer to appendix for engineering properties of materials.

ENGINEERING GEOLOGY PROFILE EXPLANATION

Metro Rail Project
 Union Station Area Aquifer Pump Tests

83-1140-06



Converse Consultants Geotechnical Engineering and Applied Sciences

Figure 5A

The groundwater-saturated zone measured at the time of the pump tests averages about 60 feet in thickness. The water table and base of the aquifer zone appear to be relatively planar and gently sloping eastward in the proposed station vicinity. Elevations of the aquifer top and bottom are tabulated for test and observation wells in the vicinities of the western (Site #1) and eastern (Site #2) areas in Tables A and B, respectively. Geologic logs and construction features of the wells are included in Appendix B - Field Exploration.

Cobble and boulder zones were encountered in most test holes in the station vicinity, occurring 70 to 80 feet deep in the western areas, and between 35 and 45 feet deep in the eastern area. Two silty zones, ranging from about 4 to 10 feet in the thickness, appear to be relatively continuous in the eastern section (Site #2), occurring within the elevation intervals of 240 to 250 feet and 210 to 220 feet above sea level. Fine-grained zones also are present in the western area (Site #1) but may be less continuous. Stratigraphic and textural variations affect well drawdowns during initial pumping, but these effects are transient and are probably relatively unimportant after a few days of pumping.

5.3 Groundwater Quality

As part of our investigation, water samples from the ground water test wells were obtained for water quality analysis. Results of the analyses appears in Appendix C of this report.

6.0 AQUIFER PUMP TEST RESULTS

6.1 General Approach and Analysis

Four pump tests (excluding short preliminary tests) have been conducted and analyzed under Converse Consultants' direction in the station vicinity. The first test was performed in 1983 by ESA Geotechnical Consultants, Inc. at the Site #1 location (Macy and Alameda Streets) and presented in Appendix E of this report. Converse and Geo/Resource Consultants conducted three additional pump tests in June, 1986. Two of these tests (Stage 1 and Stage 2) were conducted in the eastern area (Site #2 - Ramirez and Vignes Streets) and the third in the western area (Site #1 - Macy and Alameda Streets) using new test wells and additional observation wells. The report by Geo/Resource Consultants, in which these three tests are described and preliminarily interpreted, are included in Appendix A - Pump Test Data. Converse has conducted additional review and analyses of these pump tests performed in 1986 and presented the results of our findings in this report.

Pump test measurements, including initial static water levels, saturated thickness, pumping rates, time-drawdown fluctuations and recovery were recorded for the pump well and observation wells during each pump test. This field data was then analyzed and plotted on log-log and semi-log paper to graphically represent the specific response of the underlying aquifer system to each pump test.

The interpretation of the pump test results involved matching specific curves of drawdown versus time and recovery versus time for each well, generated from the pump test data to theoretical type-curves of an appropriate aquifer system model. This procedure involves the search for as close as possible match of fluid level response in the aquifer to that expected in the well-defined theoretical aquifer model. This approach requires that the theoretical and actual aquifer fluid level response for a given flow rate be nearly identical. Appropriate values derived from the type-curve matching are then used to calculate the aquifer's transmissivity and storativity. The specific type-curves generated from the pump test data and the type curve match points are shown in Figures 6, 7 and 8.

FIGURE NO. 6
UNION STATION SITE #1, STAGE 2
DELAYED YIELD CURVES AND MATCH POINTS

Match Point Reference: Lohman, U.S.G.S, Professional Paper 708, Plate 8

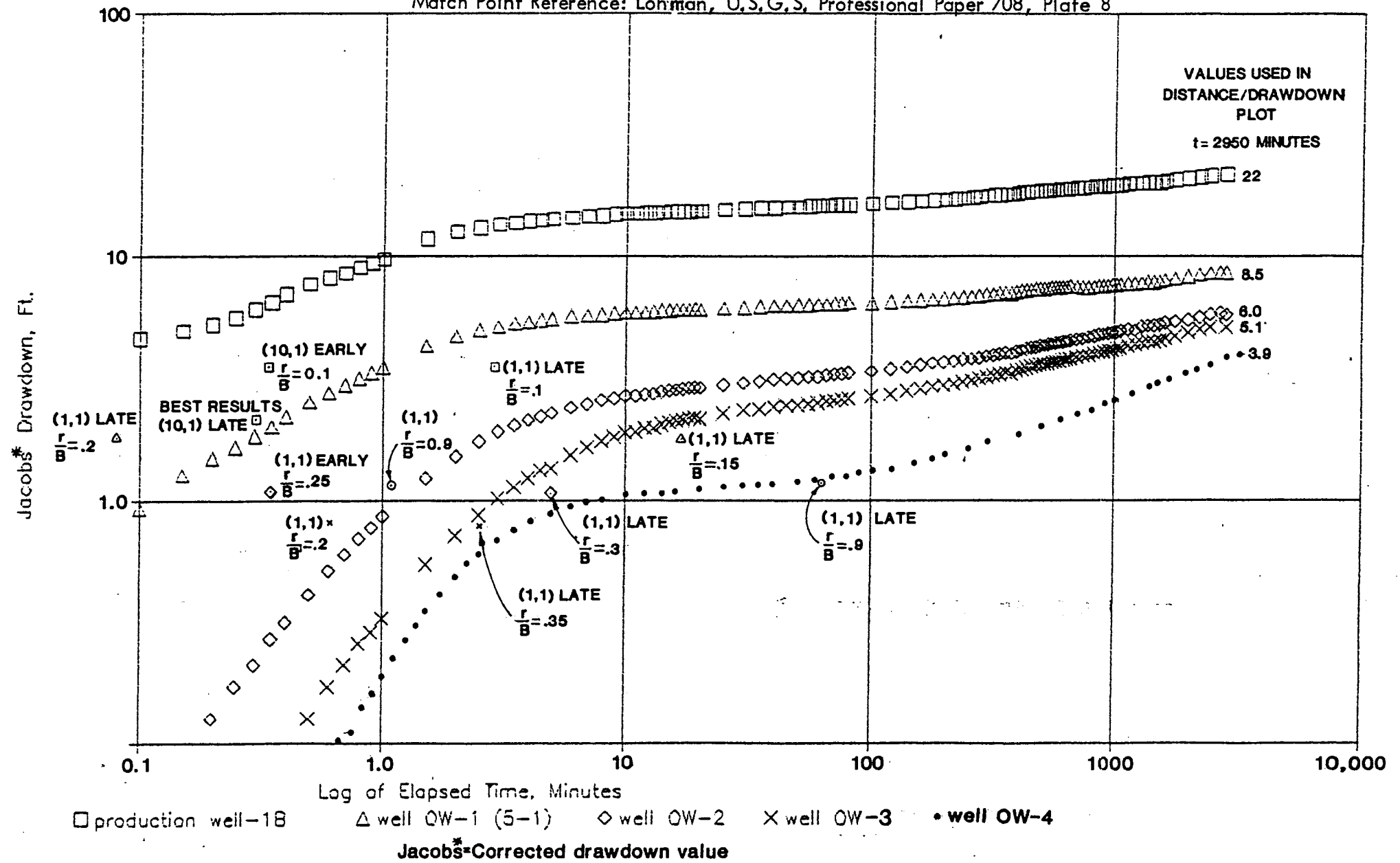
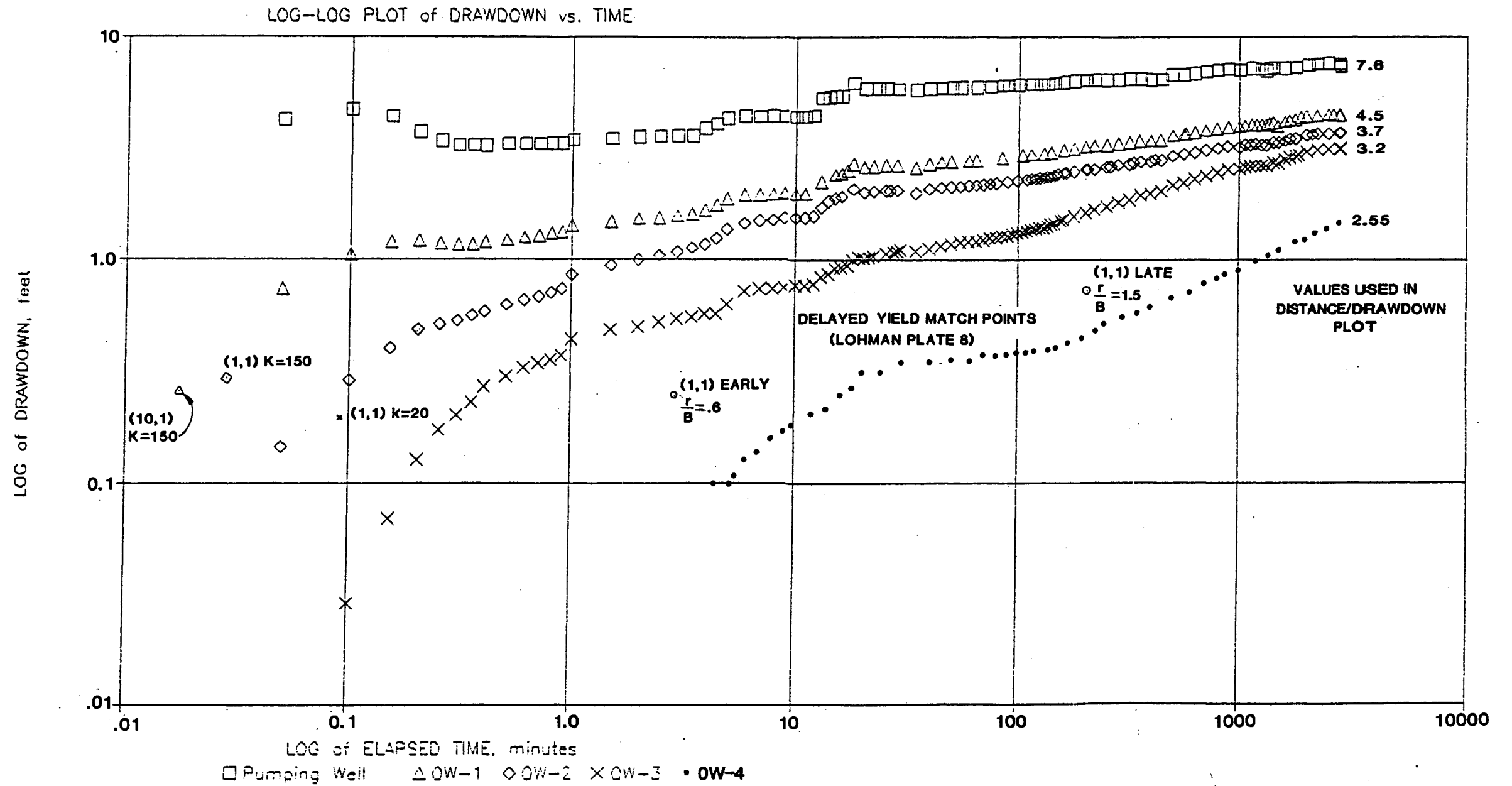


FIGURE NO. 7
UNION STATION SITE # 2 , STAGE 1

Match Point Reference: Lohman, U.S.G.S. Professional Paper 708, Plate 9



In an aquifer system similar to that within the Los Angeles River narrows at the test sites, aquifer properties, i.e., permeability, transmissivity and storativity, may vary considerably in time and spatial distribution. Thus, it is important to recognize that calculated values of aquifer properties based on the results of short term (72 hours) pump tests cannot predict exact aquifer conditions to be experienced during dewatering for much longer periods.

Additional analyses and interpretation were performed using semi-log plots of distance versus drawdown and residual drawdown versus time for wells in each test site. Residual-drawdown plots for individual wells located close enough to the pump well and taken during the pump test recovery period provided aquifer data unaffected by pump vibrations and momentary variations in pumping rate. These methods provide another analytical method with which to interpret aquifer properties. Semi-log plots of distance versus drawdown and residual drawdown versus time for selected individual wells are shown in Appendix A of this report.

Table C summarizes the numerical results of aquifer parameters calculated by various analytical methods for each pump test site.

6.2 Interpretation

Based on the analyses and interpretation of the type-curve matching and semi-log and log-log plots, it is our opinion that there is no single value of transmissivity that represents the aquifer characteristics at both sites 1 and 2 for all possible periods of future dewatering. Rather, there is a range of expected values which may represent the initial aquifer transmissivity at the start of dewatering followed by a different aquifer transmissivity that represents aquifer conditions after long periods of dewatering. This statement is borne out by interpretation of various pump test data and semi-log, time-drawdown plots for observation wells which show definite boundary effects after about 200 minutes of pumping. In essence, the effect of a boundary is to reduce the amount of saturated thickness in the aquifer which reduces the transmissivity.

In our attempt to provide as much useful aquifer information as possible, we have presented both initial and long term transmissivity values and a

TABLE C
SUMMARY OF PUMP TEST RESULTS FOR UNION STATION SITE #1 - MACY AND ALAMEDA STREETS

Pump Test Date	Stage No.	Well No.	Average Pumping Rate (gpm)	Duration (min.)	Transmissivity (gallons per day per foot)				Storage Coefficient		
					Log-Log	Semi-Log		Dist - DD	Residual - DD	Log-Log	Dist - DD
1983	1	OW-1	150 (3)	1380	54,000 (10)	140,000 (12)		--	--	--	--
		OW-2 (1)	150	1380	21,000 (10)	--	--	--	--	0.07 (10)	--
		OW-3 (2)	150	1380	42,000 (10)	30,000 (12)	--	--	--	0.02 (10)	--
		All	150	1380	--	--	--	21,000 (11)	--	--	0.06 (11)
1986	2	Pump Well	362	2998	12,000 (6)	48,000/83,000 (13)	62,000/28,000 (15)	--	84,500 (14)	--	--
		OW-1 (4)	362	2998	23,000 (6)	119,000/112,000 (13)	117,000/60,000 (15)	--	105,000 (14)	--	--
		OW-2	362	2998	38,000 (6)	127,000/115,000 (13)	129,000/49,000 (15)	--	111,000 (14)	--	--
		OW-3	362	2998	50,000 (6)	130,000/119,000 (13)	145,000/54,000 (15)	--	--	--	--
		OW-4	362	2998	35,000 (6)	--	--	--	--	--	--
		All	362	2998	--	--	--	46,600 (9)	--	--	9.0x10 ⁻³ (9)

TABLE C
SUMMARY OF PUMP TEST RESULTS FOR UNION STATION SITE #2 - RAMIREZ AND VIGNES STREETS

Pump Test Date	Stage No.	Well No.	Average Pumping Rate (gpm)	Duration (min.)	Transmissivity (gallons per day per foot)				Storage Coefficient		
					Log-Log	Semi-Log		Dist - DD	Residual - DD	Log-Log	Dist - DD
1986	1	Pump Well	295	2880	--	--	153,000/71,000 (15)	--	--	--	--
		OW-1	295	2880	130,000 (7)	--	104,000/64,000 (15)	--	--	1x10 ⁻⁴ (7)	--
		OW-2	295	2880	114,000 (7)	--	205,000/85,000 (15)	--	--	5x10 ⁻⁴ (7)	--
		OW-3	295	2880	173,000 (7)	--	186,000/57,000 (15)	--	--	6x10 ⁻⁴ (7)	--
		OW-4 (5)	295	2880	140,000/ 45,000 (8)	--	--	--	--	4x10 ⁻³ / 9x10 ⁻² (8)	--
		A11	295	2880	--	--	--	72,000 (9)	--	--	4.8x10 ⁻³ (9)
1986	2	Pump Well	572	1440	--	200,000/180,000 (13)	191,000/110,000 (15)	--	178,000/ 134,000 (14)	--	--
		OW-1	572	1440	39,000 (8)	200,000/200,000 (13)	187,000/187,000 (15)	--	143,000 (14)	2x10 ⁻³ / 1x10 ⁻⁵ (8)	--
		OW-2	572	1440	61,000 (8)	190,000/200,000 (13)	196,000/196,000 (15)	--	130,000 (14)	1x10 ⁻³ / 2x10 ⁻³ (8)	--
		OW-3	572	1440	69,000 (8)	250,000/250,000 (13)	244,000/244,000 (15)	--	--	5x10 ⁻⁴ / 1x10 ⁻⁵ (8)	--
		OW-4 (5)	572	1440	24,000 (8)	--	--	--	--	1x10 ⁻³ / 9x10 ⁻² (8)	--
		A11	572	1440	--	--	--	70,200 (9)	--	--	0.13 (9)

TABLE C
SUMMARY OF PUMP TEST RESULTS - UNION STATION SITES 1 AND 2

NOTES

- 1) This well is referenced as OW-1 in ESA Geotechnical Consultants (1983) and Geo/Resource Consultants (February, 1986).
- 2) This well is referenced as OW-2 in ESA Geotechnical Consultants (1983) and Geo/Resource Consultants (February, 1986).
- 3) This well is referenced as 5-1 in ESA Geotechnical Consultants (1983) and Geo/Resource Consultants (February, 1986).
- 4) This well is 1983 boring 5-1.
- 5) This well is 1983 boring 5-5.
- 6) Analysis by Converse Consultants (Figure No. 6) using "delayed yield" type curves (Lohman, 1972, Plate 8).
- 7) Analysis by Converse Consultants (Figure No. 7) using "discharging image" type curves of Lohman, (1972, Plate 9).
- 8) Analysis by Converse Consultants (Figure No. 8) using "delayed yield" type curves (Lohman, 1972, Plate 8). Figures are for early/late times (one Figure means same value for both early and late times).
- 9) Analysis by Converse Consultants (Figure Nos. 9 and 10) using Jacob semi-log plot of distance versus drawdown (e.g., see Powers, 1981, p. 82-83).
- 10) Analysis by ESA Geotechnical Consultants, Inc. (Appendix A) using "delayed yield" type curves of Neuman, 1975).
- 11) Analysis by ESA Geotechnical Consultants, Inc. (Appendix A) using Jacob semi-log plot of distance versus drawdown (e.g., see Powers, 1981, p. 82-83).
- 12) Analysis by Geo/Resource Consultants, Inc. (Appendix A) using semi-log residual drawdown (buildup) method (e.g., see Powers, 1981, p. 82-85).
- 13) Analysis by Geo/Resource Consultants, Inc. (Appendix A) using semi-log drawdown/residual drawdown methods (e.g., see Powers, 1981, p. 82-85).
- 14) Analysis by Converse Consultants, Inc. (Appendix A) using semi-log plot of residual drawdown.
- 15) Analysis by Converse Consultants, Inc. (Appendix A) using semi-log plots of distance versus drawdown with initial and long-term average transmissivity/permeability values.

permeability value. For practical purposes, under normal conditions the real aquifer permeability can be considered as a constant value. Transmissivity values, however, do change with time due to the effects of boundaries and dewatering which create changes in the saturated thickness.

Aquifer transmissivity as calculated from a semi-log or log-log time-drawdown plot from an individual observation well represents that portion of the aquifer surrounding that individual well; however, often that value may not be representative of the aquifer, as a whole. Most of the variations in calculated values of transmissivity among observation wells at the same site during the same pump test can be attributed to the combined effects of: (1) inhomogeneties and variations in the local hydrological conditions (e.g., coarse, well-sorted alluvial channel gravels as compared to fine-grained deposits); (2) differences in directional transmissivity due to aquifer anisotropy; and (3) variations in observation well efficiencies caused by differences in well construction/development.

Storativity, a dimensionless term, represents the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer for a unit change in hydraulic head. Storativity values were calculated from the pump test data using the calculated initial and long-term transmissivity values. Storativity values presented in tables D and E are thought to be representative of site aquifer conditions. These are apparent values calculated from short-term (72 hours) pumping tests. Apparent storativity values may be expected to change over long pumping periods.

6.2.1 Initial Transmissivity/Permeability Values

For initial aquifer transmissivity and real permeability values, calculations were made using relatively early time-drawdown data from the semi-log plots prior to the influence of the boundary effects, yet late enough for the semi-log analysis to be valid. Thus, these initial aquifer transmissivity and permeability (transmissivity divided by saturated aquifer thickness) values are representative of actual aquifer transmissivity in that area of the aquifer between the pump well and observation wells under constant head and continuous recharge. These initial transmissivity values represent transient aquifer conditions that would likely exist at the beginning of aquifer dewatering and decrease as dewatering progresses. However, the calculated permeability values do not change with time.

Table D presents the estimated initial aquifer transmissivity and real permeability values calculated for sites 1 and 2, as interpreted from the pump test data of June 1986 and represents aquifer conditions at the time of the test.

TABLE D
SUMMARY OF INITIAL TRANSMISSIVITY, PERMEABILITY AND STORATIVITY VALUES

	SITE 1		SITE 2	
	<u>Macy and Alameda Streets</u>		<u>Ramirez and Vignes Streets</u>	
INITIAL TRANSMISSIVITY	<u>gpd/ft</u>	<u>ft²/min.</u>	<u>gpd/ft</u>	<u>ft²/min.</u>
	106,000	9.8	180,000	16.7
PERMEABILITY	<u>gpd/ft²</u>	<u>ft/min.</u>	<u>gpd/ft²</u>	<u>ft/min.</u>
	1,770*	0.16*	3,000†	0.28†
STORATIVITY (Dimensionless)	0.07		0.10	

AVG = .22

* Average saturated thickness of the Site #1 aquifer on June 24, 1986: 60 feet.

† Weighted average saturated thickness of the Site #2 aquifer on June 6, 1986: 59.5 feet.

Note: Values shown are rounded for convenience.

6.2.2 Long-Term Average Transmissivity Values

The average long-term aquifer transmissivity values were estimated from interpretation of the distance-drawdown, semi-log and log-log time drawdown and the residual drawdown (recovery) plots of the individual observation and pumping wells.

It should be emphasized that the real aquifer permeability changes very little with time. However, transmissivity values do change with time because of the effects of boundaries and dewatering which create changes in the saturated thickness.

The distance-drawdown plots of several observation wells provide a representative average aquifer transmissivity values for the area between the observation wells (Figures 9 and 10). This value is thought to be very representative of the average aquifer conditions. The distance-drawdown plots of the observation wells at both sites for both pump tests show consistency among individual wells, suggesting that the values of transmissivity calculated from these plots are representative of the aquifer conditions within the area of the aquifer between the observation wells and the pump well at the time of the pump test.

A number of log-log time-drawdown plots using "delayed yield" matching curve techniques were employed to calculate transmissivity and storage values. For the most part, these calculated transmissivity values are low compared to values calculated by semi-log analysis, although some values compare favorably with the distance-drawdown values of average aquifer transmissivity, suggesting that these values are representative of long-term average aquifer conditions.

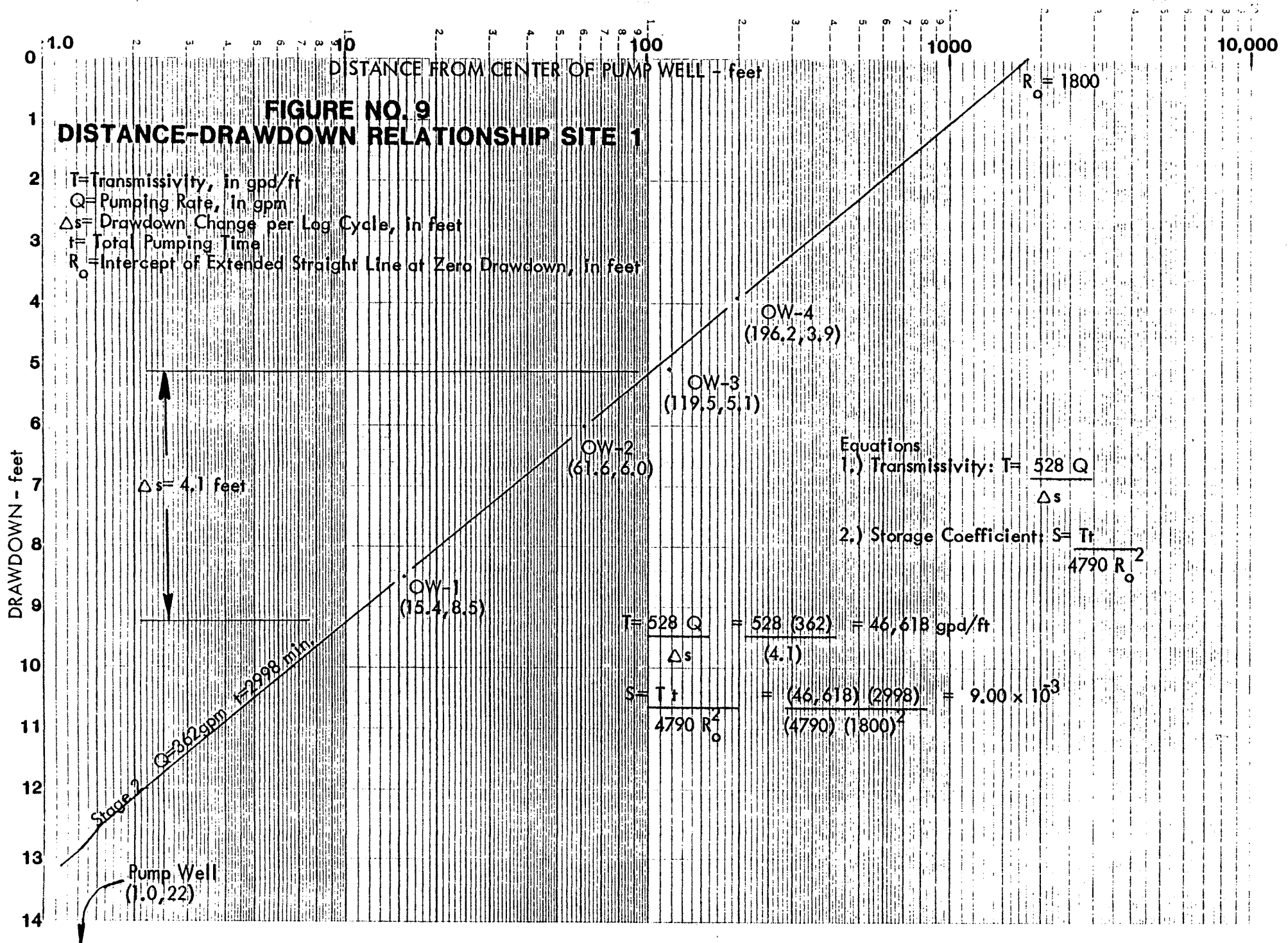


FIGURE NO. 9
DISTANCE-DRAWDOWN RELATIONSHIP SITE 1

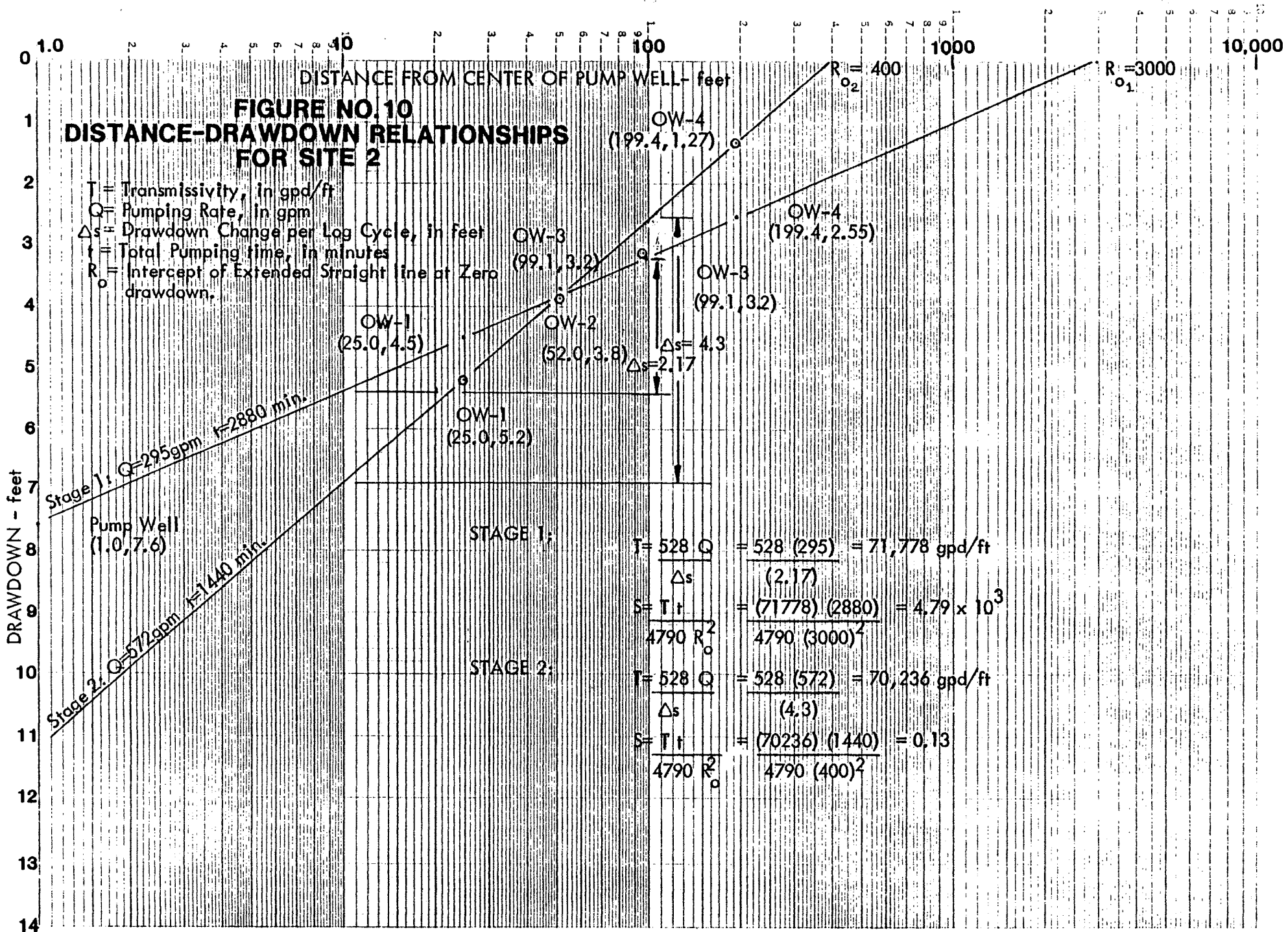
T = Transmissivity, in gpd/ft
 Q = Pumping Rate, in gpm
 Δs = Drawdown Change per Log Cycle, in feet
 t = Total Pumping Time
 R_o = Intercept of Extended Straight Line at Zero Drawdown, in feet

Equations

- 1.) Transmissivity: $T = \frac{528 Q}{\Delta s}$
- 2.) Storage Coefficient: $S = \frac{T t}{4790 R_o^2}$

$$T = \frac{528 Q}{\Delta s} = \frac{528 (362)}{(4.1)} = 46,618 \text{ gpd/ft}$$

$$S = \frac{T t}{4790 R_o^2} = \frac{(46,618) (2998)}{(4790) (1800)^2} = 9.00 \times 10^{-3}$$



Residual drawdown (recovery) plots provide reliable values of aquifer conditions near the individual observation wells because the recovery is not influenced by the variations in pumping rates that commonly occur during the drawdown periods. However, as in this case, when boundary conditions are known or suspected, the interpretation of the recovery data must be done with caution because of the difficulty in separating the influence of boundaries.

Table E presents the long-term average aquifer transmissivity and storativity values at sites 1 and 2:

TABLE E
SUMMARY OF LONG-TERM AVERAGE TRANSMISSIVITY/STORATIVITY VALUES

	SITE 1		SITE 2	
	Macy and Alameda Streets		Ramirez and Vignes Streets	
	<u>gpd/ft</u>	<u>ft²/min.</u>	<u>gpd/ft</u>	<u>ft²/min.</u>
LONG-TERM TRANSMISSIVITY	60,000	5.6	100,000	9.3
APPARENT STORATIVITY (Dimensionless)	0.10		0.10 - 0.20	

Note: Values shown are rounded for convenience.

6.3 Chemical Treatment of Dewatering and Drainage Effluent

The presence of polluted ground water below the Union Station site will require provisions for the treatment and disposal of dewatering and drainage effluent. These provisions will be required to meet all the applicable standards, conditions and requirements imposed by the City of Los Angeles Sanitation Bureau and the California Regional Water Quality Board, Los Angeles Region. Appendix D presents information about the temporary treatment system used during the Union Station pump tests. Any treatment or disposal system used for the proposed terminal will require permit application and written concurrence of the California Regional Water Quality Control Board, Los Angeles Region.

6.4 Subsidence

The results from 1986 pump tests at Sites 1 and 2, in our judgment, do not change the subsidence data presented in Section 6.2.4, page 18, of our September 1983 Geotechnical Report for Design Unit A135.

7.0 CLOSURE

This report presents our results of two separate aquifer pump tests performed in the Union Station area. Considerable judgment should be exercised in the interpretation and use of these results. Care should be exercised in interpolating or extrapolating aquifer properties between or beyond each pump test site. This information should allow contractors to proceed more confidently in designing dewatering systems for the proposed construction.

The findings and recommendations presented in this report are based on analyses of currently available data and were prepared in accordance with generally accepted professional engineering and geologic principles and practice. We make no other warranty, either express or implied.

REFERENCES

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8. Powers, Patrick J., 1981, Construction Dewatering, a Wiley-Interscience Publication, 98-127 p.
9. State Water Rights Board, Report of Referee, Volume 11, Appendixes, July 1962, P-5 to P-8.
10. Todd, David K., 1980, Groundwater Hydrology, Second Edition, John Wiley & Sons, Inc., 111-218 p.

APPENDIX A
PUMP TEST DATA

SUMMARY OF TEST DATA

1. Geo/Resource Consultants report of analysis of the 1986 aquifer pump tests, dated July 25, 1986.
2. Geo/Resource Consultants well test analysis graphs of the 1986 aquifer pump test, dated July 25, 1986 - Appendix B.
3. Geo/Resource Consultants review and analysis of the 1983 pump test results, dated February 25, 1986.
4. Site #1 (Macy and Alameda Streets) pump test data, includes drawdown and recovery data from the 1986 pump test.
5. Site #2 (Ramirez and Vignes Streets) pump test data, includes drawdown and recovery data from this 1986 pump test.
6. Analysis by Converse Consultants of selected wells from Sites #1 and #2 using semi-log time versus drawdown methods.
7. Analysis by Converse Consultants of Sites #1 and #2 using semi-log residual drawdown methods.

NOMENCLATURE FOR APPENDIX A

μ = viscosity, cp
C = permeability, gpd/ft²
T = transmissivity, gpd, ft
Q = discharge, in gpm
K = permeability, gpd/ft²
h = saturated thickness of aquifer

Pd = dimensionless pressure
 Δp = change in pressure in "skin" region next to wellbore, psi
 μ = viscosity, cp
 β = formation volume factor
 γ = Eulers constant, $\gamma = 1.78$

REFERENCE: SOCIETY OF PETROLEUM ENGINEERS,
Monograph Volume 5, 1977
Advances in Well Test Analysis



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November 13, 1986
228-08H-01-1

NOV 14 1986

Converse Consultants, Inc.
126 West Del Mar Boulevard, Suite A
Pasadena, CA 91105

RECEIVED

Attention: Mr. Howard A. Spellman, Jr.

Subject: MRTC-Union Station, Pump Tests

Dear Mr. Spellman:

The following is a letter report of analysis of the aquifer pump tests conducted at Location 2 on June 6, 1986, and at Location 1 on June 24, 1986. The results are presented in the following discussion.

Test Activities

Location 2 Tests: The test activities at Location 2 test wells consisted of:

1. 48-hour variable rate pump test at an average rate of 295 gpm.
2. 24-hour constant rate pump test at an average rate of 572 gpm.
3. 21-hours, 15-minute well recovery test.

The duration of time between the two tests was 1-hour 56-minute. The pumping well water (fluid) level had recovered to approximately 80% of the initial static level within this pump recovery period. The pumping rate during both flow tests was variable. Fluctuations in the fluid level in the pumping well and in well OW-1, OW-2, and OW-3 were measured and recorded with an Enviro Labs DL 120 data logger system using 50-, and 25-PSI transducers. Data was processed in the field with a COMPAQ computer system. The geometry of the test wells at Location 2 are presented in Figure 1. Data for these pump tests are provided in Appendix A₁.

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Location 1 Tests: The test activities at Location 1 test wells consisted of:

1. 9-minute test at an average rate of 341 gpm.
2. 49-hour, 58-minute constant rate pump test at an average of 362 gpm.
3. 4-hour, 19-minute well recovery test.

The geometry of the test wells at Location 1 are presented in Figure 2. The general test conditions observed at Location 2 are applicable to Location 1. Data for these pump tests are provided in Appendix A_p.

Approach to Analysis

The interpretation of the well test results involved an analysis technique called the inverse problem, (Gringerten, et. al., 1979). The analysis involved the search of a well-defined theoretical aquifers model that has as close as possible fluid level response to the actual aquifer condition. This approach requires that the theoretical and actual aquifer fluid level response for a given flow rate be nearly identical. Also, the solution of an inverse problem is usually not unique. The validity of this technique in lieu of inherent short comings is substantiated by understanding the relationship of the time dependence of an aquifers response for a specific aquifer system.

A well test creates a fluid level decline first observed in the wellbore and with time will extend through the near wellbore region to the full extent of the aquifer. The observed fluid level decline during testing is indicative of the time dependant type of flow condition in the aquifer. These transitional flow conditions are early time (unsteady-state flow), infinite acting time (quasi-steady state flow), and late time (steady state flow.. The observed fluid level response also is totally indicative of the unique aquifer parameters characterizing the aquifers behavior, (Gringerten, et. al., 1979).

Aquifer characteristics observed during each flow time period are wellbore storage and fracture effects on flow

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during early time: aquifer permeability and skin effects for infinite acting time; and average aquifer fluid level during late time. Therefore, the analysis requires the recognition of the corresponding flow time period representative of the observed fluid levels. Additionally, the earlier the test parameters are observed, the more detailed and unique the aquifer information.

The identification of the applicable theoretical aquifer models and the identification of the appropriate flow time period for purposes of analysis was accomplished by use of published type-curves. Specific type-curves utilized for this investigation are from U.S. Geological Survey, Professional Paper 708, and the Society of Petroleum Engineers, Monograph 5. Test data has been plotted to a scale to correspond with the published type curves. Test curves are provided in Appendix A₀.

Analysis of results

Well tests of Locations 1 and 2 were analyzed for:

- o Wellbore effects
- o Identification of theoretical model
- o Calculation of transmissivity
- o Identification of hydrologic boundaries.

Well Location 2

For purpose of this analysis, pump test 2 at Location 2 was evaluated because of the near constant pumping rate and the pump test results represent aquifer conditions. Pump test 1 data is provided but is not evaluated.

Wellbore Effects: Wellbore storage and skin effects were evaluated from data graphs of the:

- Log Drawdown, s (ft) versus Log Elapsed Time, t, (min.)
- Log Recovery, s(ft) versus Log Elapsed Time Ratio, t, (min.)

Wellbore storage effects were observed in the pumping well, OW-2, and OW-3, i.e., slope of 1. No wellbore effects were observed in well OW-1. The wellbore storage portion of the data is shown on the Log-Log graphs in Appendix A₀. Wellbore skin effects were not observed in all test wells, i.e., effective wellbore radius is equal to the actual radius of the well.

Hydrogeologic Model: The Log-Log graphs for both drawdown and build-up were type curve matched to published curves to identify the appropriate hydrologic flow model which was used to identify the appropriate data for semi-log analysis of transmissivity, and identify any hydrologic boundary effects.

The applicable flow model is unsteady-state flow in a confined aquifer. The observation well graphs match the type curve in U.S. Geological Survey, Professional Paper 708, Plate 8. The pumping well matches type-curve $C_d = 10^3$, $S=0$ (Figure C.6, SPE Monograph, No. 5, 1976). The type-curve match provided the following information:

- All wells reached late semi-log time within 13 minutes.
- A porosity boundary effects was observed in the pumping well during drawdown (@100 minutes) and in the observation wells during recovery (OW-1 @ 13 minutes, OW-2 and OW-3, @ 9 minutes).
- Well OW-1 reach a steady-state flow condition @ 1,000 minutes during drawdown.

Aquifer Property Analysis: The aquifer properties of Location 2 were calculated using the Jacob's Method from the appropriate portion of the semi-log graphs. The results of the analysis are as follows:

$$T = \frac{2.3}{4 \pi} \frac{Q}{S/\text{cycle}} \quad C = \frac{T}{h} \quad \begin{array}{l} Q = 572 \text{ gpm or } 1.274 \text{ ft}^3/\text{sec} \\ h = 59.2 \text{ ft.} \end{array}$$

DRAWDOWN

<u>Well</u>	<u>s/cycle</u>	<u>T (ft²/sec)</u>	<u>T(gpd/ft)</u>	<u>C (gpd/ft²)</u>
Pumping	.75	.311	200,917	3,394
OW-1	.75	.311	200,917	3,394
OW-2	.78	.299	193,165	3,263
OW-3	.60	.388	251,308	4,245

BUILD-UP

<u>Well</u>	<u>s/cycle</u>	<u>T (ft²/sec)</u>	<u>T(gpd/ft)</u>	<u>C (gpd/ft²)</u>
Pumping	.82	.284	183,769	3,104
OW-1	.75	.311	200,917	3,394
OW-2	.75	.311	200,917	3,394
OW-3	.60	.389	251,308	4,245

Well Location 1

Pump test 1 was for 9-minutes and will not be analyzed, but the test data is provided in Appendix A₁. The analysis of pump test 2 is provided in the following discussion.

Wellbore Effects: The analysis of pump test 2 for drawdown testing utilized corrected Jacob's Log-Log graphs, and recovery data analysis on standard Log-Log graphs. Wellbore storage effects were observed in all test wells during drawdown testing for the first 9-minutes of testing, see graphs in Appendix A₀. Storage effects were observed during recovery testing in the pumping, OW-1, and OW-3 wells. The effects were within the first minutes of recovery, see graphs in Appendix A₀. Wellbore skin effects were not observed in all test wells.

Hydrogeologic Model: The Log-Log graphs for both drawdown and recovery were type-curve matched in the same manner as Location 2. The appropriate hydrogeologic model at Location 1 is unclear. The corrected Jacob's Log-Log graph for drawdown matches an unsteady-state flow in a confined aquifer with a porosity boundary effect observed after 100-minutes.

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The uncorrected drawdown Log-Log graph can match either an early-time delayed yield graph or late-transient flow in a confined aquifer. The Log-Log graph for recovery can also match early-time delayed yield or a late-transient flow in a confined aquifer.

The more appropriate hydrologic model for purposes of calculating aquifer properties for dewatering is the unsteady-state radial flow model. Any observed delayed-yield effects are over within a short time period (first 100-minutes) with porosity boundary effects within 200-minutes. The appropriate semi-log portion of the data is shown in Appendix A₀.

Aquifer Property Analysis: The aquifer properties at Location 1 were calculated using the Jacob's method from the appropriate portion of the semi-log graphs. The results of the analysis are as follows:

$$T = \frac{2.3}{4} \frac{Q}{P} \text{ s/cycle} \quad C = \frac{T}{h} \quad Q = 360 \text{ pgm or } .802 \text{ ft}^3/\text{sec} \\ h = 60 \text{ ft.}$$

DRAWDOWN

<u>Well</u>	<u>s/cycle</u>	<u>T (ft³/sec)</u>	<u>T(gpd/ft)</u>	<u>C (gpd/ft²)</u>
Pumping	2.00	.073	47,460	790
OW-1	.80	.184	118,602	1977
OW-2	.75	.196	126,508	2,108
OW-3	.73	.201	129,974	2,166

BUILD-UP

<u>Well</u>	<u>s/cycle</u>	<u>T (ft³/sec)</u>	<u>T(gpd/ft)</u>	<u>C (gpd/ft²)</u>
Pumping	1.15	.127	82,505	1,375
OW-1	.85	.173	111,625	1,860
OW-2	.83	.177	114,345	1,905
OW-3	.80	.183	118,602	1,977

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Stabilized Flow/Boundary Effects: Porosity boundary effects were observed in the later pump test data at Locations 1 and 2. The boundary effects are typical for a two porosity system. The radius of influence (drawdown) has extended to a point in the aquifer where a change in porosity (in this case lower porosity) effects the observed fluid level response. For the Union Station aquifer systems, the fluid level response at the point boundary effects were observed match an unsteady-state radial flow aquifer model, i.e., drawdown and recovery following a new Theis curve.

The significant of the boundary effects is that a stabilized drawdown value must consider this new aquifer flow regime. The stabilized drawdown for a given pumping rate can be estimated from a projection of the new Theis curve through the observed boundary effects data on the Log-Log graphs. The drawdown value from the projected Theis curve can then be plotted on a well performance curve (log of drawdown, s, ft, versus log of pumping rate, Q, gpm).

Stabilized drawdown for the pumping wells at Locations 1 and 2 were estimated. The results are presented in Figure 3.

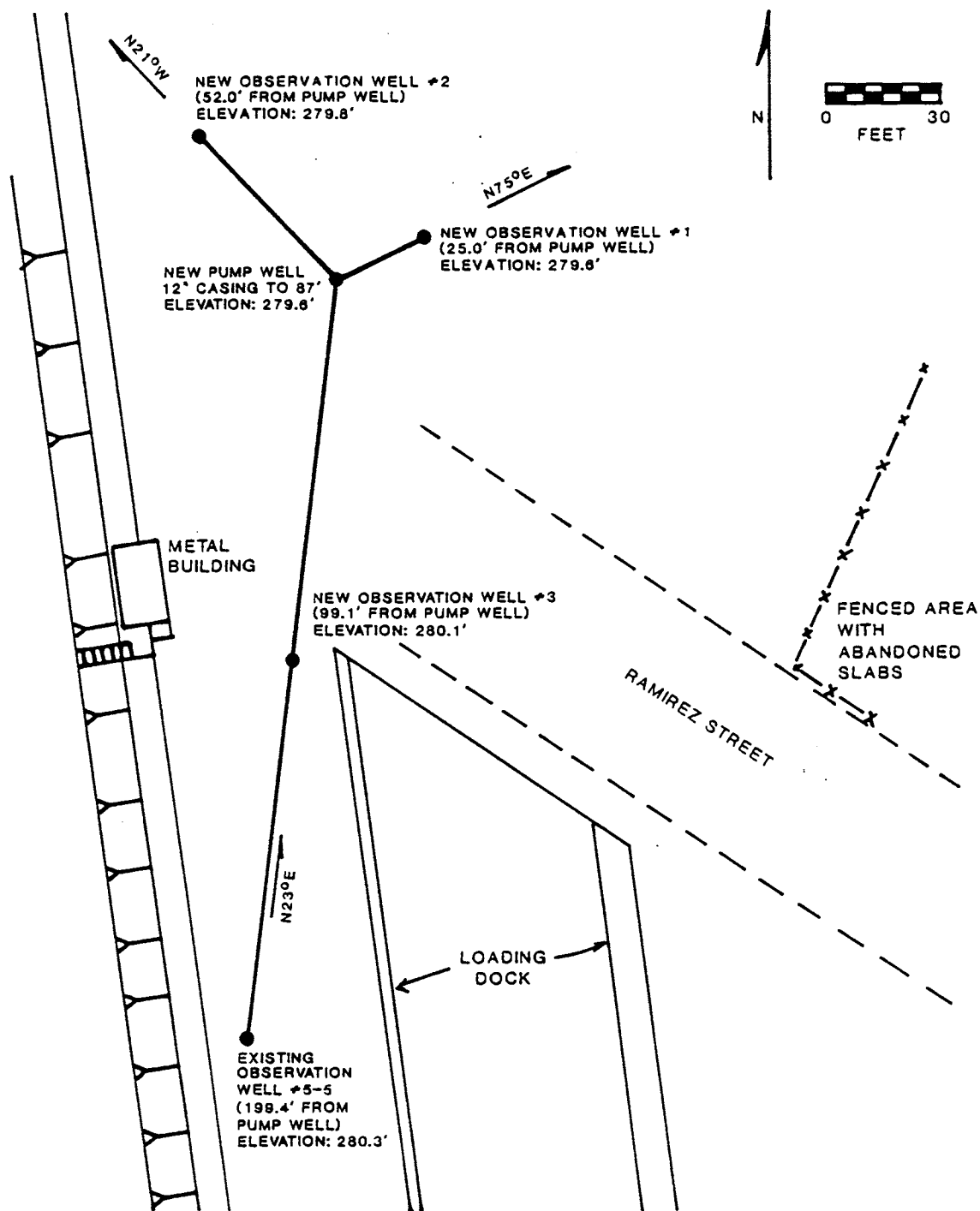
Please contact me should you have any questions concerning the results of this analysis.

Sincerely yours,
GEO/RESOURCE CONSULTANTS, INC.



Michael J. King
Senior Hydrogeologist

MJK/bb



NOTE: Observation well No. 5-5 (1983) was used as Observation well No.4 for the 1986 Site #2 pump test.



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Job No. _____ Appr. _____ Date _____

MRTC PUMP TEST
 83-1140-06
 SITE #2
 PUMP TEST WELL LOCATION

FIGURE

1

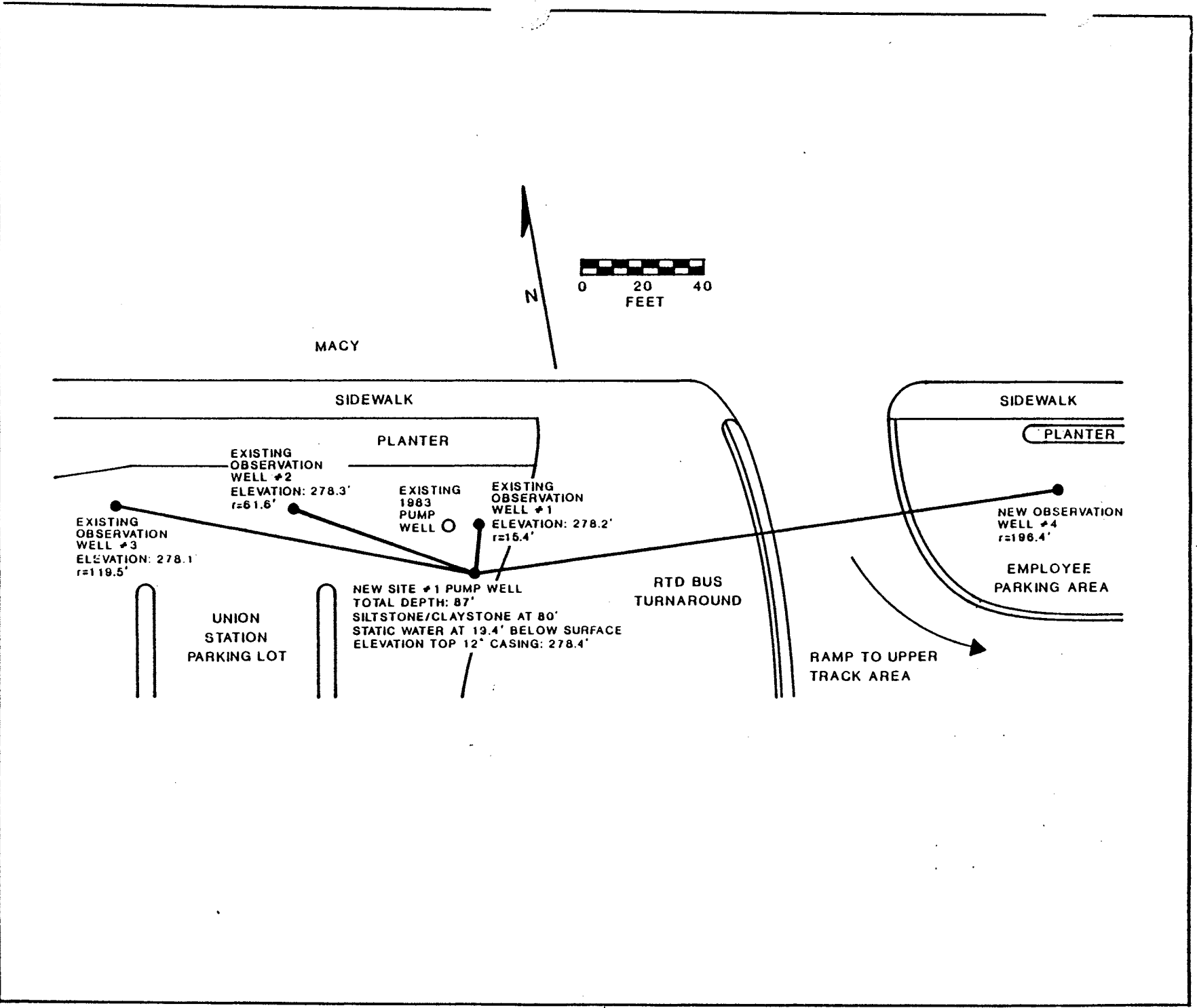


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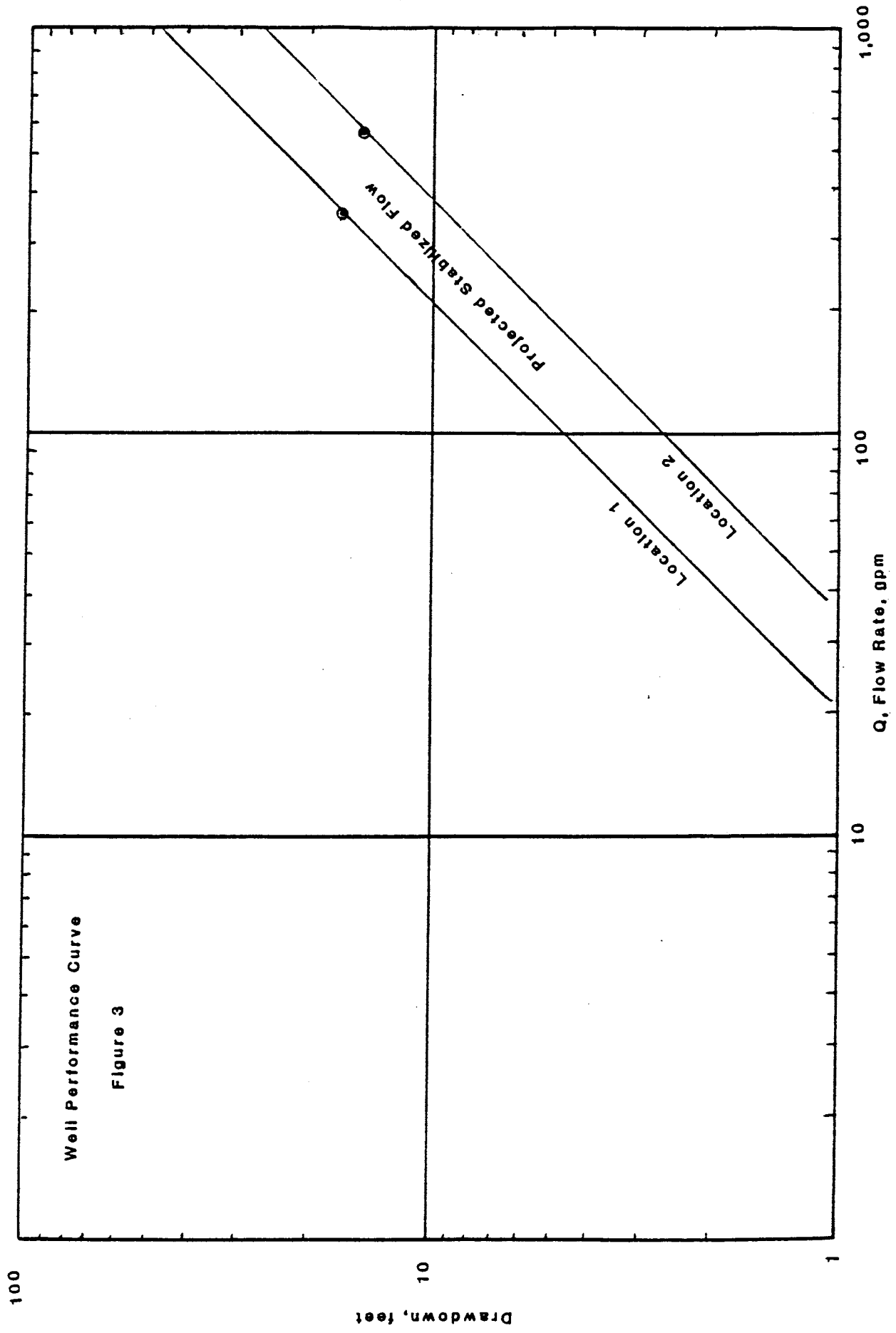
Job No. _____ Appr. _____ Date _____

MRTC PUMP TEST
83-1140-06
SITE #1
UNION STATION

FIGURE
2



A-9



Well Performance Curve

Figure 3

Drawdown, feet

Q, Flow Rate, gpm

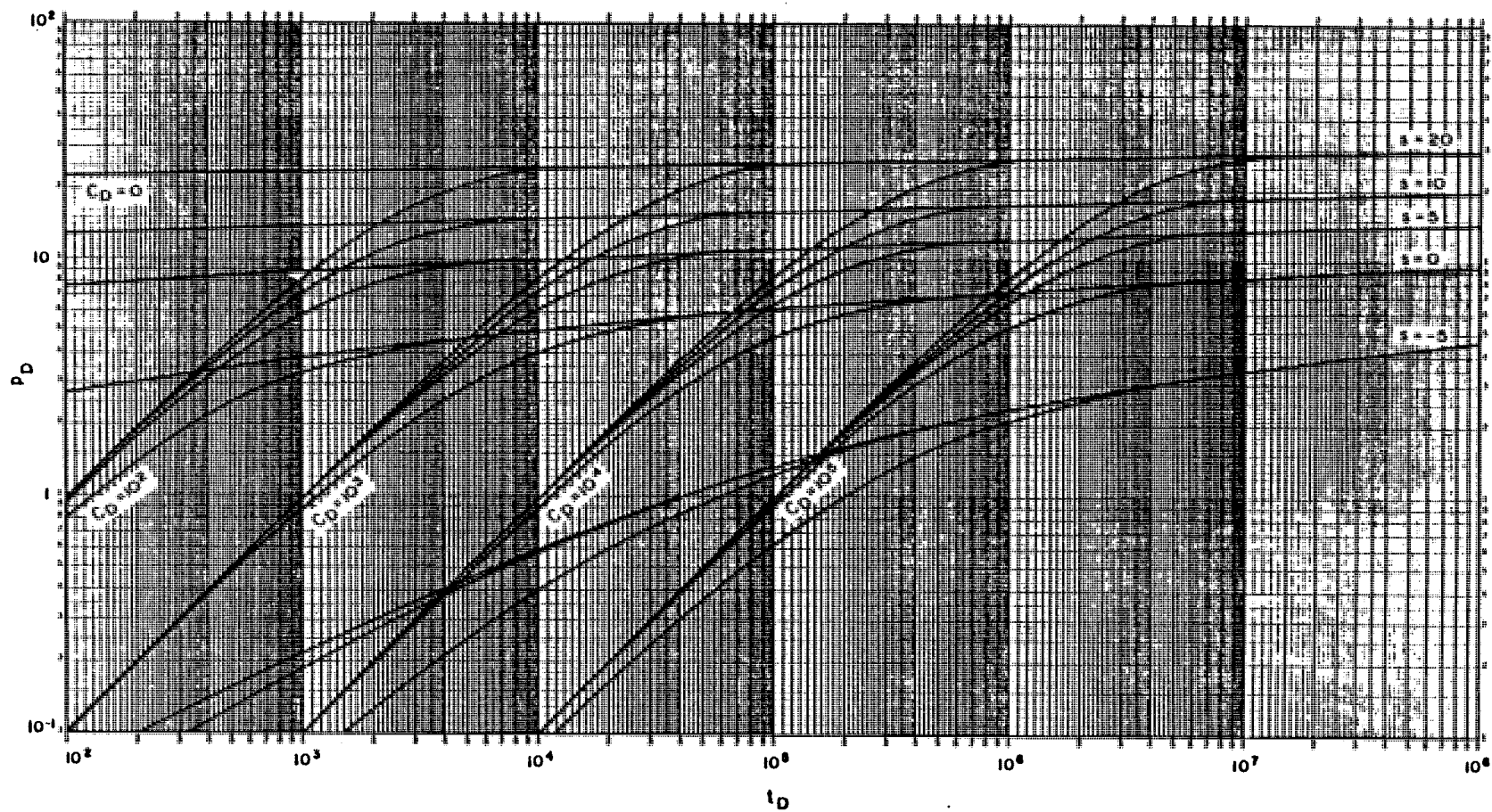
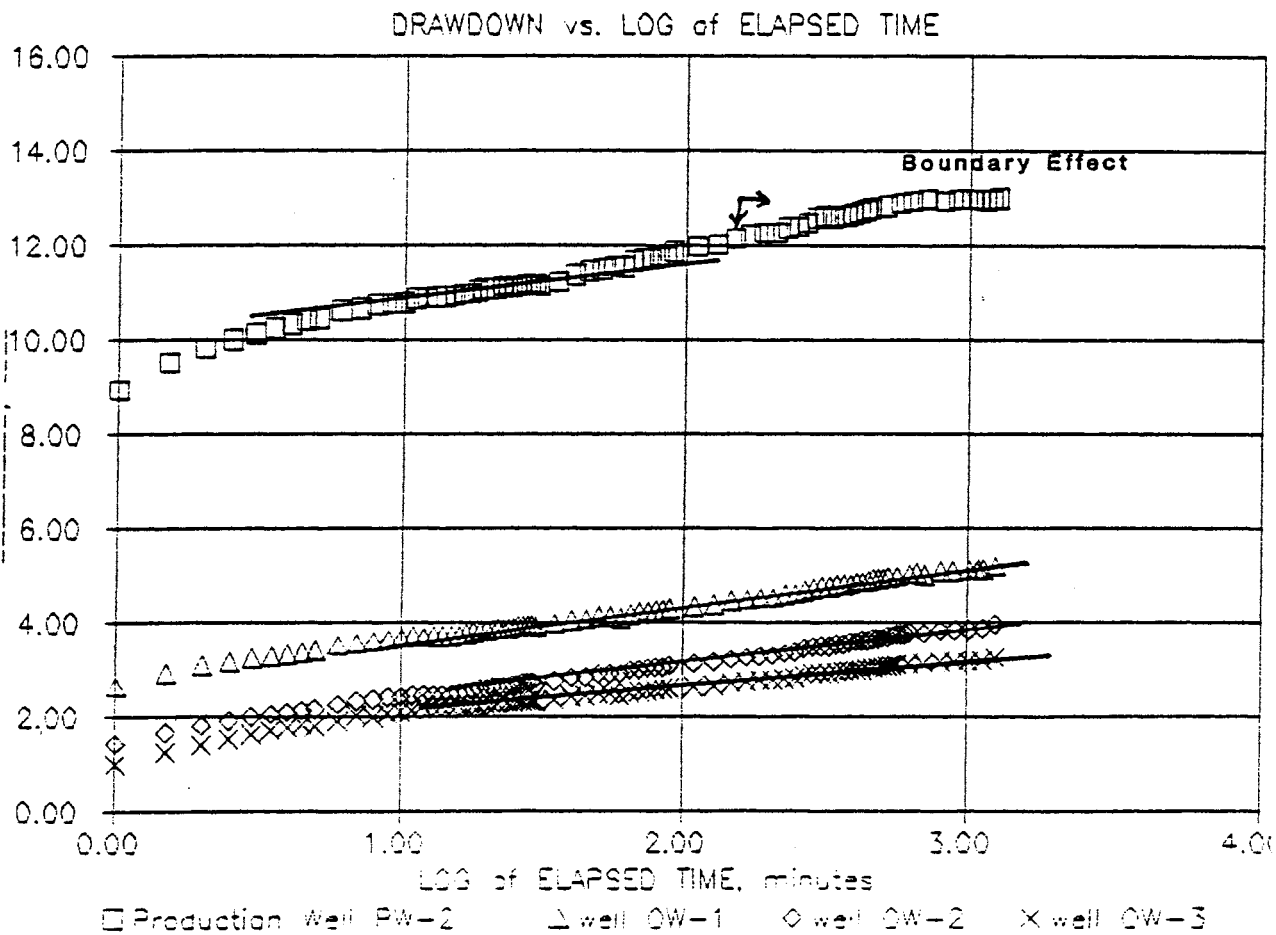


Fig. C.6 Dimensionless pressure for a single well in an infinite system, wellbore storage and skin included. After Agarwal, Al-Hussainy, and Ramey.¹⁰ Graph courtesy H. J. Ramey, Jr.

Reference: Society of Petroleum Engineers, "Advances in Well Test Analysis", Monograph Volume 5, 1977.

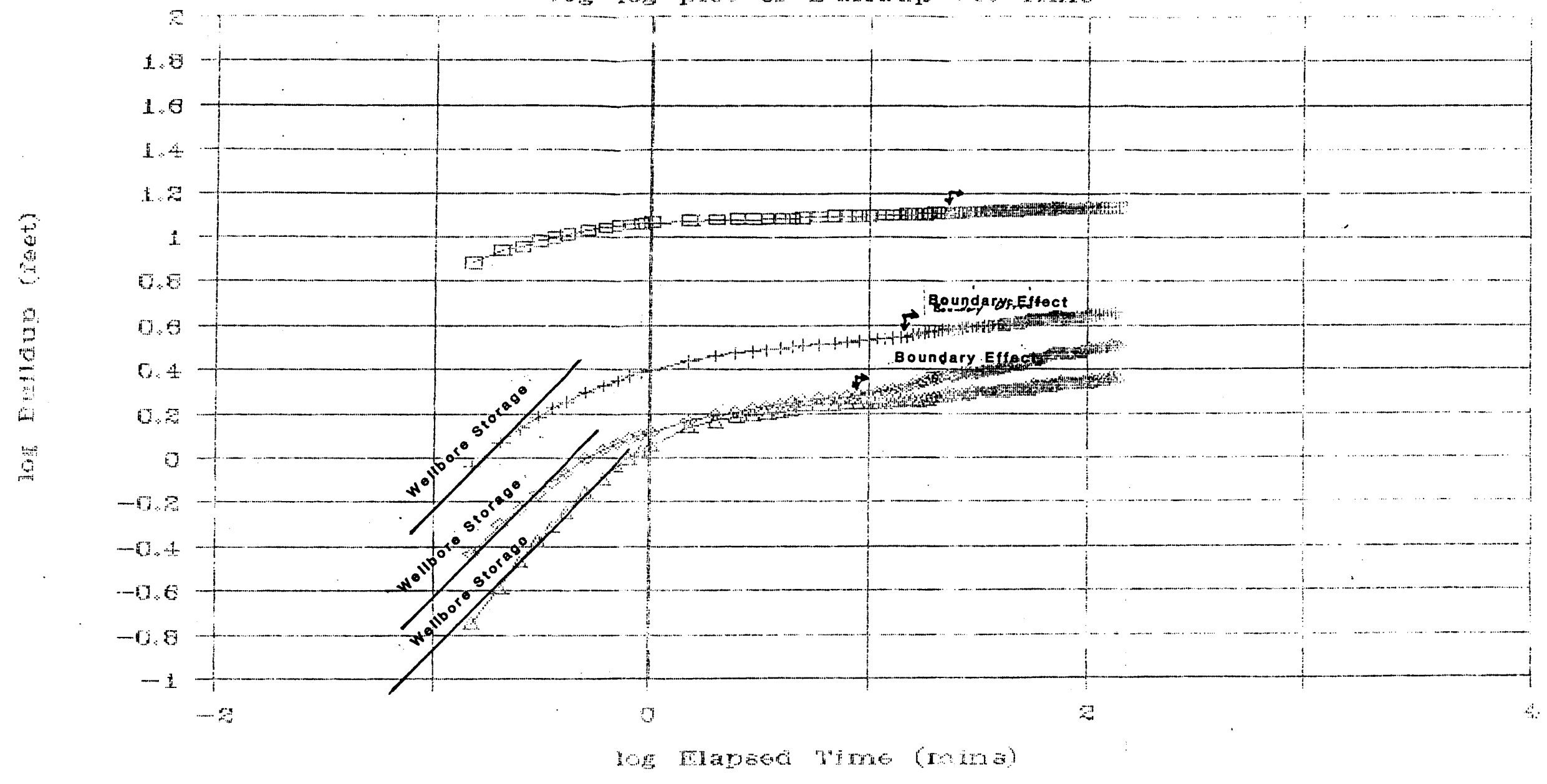
APPENDIX A₀
WELL TEST ANALYSIS
GRAPHS

Location 2 Test 2

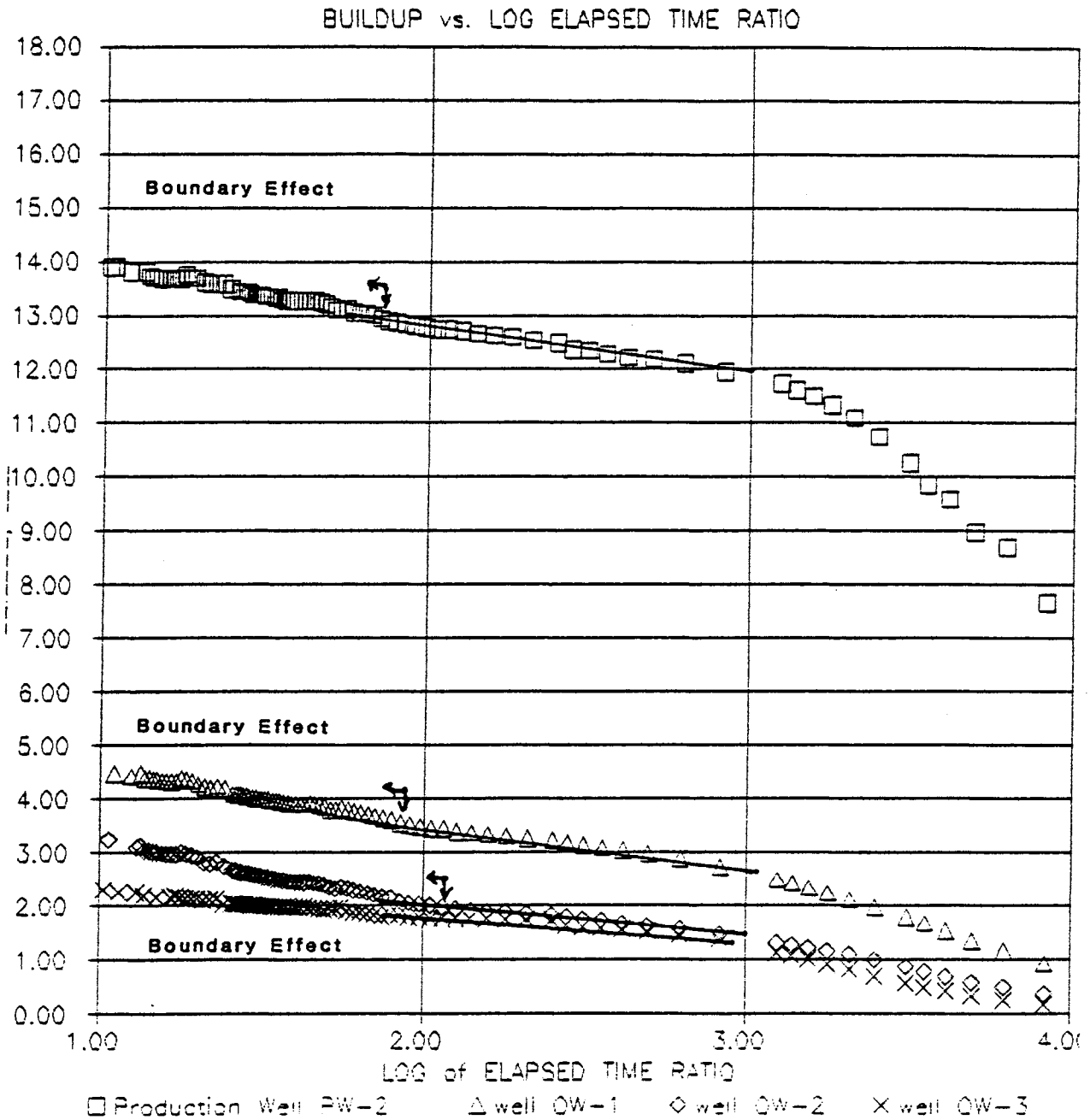


Union Station Aquifer Loc. 2 Test 2

log-log plot of Buildup vs. Time



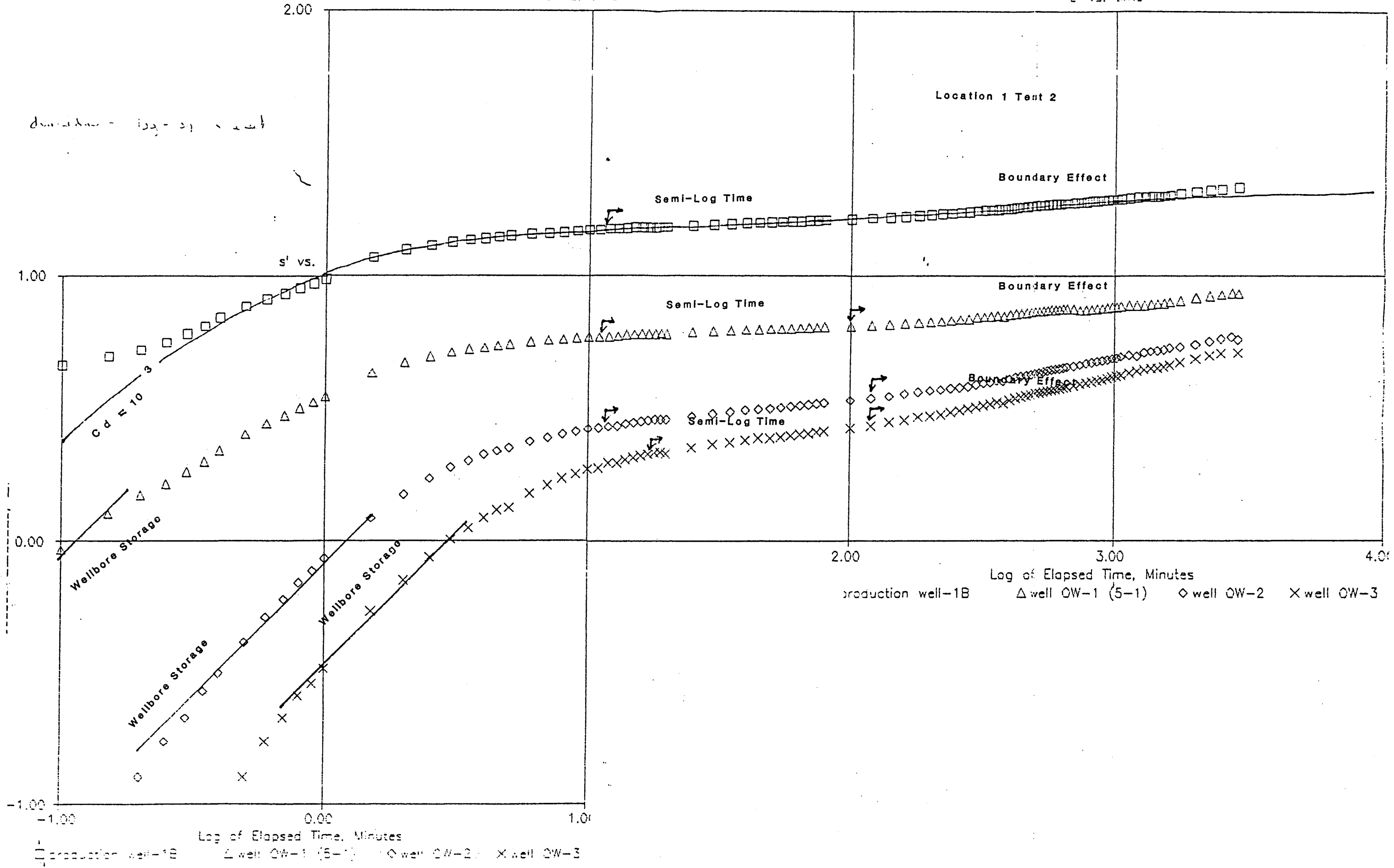
Location 2 Test 2



s' vs. time

s' vs. time

100.1 drawdown - log - s' - result



Location 1 Test 2

Boundary Effect

Semi-Log Time

Boundary Effect

Semi-Log Time

Boundary Effect

Semi-Log Time

Log of Elapsed Time, Minutes

production well-1B Δ well OW-1 (5-1) \diamond well OW-2 \times well OW-3

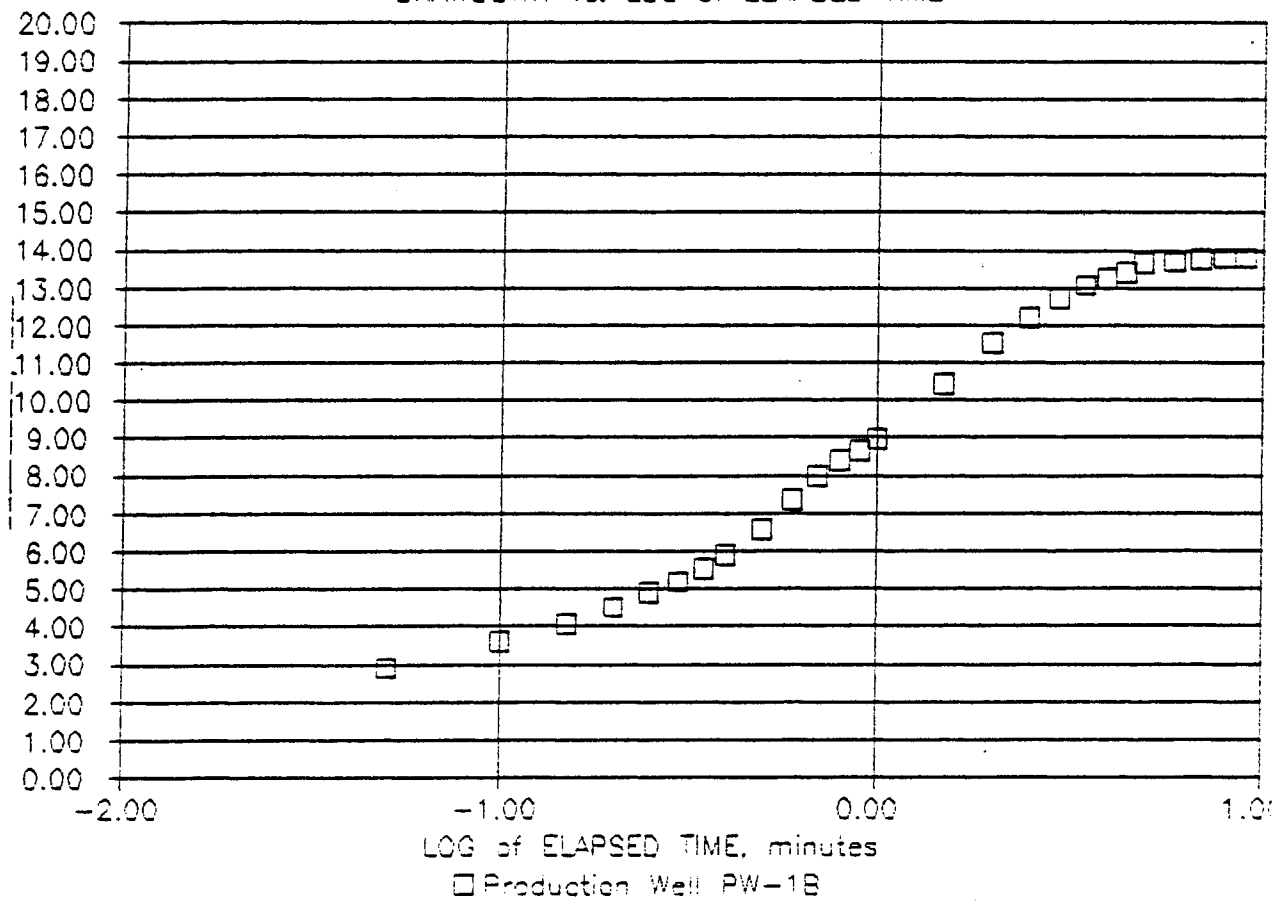
Log of Elapsed Time, Minutes

production well-1B Δ well OW-1 (5-1) \diamond well OW-2 \times well OW-3

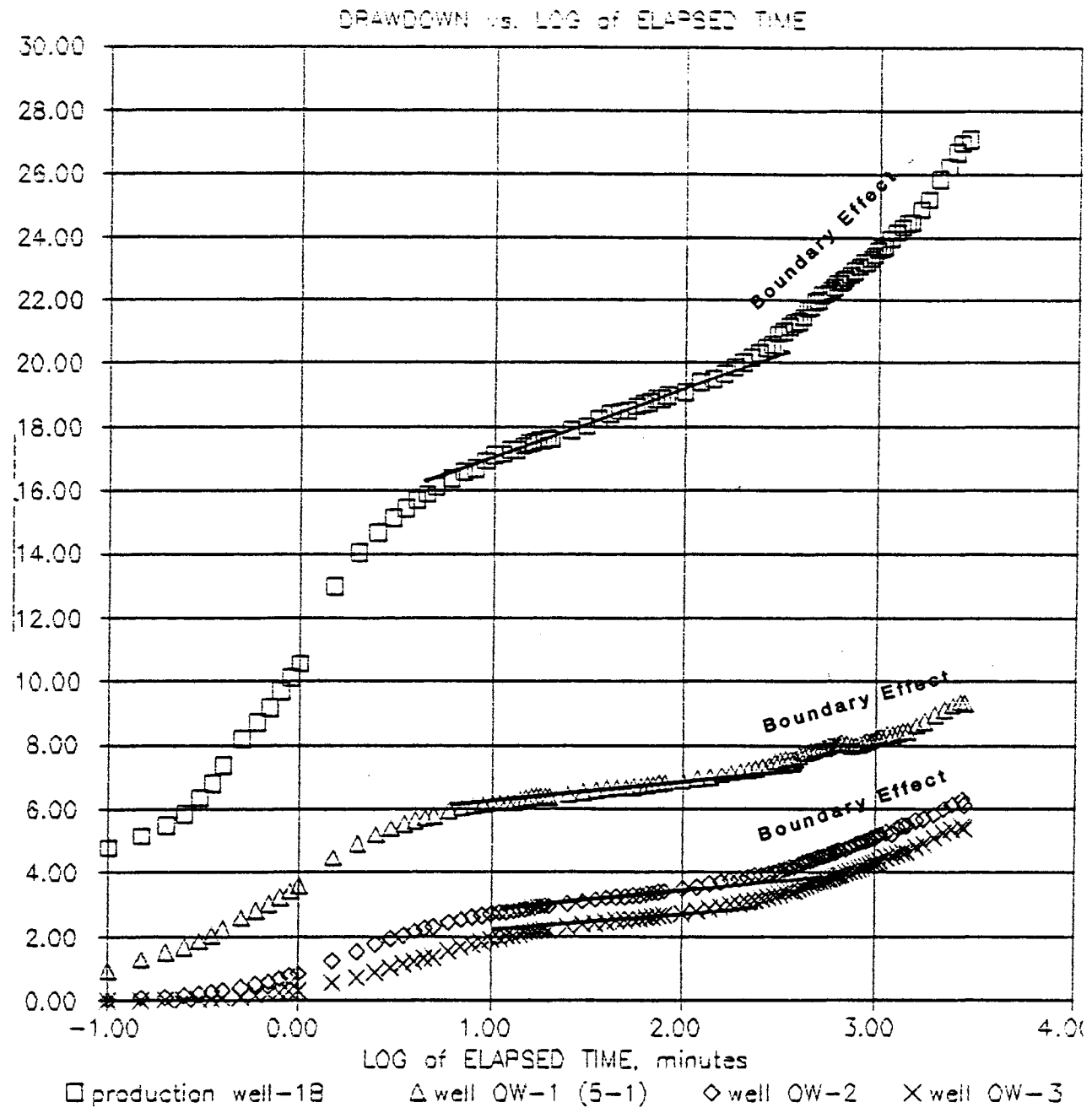
Location 1 Test 1

NOT EVALUATED

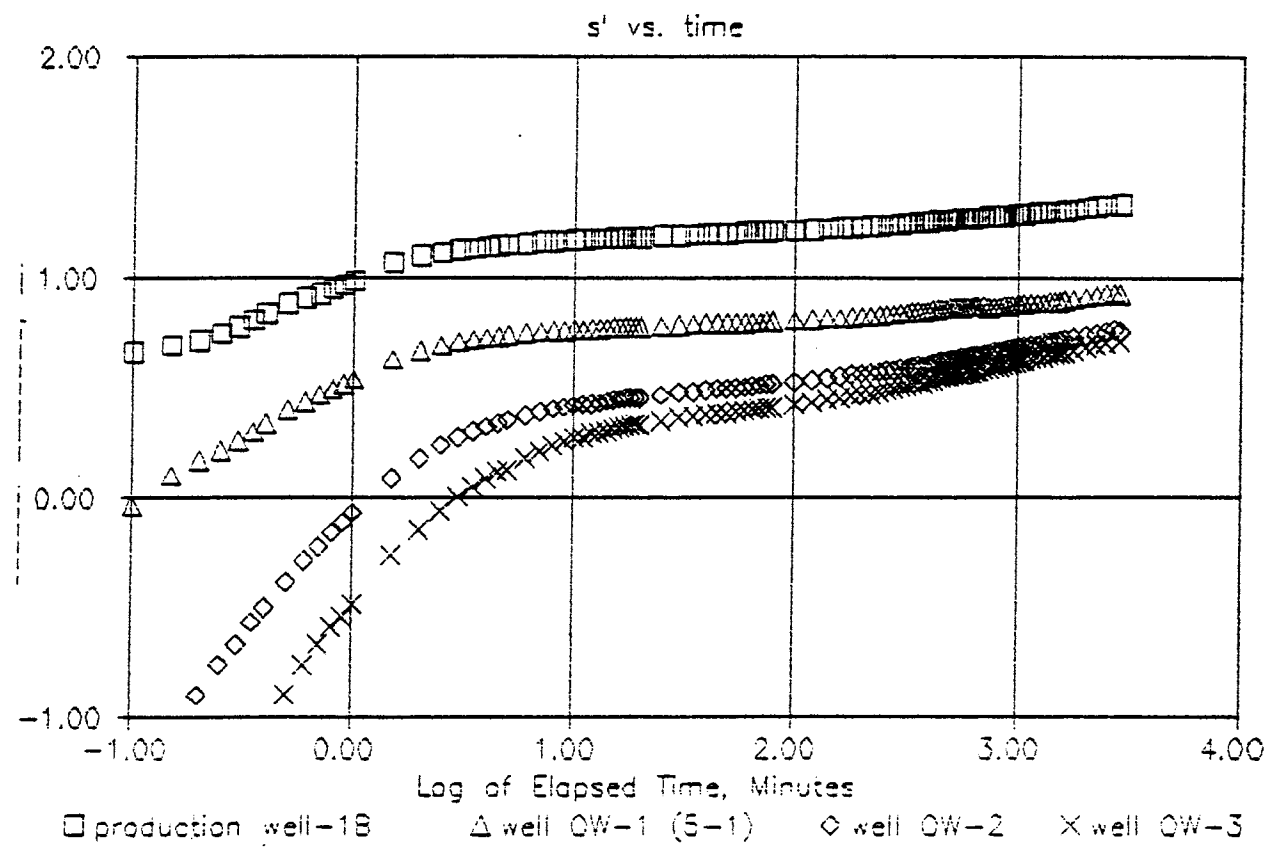
DRAWDOWN vs. LOG of ELAPSED TIME



Location 1 Test 2

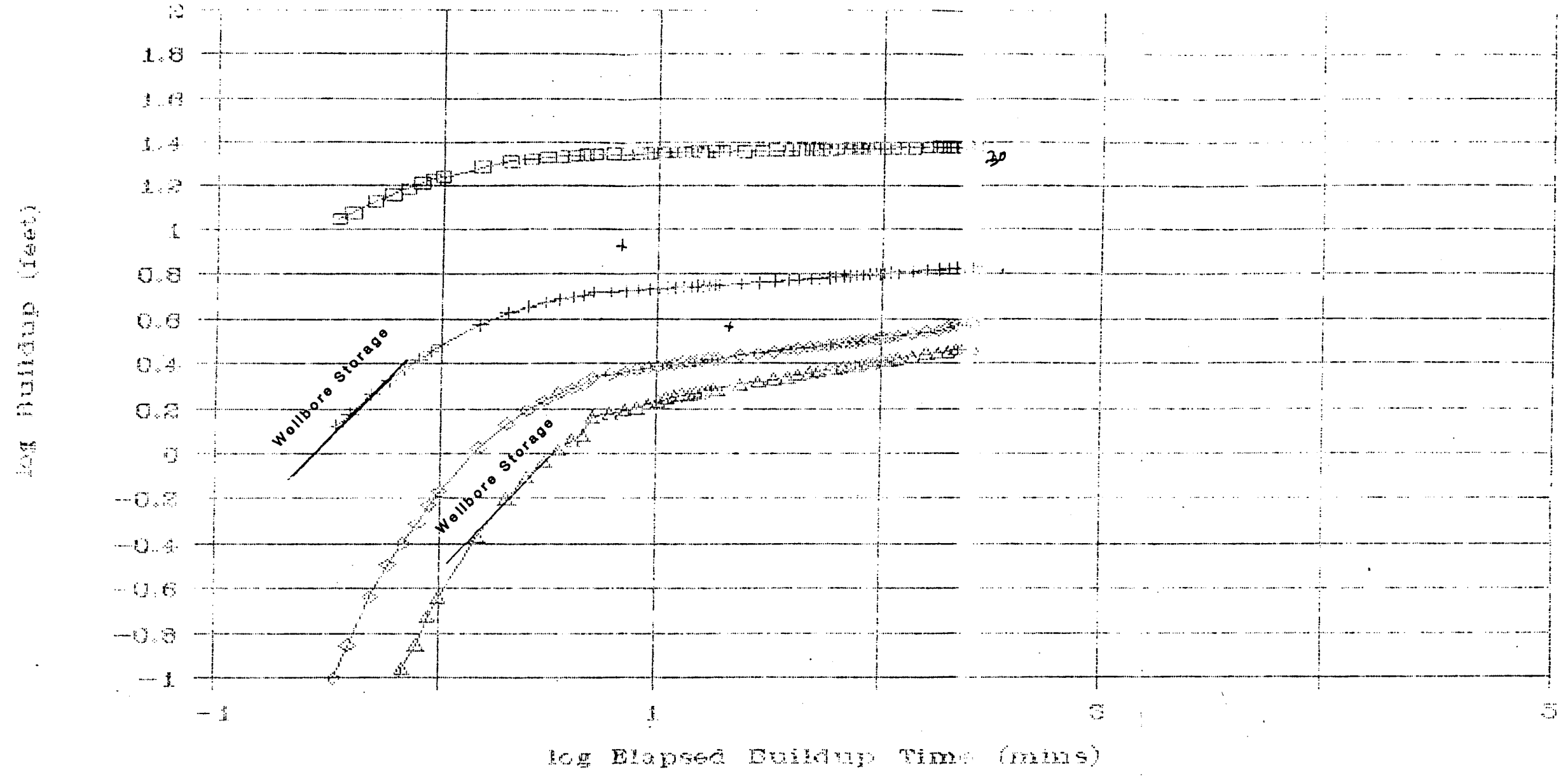


Location 1 Test 2

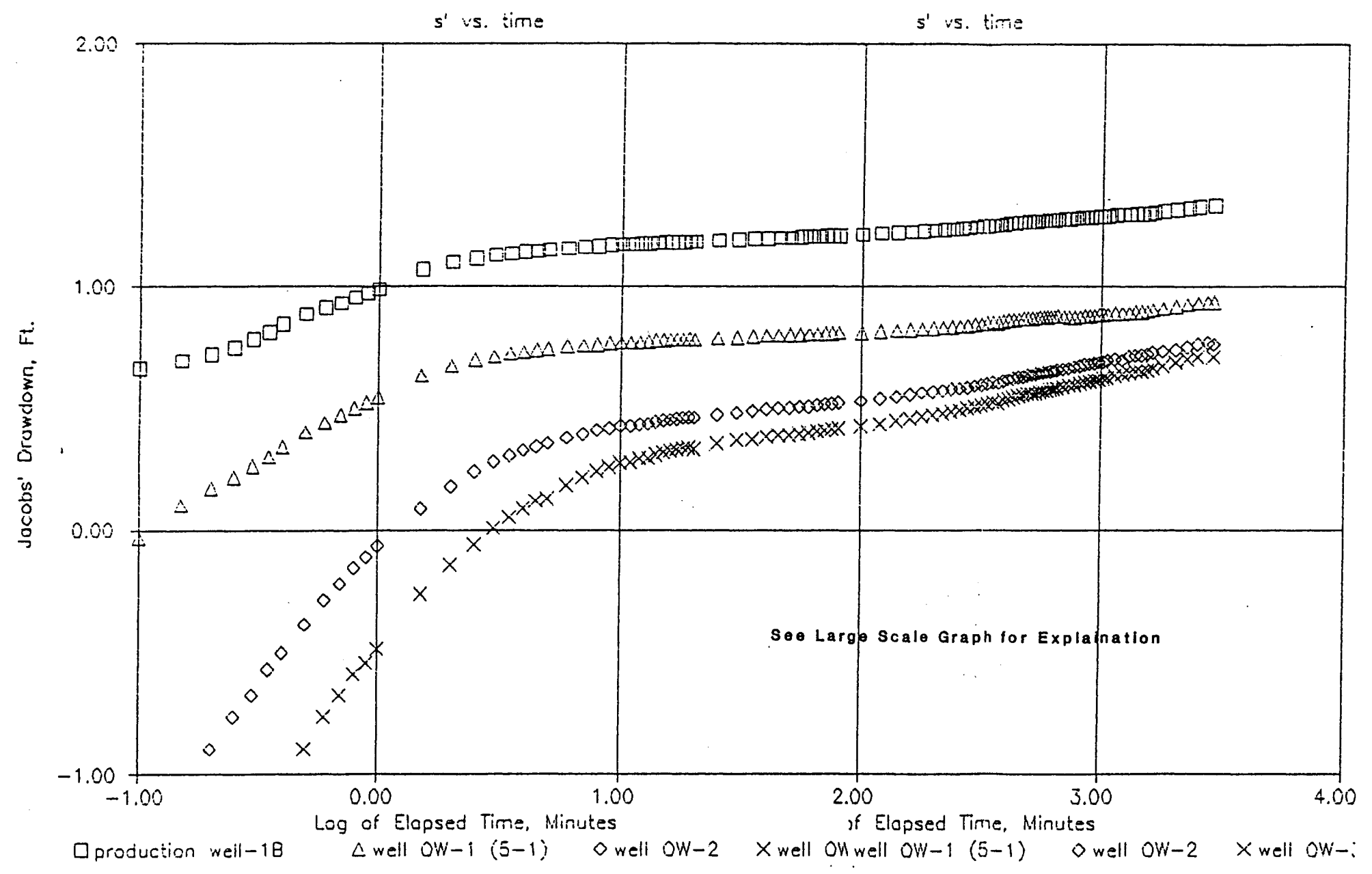


Union Station Loc. 1 Test 2

Top-log plot of buildup

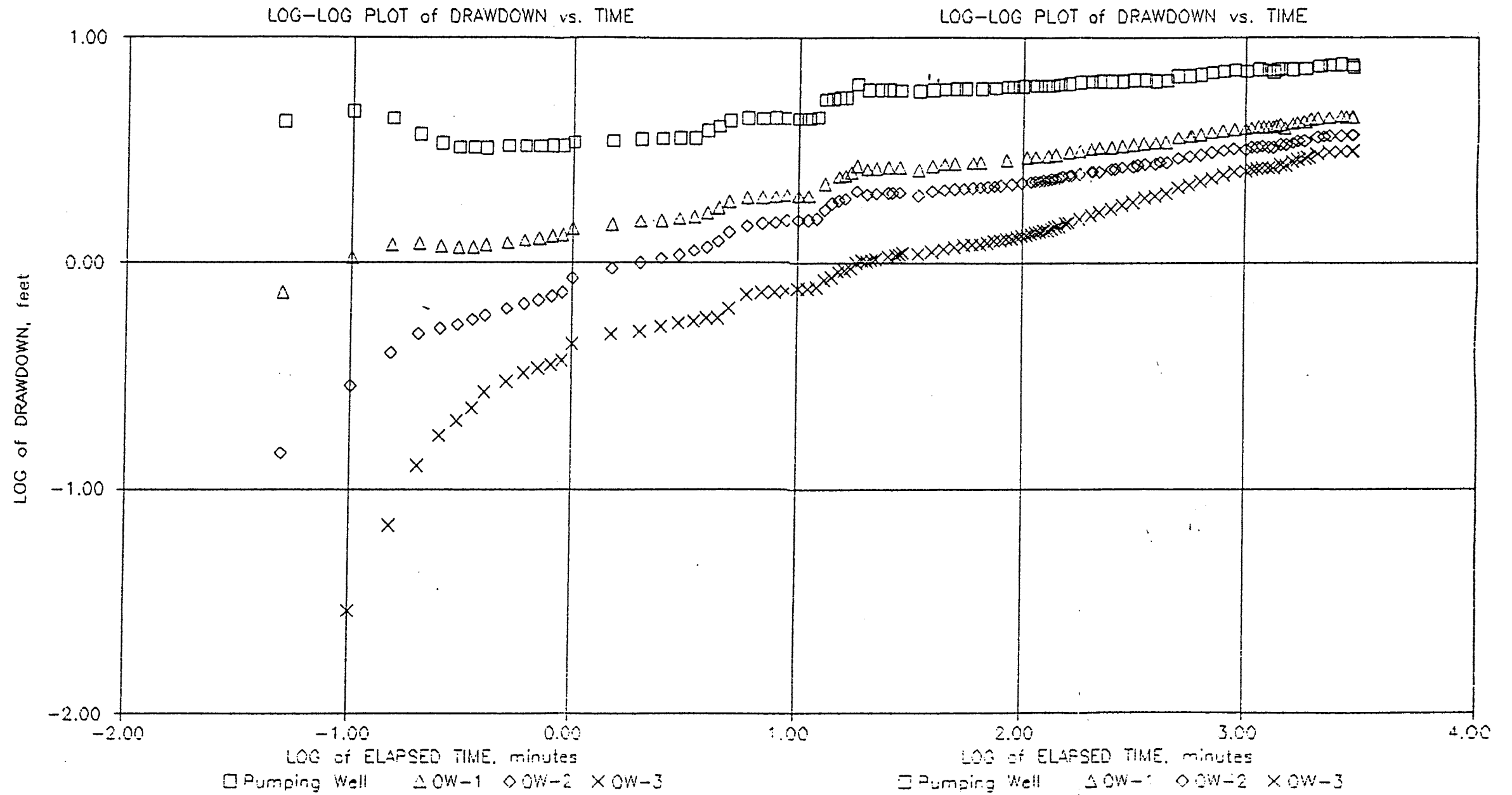


Location 1 Test 2



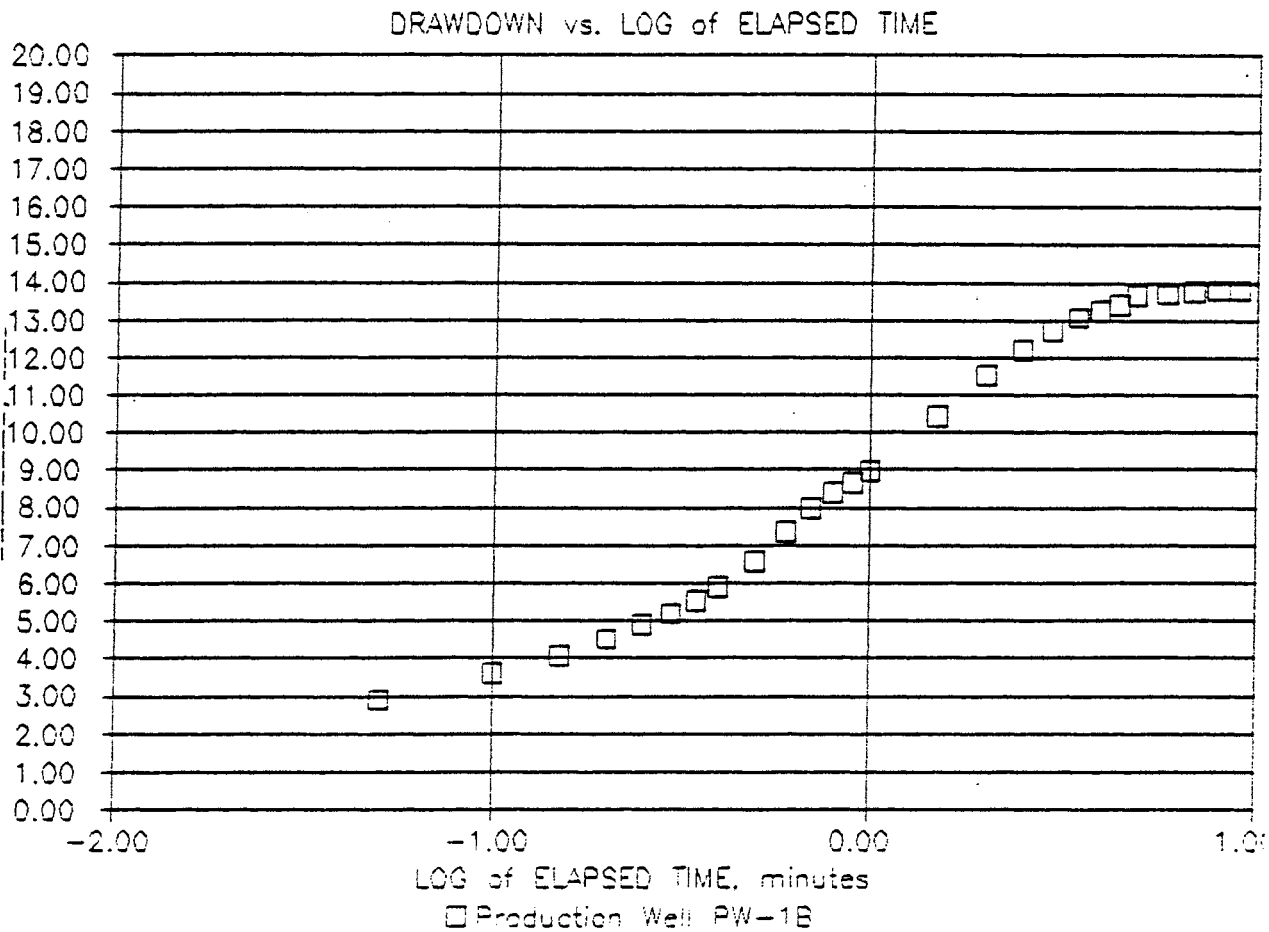
NOT EVALUATED

Location 2 Test 1

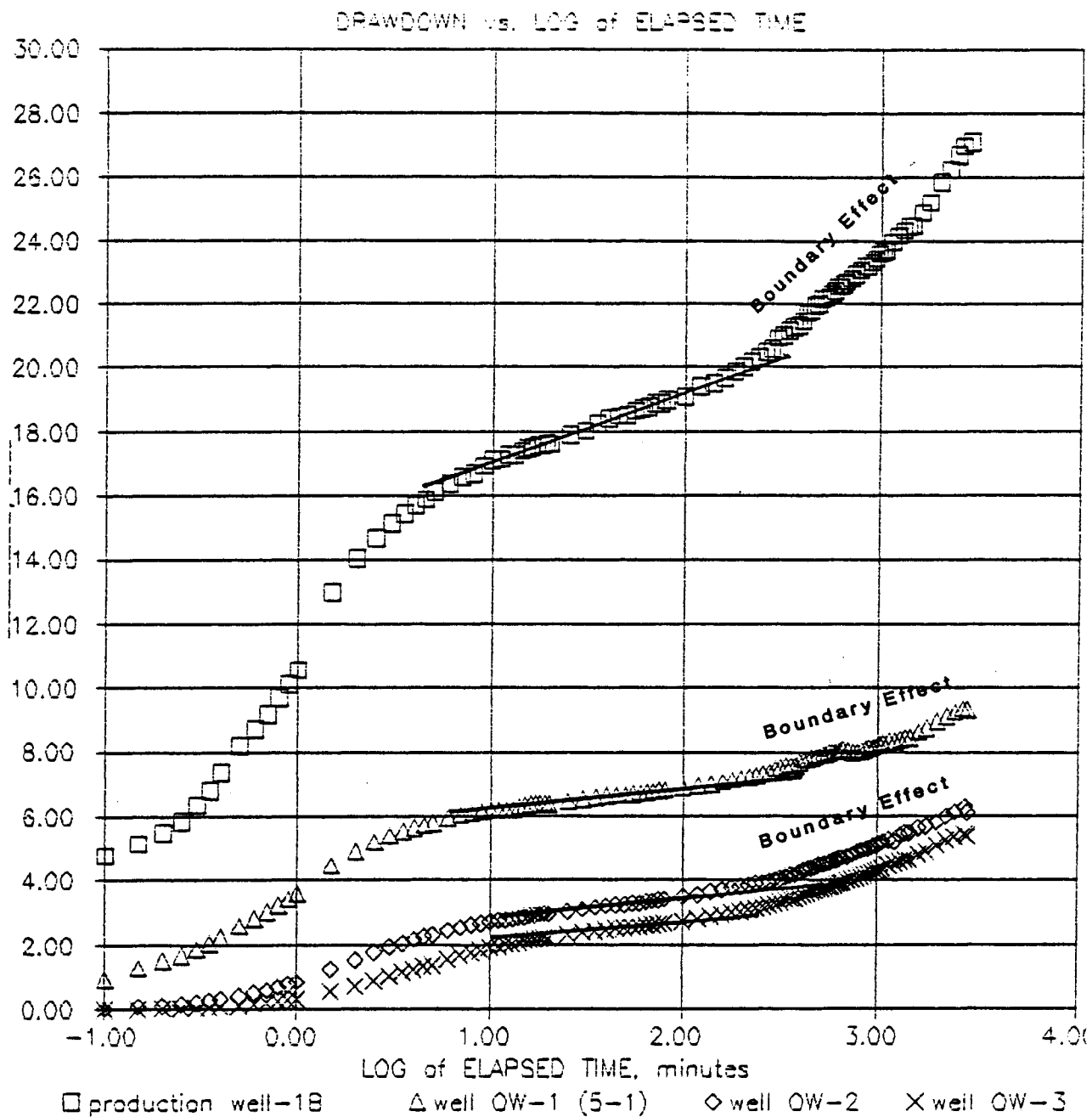


Location 1 Test 1

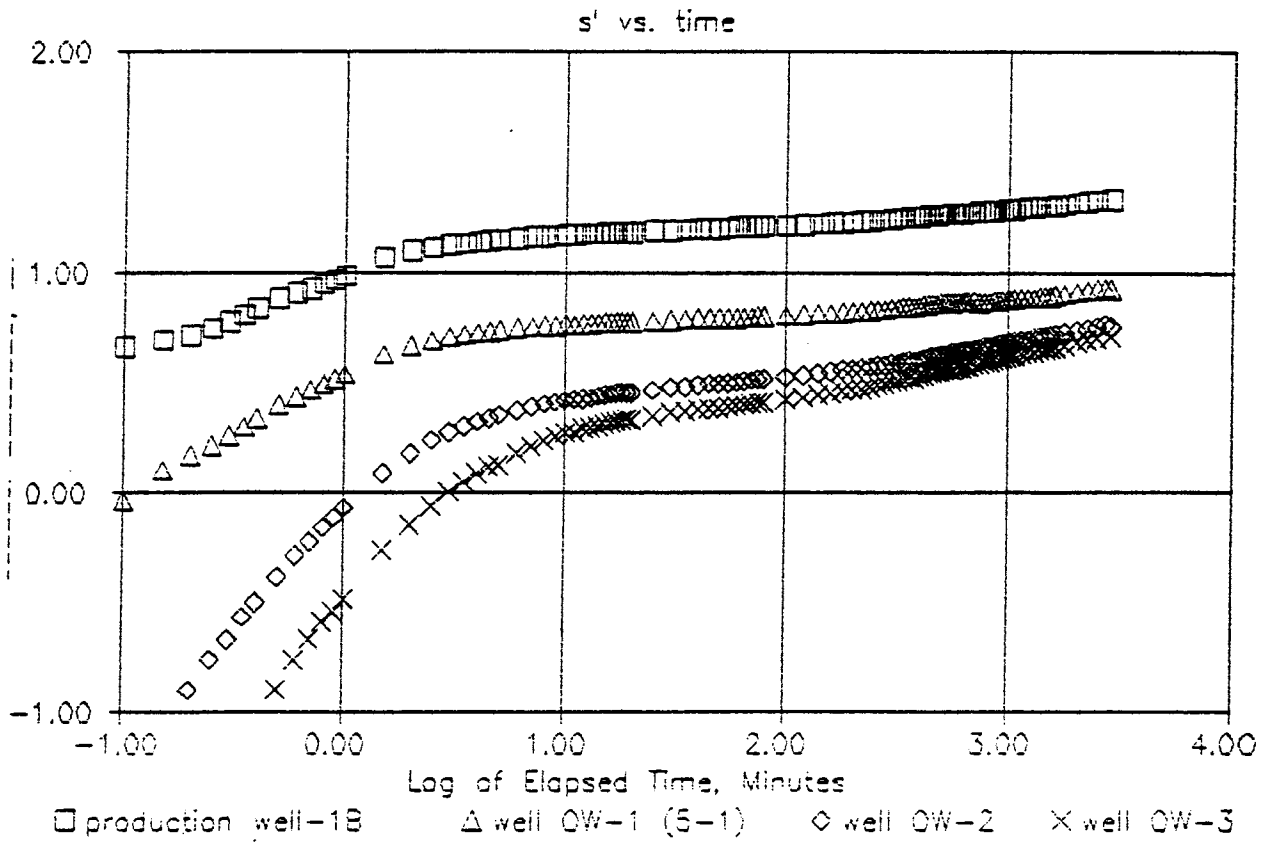
NOT EVALUATED



Location 1 Test 2

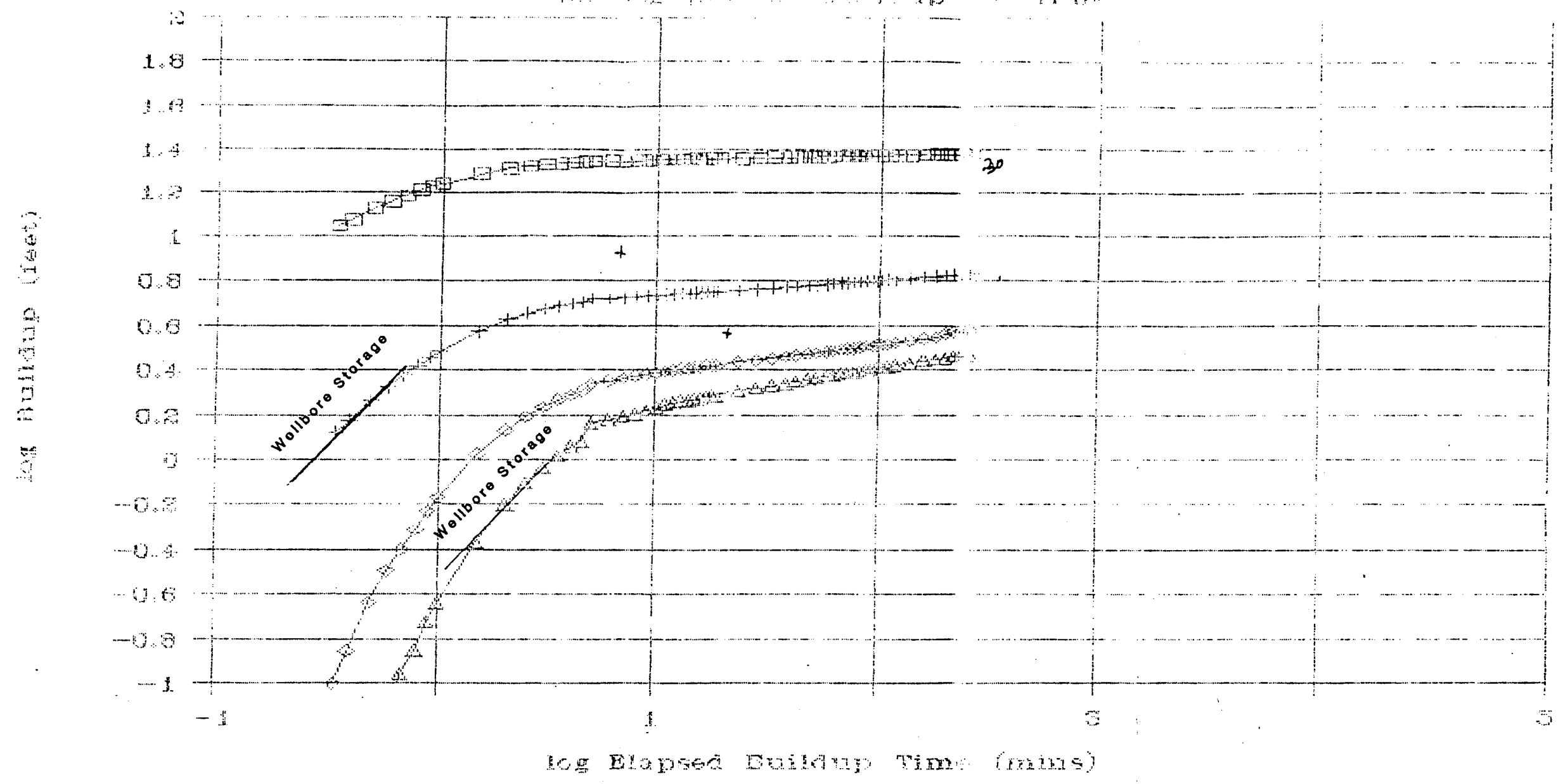


Location 1 Test 2

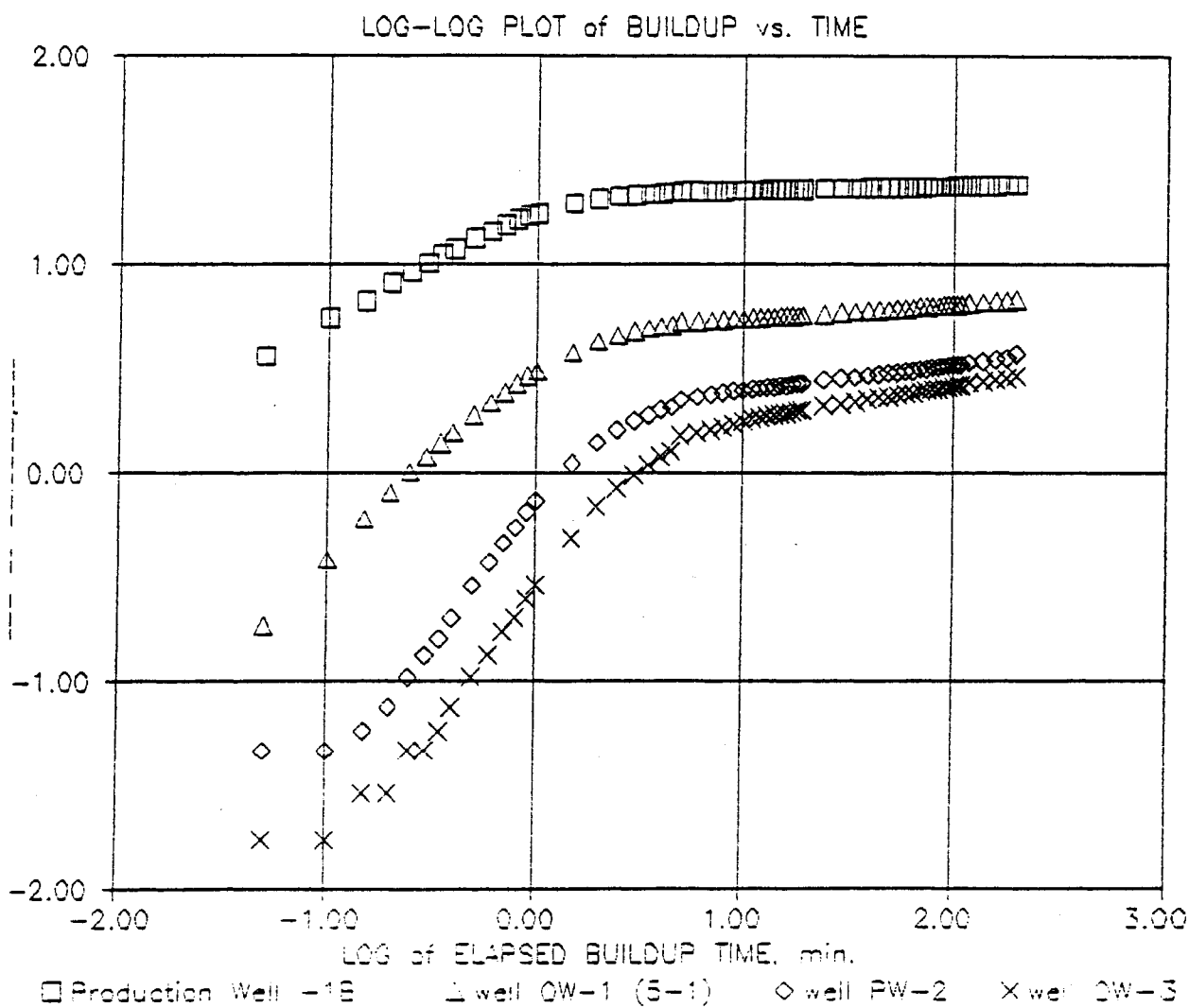


Union Station Loc. 1 Test 2

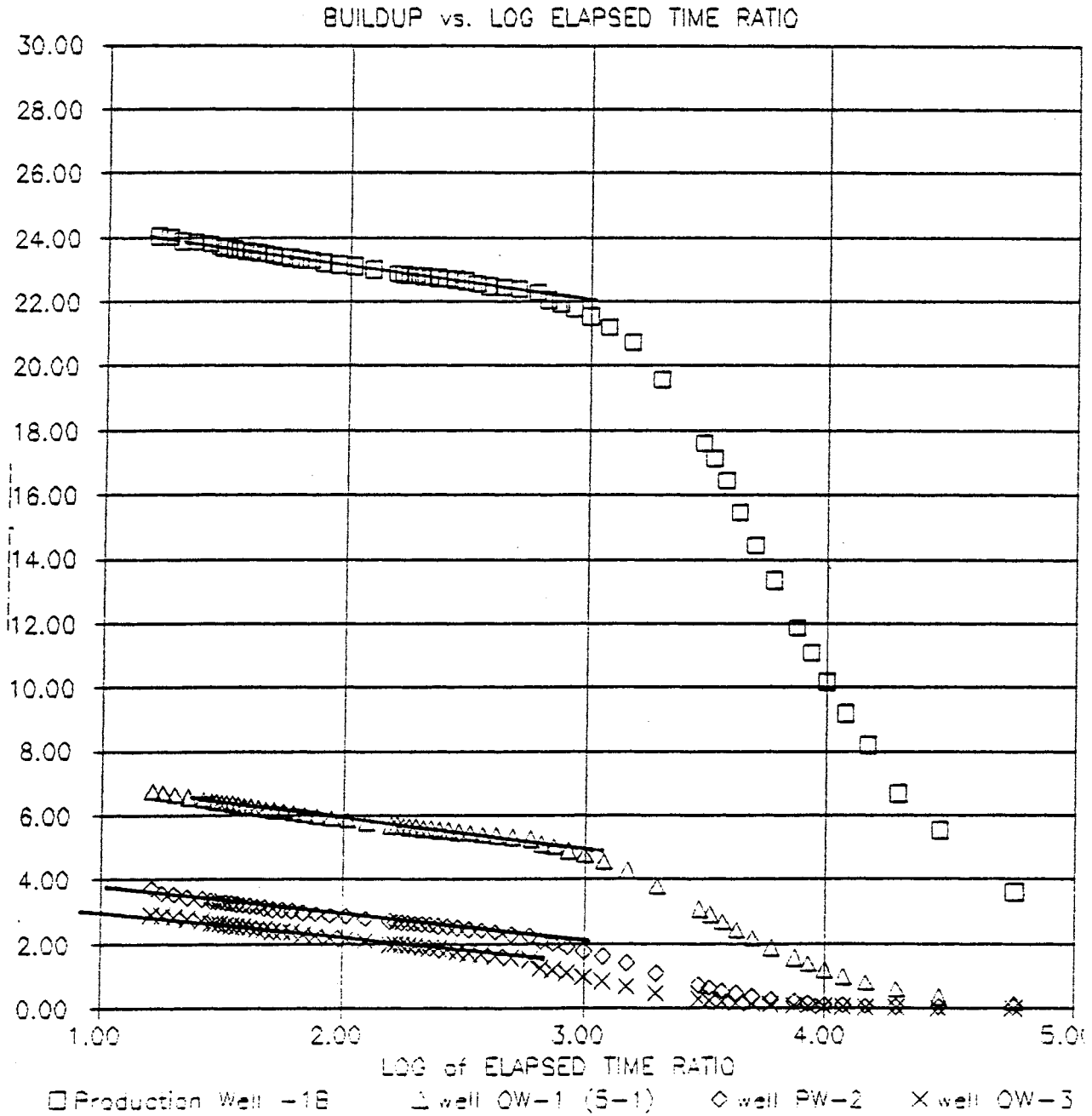
log-log plot of buildup



Location 1 Test 2



Location 1 Test 2





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SAN FRANCISCO
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TUCSON
WASHINGTON, D.C.

February 25, 1986
225-08H

Mr. Roger Hail
ESA Geotechnical Consultants
2625 Redwing Road, Suite 325
Fort Collins, CO 80526

Subject: MRTC Union Station - Pump Test Design

Re: Conversation of 24 February 86

Dear Mr. Hail:

Thank you for the information concerning the subject report. I reviewed the pump test data to facilitate the design of the additional test to assure interpretable data is collected. The following discussion presents a summary of my interpretation and a resulting pump test design.

I performed a type curve analysis of available data to characterize the flow regime to establish key properties to design the test.

Well OW-2: The well matched an unsteady-state line source model, see enclosed plot. The well experienced well bore storage up to about 2×10^{-6} t/r² and then followed the model. The well never reached the semi-log analysis point at the 175 gpm rate, but did for the 150 gpm rate. A Horner-type semi-log analysis and a type curve analysis was conducted, as follows:

Semi-Log Analysis: $T = \frac{2.303 (.334 \text{ ft}^3/\text{sec})}{4 \pi (1.34 \text{ ft/cycle})}$

$T = 29.978 \text{ gpd/ft}$

Type-Curve: $T = \frac{Pd (141.3) (5,143 \text{ BPD}) \mu B}{(P_1 - P_2)}$

$T = \frac{(141.3) (5,143)}{.47 \text{ psi}}$

or $T = 28,140 \text{ gpd/ft}$

Match Point = Pd = 1

$\mu = 1$

B = 1

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Well OW-1: Your analysis is correct in that this well demonstrates delayed yield. The reported transmissivities are:

Test 1 - 20,955 gpd/ft.
Test 2 - 21,488 gpd/ft.

The well does not show wellbore storage or skin effects.

Well 5-1: The log-log plot of both tests can be interpreted in two ways. The first interpretation is a delayed yield with a quick response. The second interpretation is that the well follows a line source model with a quick response. A semi-log analysis was conducted as shown in the attached figure to help select the appropriate interpretation. I selected the second interpretation because:

1. A drawdown of only 5 ft. in a well 11 feet from a well pumping 150 gpm will in most cases go into late unsteady-state time in a short period.
2. The permeability between the wells is relatively high.
3. An accurate type-curve match for delayed yield will be difficult due to the quick response of the well. Also, a quick response is not indicative of delayed yield.

Semi-Log Analysis: $T = \frac{2.303 (.334 \text{ ft}^3/\text{sec})}{4 \pi (.34 \text{ ft}/\text{cycle})}$

$T = .211 \text{ ft}^2/\text{sec}$ or 136,853 gpd/ft.

Type-Curve: $T = \frac{(141.3) (6,000 \text{ BPD}) (1) (1) (6)}{1.72 \text{ psi}}$

$T = 2,957,442 \text{ md.-ft.}$

or $T = 53,825 \text{ gpd/ft}$

The transmissivities are relatively high which looks to be a local condition.

Pumping Well: The provided information on the pumping well is inconclusive. Data in the observation wells and what was reported on the pumping well indicate single phase flow with less than 2% methane held in solution. The pressure drop in the well was not significant in terms of methane coming out of the solution. The pumping rate looks to have been variable toward the end of the test, which does not appear to have been due to gas breakout. More information on pumping

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rates and fluid levels during pumping would be necessary to confirm any of those facts.

The postulation that the pumping well was damaged with a 30% lose of efficiency appears to be based on experience during the installation of the well and a distance drawdown plot. The distance drawdown plot is not definitive because of the variable permeability at distance in the aquifer, and the delayed yield condition. The information provided will not be used for pump test design.

Test Design

A diagnostic model of expected flow conditions in wells during the planned pump test was developed to assist in the definition of expected:

- o Pumping rates
- o Test duration for required well response
- o Drawdown
- o Effects of gas production

A radial unsteady-state flow model for an aquifer with a transmissivity of 29,900 gpd/ft (from well OW-2) was developed for an observation well at a distance of 50 feet from the pumping well, see enclosed Well Test Design. A pumping rate of 150 gpm was used to design well responses. A delayed yield aquifer condition was not modeled because the simpler radial flow modal provides suitable results for both conditions. A drawdown-time response curve for an observation well at a distance of 50 feet was prepared with supporting calculations presented in the enclosed well test design. Also provided is expected drawdown calculations for the pumping well. The resulting well test design is as follows:

Pumping Rate: 225 gpm \pm 10%, using

- Flexible diaphragm orifice flow control values
- Well head gas separator and ignition detector

Duration of Test: Not less than 24 hours pumping
Not less than 12 hours recovery

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Instrumentation:

Pumping well - 50 psi pressure transducer placed in protective access tubing set at @ just above the pump intake valve.

Observation Wells - 25 psi transducer set @ 90% of measuring capacity

Data Collection: 4-channel Data Logger with IBM/COMPAQ computer interface

	<u>Time Intervals</u>	<u>Recording Intervals</u>
* Collection Intervals	6 sec to 30 sec	3 sec
	30 sec to 60 sec	6 sec
	60 sec to 300 sec	30 sec
	5 min to 120 min	1 min
	2 hrs to 6 hrs	20 min
	6 hrs to end	30 min

* For Drawdown and Build-up Testing

Density of the fluid column in wells is to be tested prior to pumping using a pressure transducers.

Please contract me if you have any questions.

Sincerely yours,
GEO/RESOURCE CONSULTANTS, INC.



Michael J. King
Senior Hydrogeologist

MJK/bb

Previous Well Test
Analysis

Well OW-2

Type Curve: Match Point $P_0 = 1$

$$Kh = \frac{(1)(141.3)(5,143 \text{ BPD})(1)(1)}{}$$

$$(6.6 \text{ ft} \times .43 \text{ psi/ft.}) = .47 \text{ psi}$$

$$Kh = 1,546,183 \text{ md-ft} \quad \text{or} \quad 28,140 \text{ gpd/ft.}$$

Semi-log Analysis:

$$T = \frac{2.3 (.334 \text{ ft}^2/\text{sec})}{}$$

$$4 \text{ ft} (1.32 \text{ ft/cycle})$$

$$T = .046 \text{ ft}^2/\text{sec} \quad \text{or} \quad 29,978 \text{ gpd/ft.}$$

Well 5-1

Semi-log Analysis:

$$T = \frac{2.3 (.393 \text{ ft}^2/\text{sec})}{}$$

$$4 \text{ ft} (.39 \text{ ft/cycle})$$

$$T = .211 \text{ ft}^2/\text{sec} \quad \text{or} \quad 136,853 \text{ gpd/ft.}$$

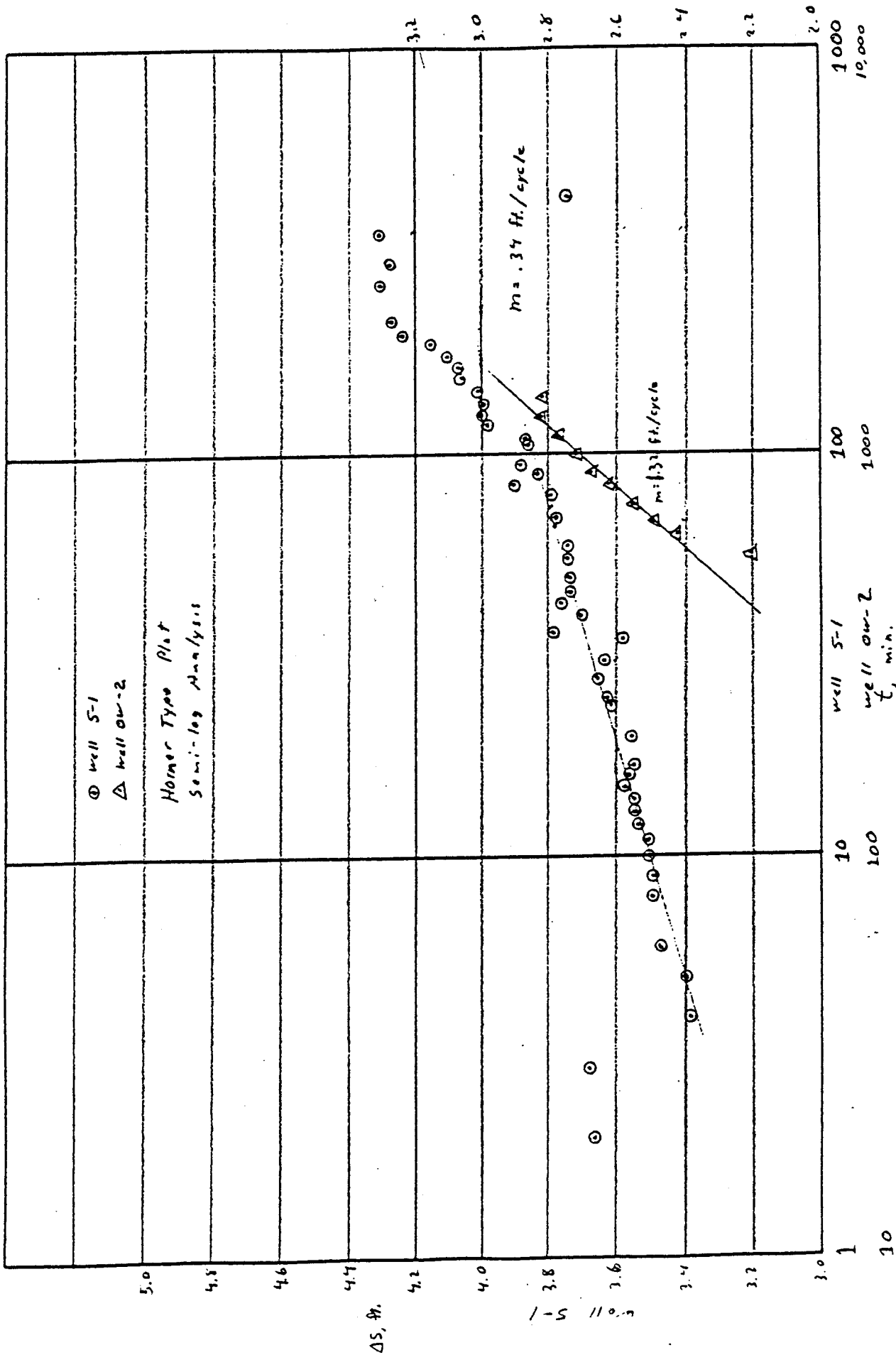
Type Curve: Match Point ($P_d = 6$)

$$Kh = \frac{(6)(141.3)(6,000 \text{ BPD})(1)(1)}{}$$

$$(4 \text{ ft} \times .43 \text{ psi/ft.}) = 1.72 \text{ psi}$$

$$Kh = 2,957,442 \text{ md-ft} \quad \text{or} \quad 53,825 \text{ gpd/ft.}$$

2-10 112m



ΔS, ft.

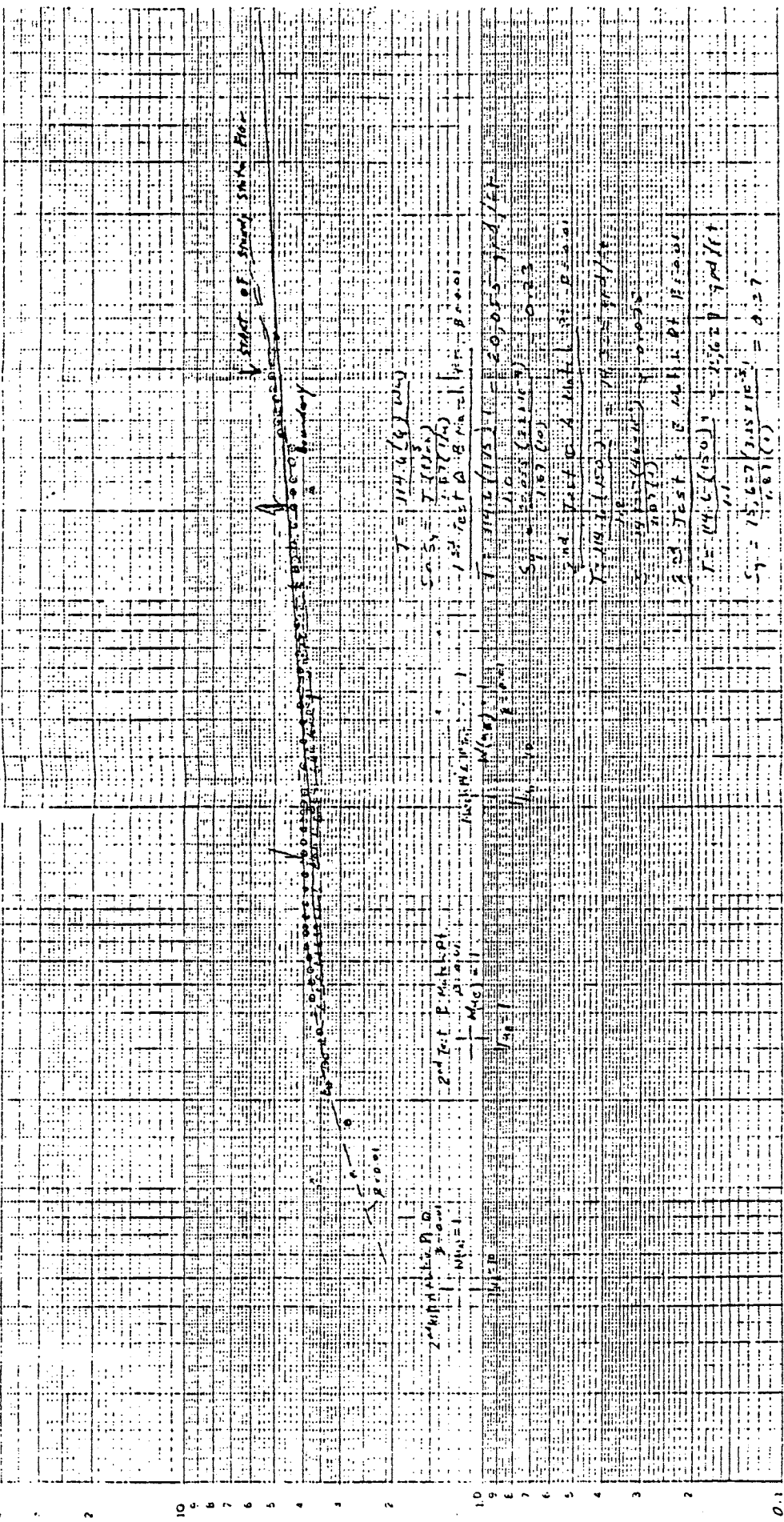
Well 5-1

Well 0W-2

t, min.

Union Station
Observation Well B-1

1st Test 2/24/53 Q = 175 gpm
2nd Test 2/24/53 Q = 750 gpm



1/2

FIGURE B-3

Union Station 4-1-51 7/2/51

$T = 14.6 \text{ (in.)}$ $\rho = 150 \text{ gpm}$

$S = T \left(\frac{1}{10} \right)$

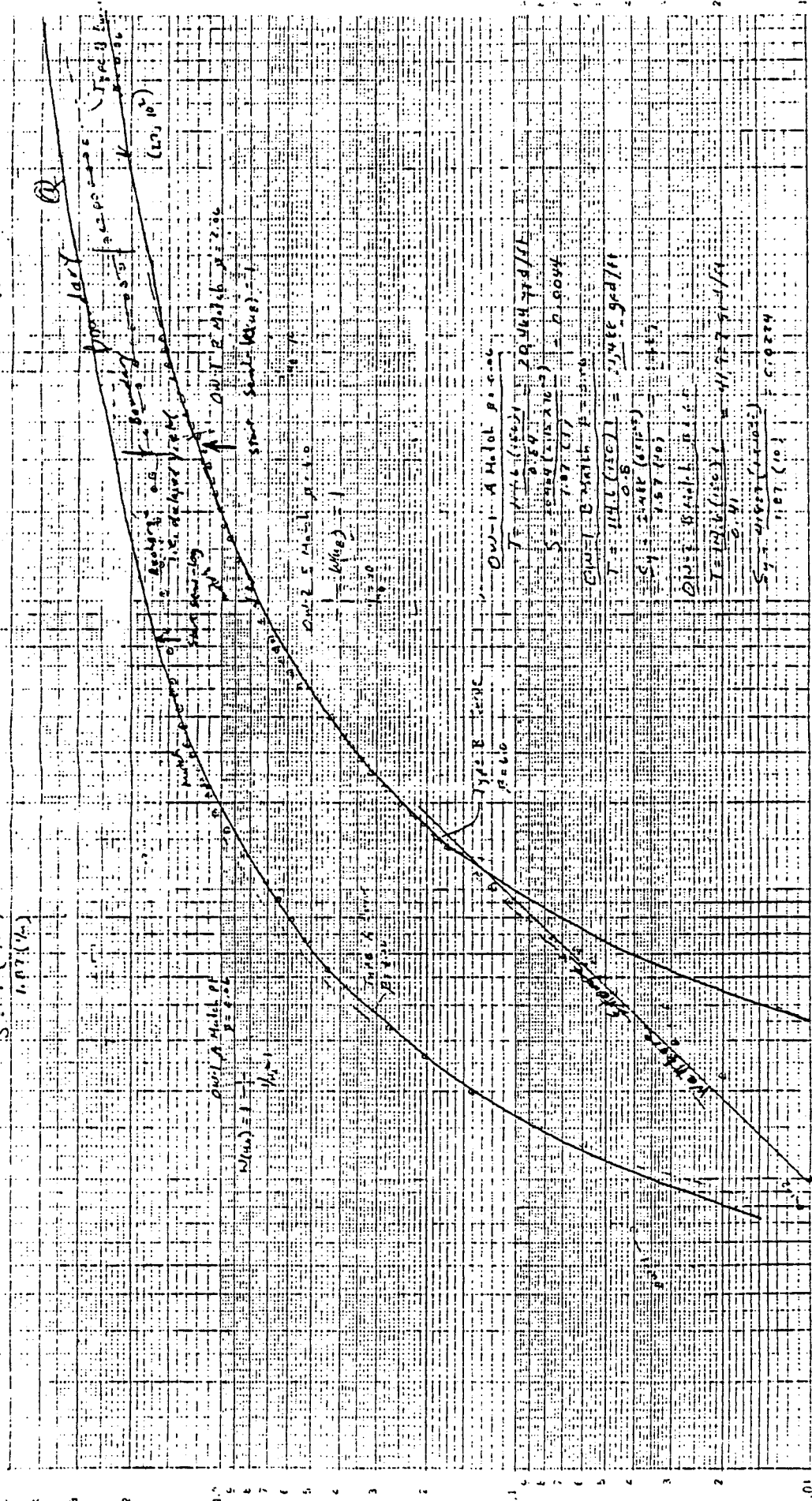
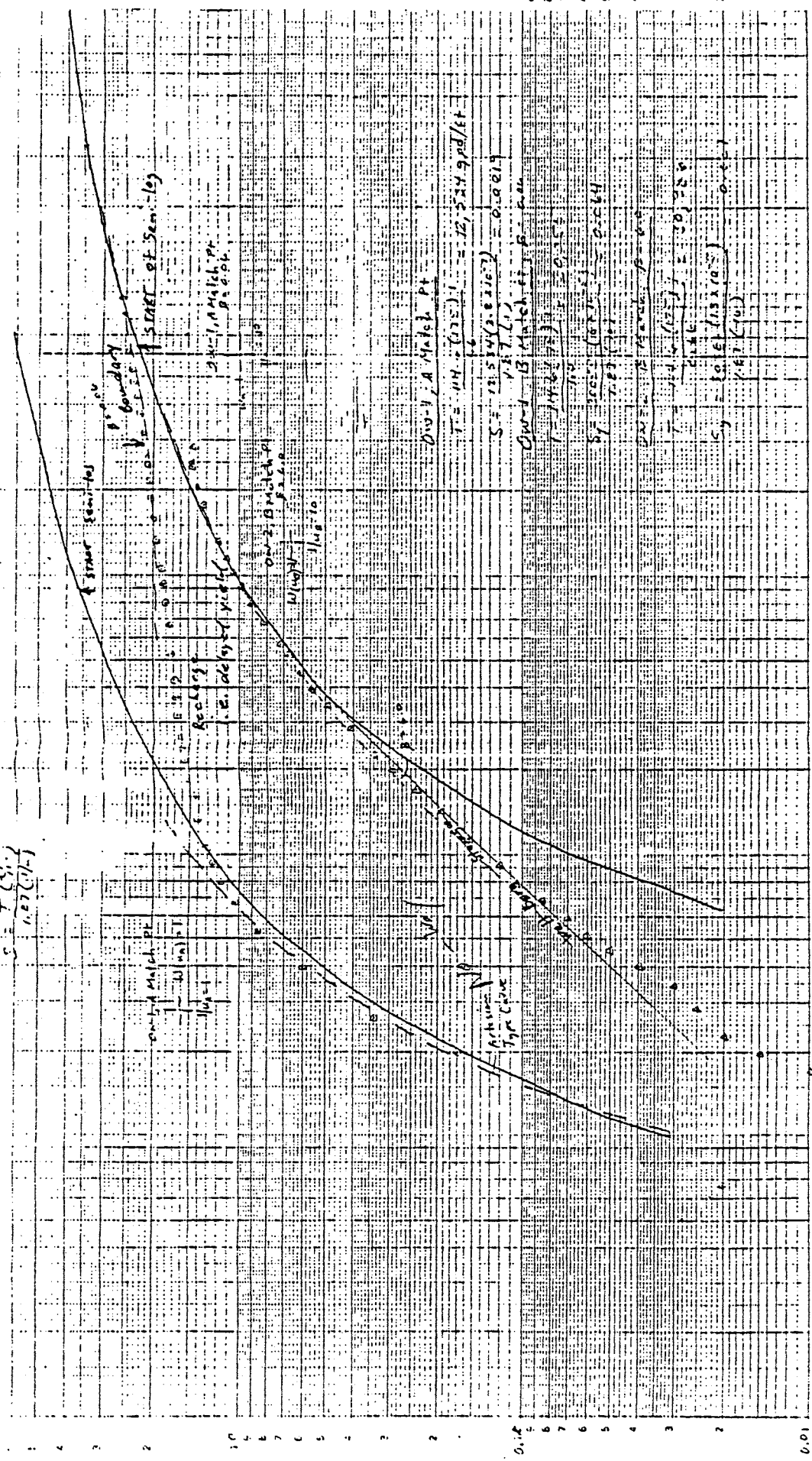


FIGURE B-2

Union on 1st Test 3/24/63

$T = 175$
 $Q = 175 \text{ gpm}$

$S = \frac{T \cdot (1.1)}{1.07 \cdot (1.1)}$



1 2 3 4 5 6 7 8 9 10
 $10^{-2} t/r^2$
 1 2 3 4 5 6 7 8 9 10
 t/r^2

FIGURE B-1

Well Test Design

$$P_d = \frac{Kh}{141.3 \text{ q Bm}}$$

$$t_0/r_0^2 = \frac{0.000264 K t}{\phi \mu c_t r^2}$$

(Dimensionless Pressure for a single well in an infinite system, no wellbore storage, no skin)

Minimum Response Time for semi-log Analysis

$$(P_0 = 1.58, t_0/r_0^2 = 10)$$

$$\text{Assume: } T = 29,900 \text{ gpd/ft.}$$

$$Q = 150 \text{ gpm}$$

$$h = 59 \text{ ft.}$$

Observation Well @ 50 ft.:

$$\text{Drawdown } \Delta P = \frac{(1.58)(141.3)(5,143 \text{ BPD})(1)(1)}{kh}$$

$$kh = 27,845 \text{ md} \times 59 \text{ ft.}$$

$$\Delta P = .69 \text{ psi or } 1.62 \text{ ft.}$$

$$\text{Time Response } t = \frac{(10)(.30)(1)(5 \times 10^8)(50 \text{ ft.}^2)}{0.000264(27,845 \text{ md})}$$

$$t = 5.1 \text{ hrs. or } 306 \text{ min.}$$

Match Point (1.62 ft, 306 min) see attached plot.

Pumping Well

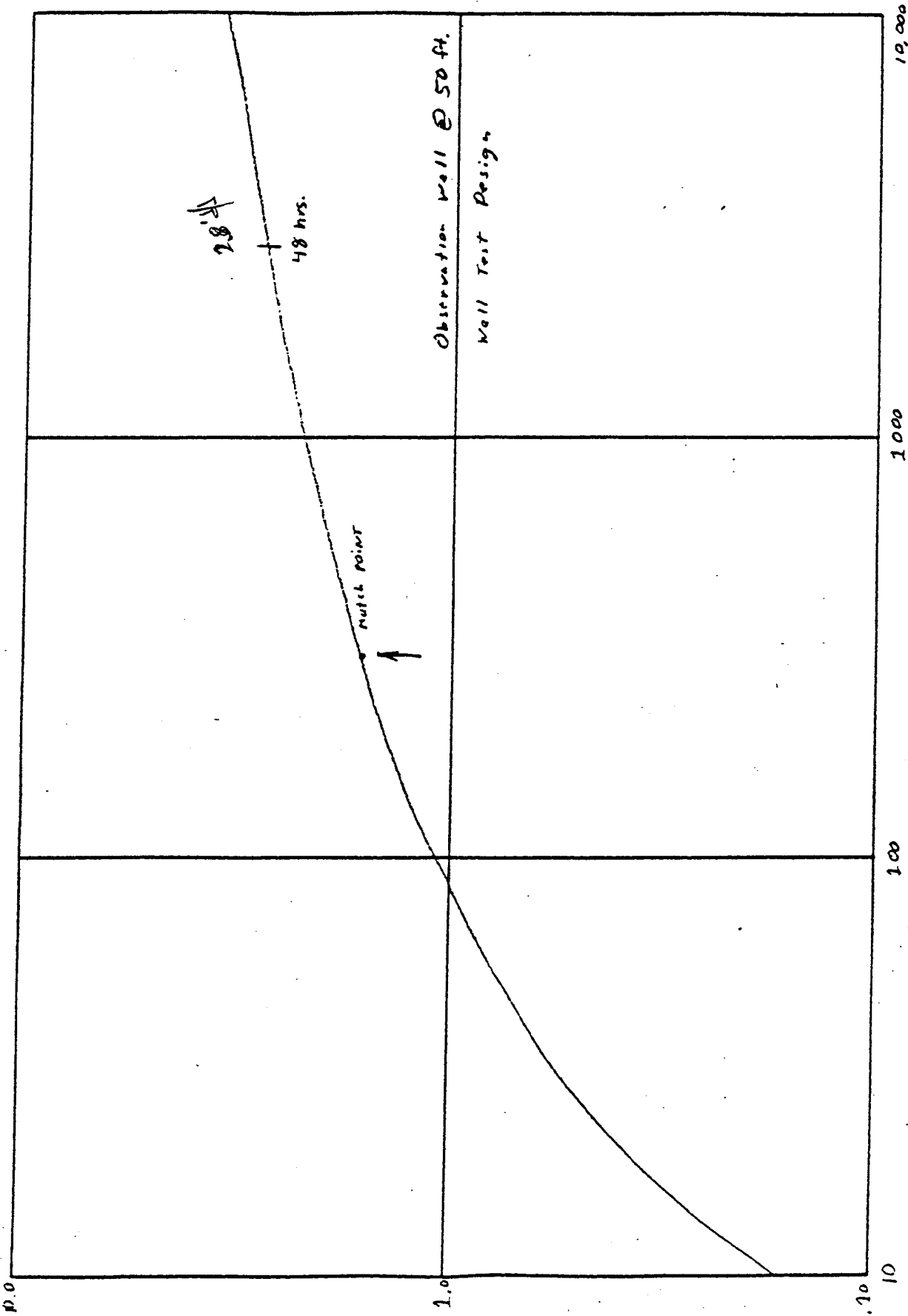
Drawdown @ $P_0 = 10$ from Agarwal, Ram, Al-Aussainy, Ramay, 1970

$$\Delta P = \frac{(10)(141.3)(5,143)(1)(1)}{27,845 \times 59}$$

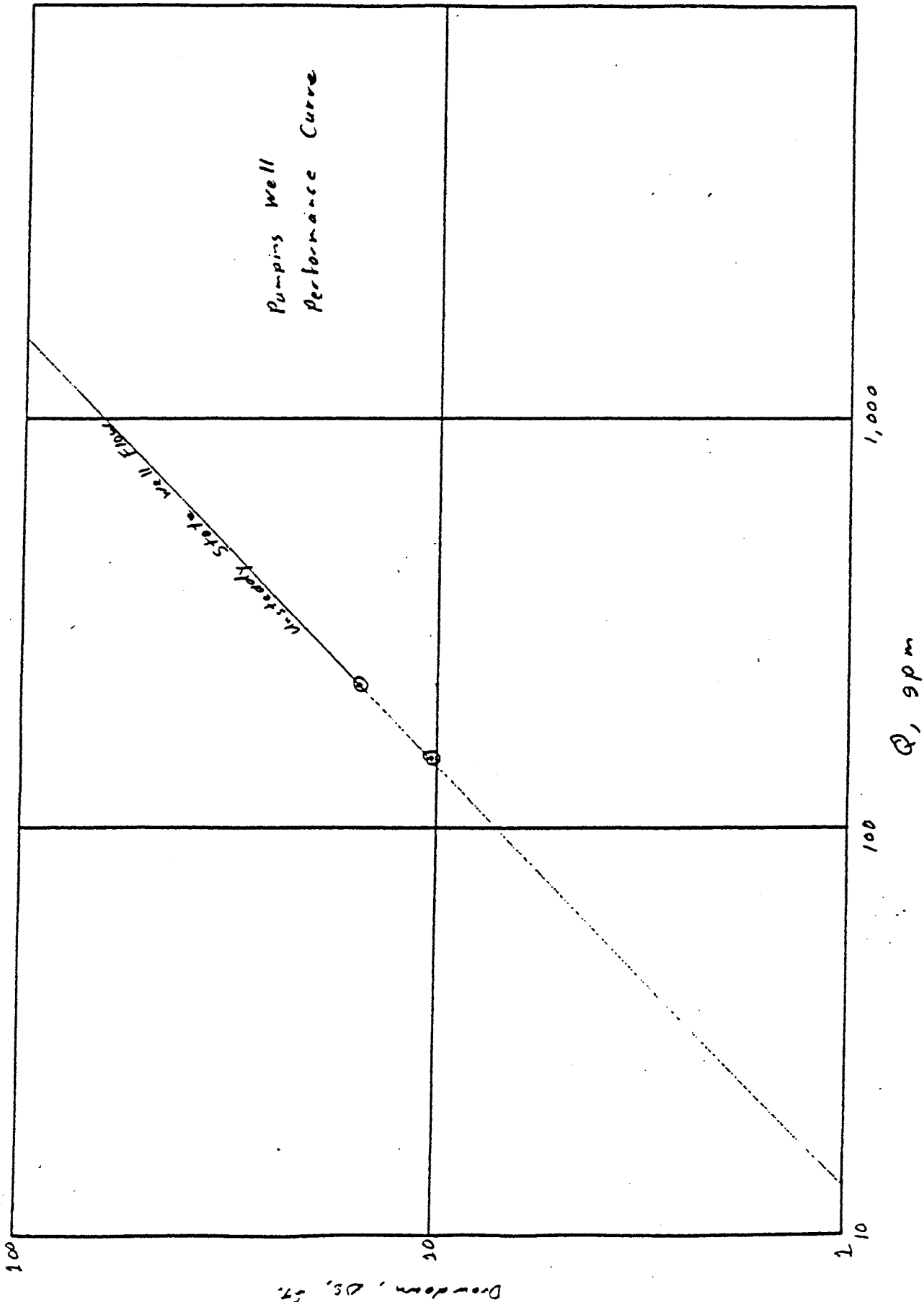
Response Time 1 min.

$$\Delta P = 4.4 \text{ psi or } 10.3 \text{ ft @ } 150 \text{ gpm}$$

$$\text{or } 15.45 \text{ ft @ } 225 \text{ gpm}$$



10



APPENDIX A₁
PUMP TEST DATA

CONSTANT RATE PUMP TEST DRAWDOWN DATA

Union Station Aquifer Test Location 1, Test 1 (PW-1B)
Discharge Rate = 341 GPM

Elapsed Time (min.)	Pumping Well PW-1B	Observe Well OW-1(5-1)	Observe Well OW-2	Observe Well OW-3
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4

0.00	1	1.24	2	0.20	3	0.00	4	0.00
0.05	1	2.89	2	0.59	3	0.01	4	0.00
0.10	1	3.60	2	0.91	3	0.04	4	0.00
0.15	1	4.07	2	1.20	3	0.09	4	0.01
0.20	1	4.51	2	1.40	3	0.12	4	0.01
0.25	1	4.91	2	1.59	3	0.16	4	0.03
0.30	1	5.20	2	1.76	3	0.20	4	0.04
0.35	1	5.55	2	1.91	3	0.26	4	0.06
0.40	1	5.89	2	2.05	3	0.30	4	0.07
0.50	1	6.58	2	2.34	3	0.39	4	0.10
0.60	1	7.36	2	2.63	3	0.49	4	0.13
0.70	1	7.97	2	2.87	3	0.58	4	0.17
0.80	1	8.40	2	3.04	3	0.65	4	0.20
0.90	1	8.66	2	3.19	3	0.73	4	0.24
1.00	1	8.98	2	3.32	3	0.81	4	0.29
1.50	1	10.42	2	3.88	3	1.14	4	0.46
2.00	1	11.52	2	4.30	3	1.39	4	0.62
2.50	1	12.21	2	4.56	3	1.59	4	0.76
3.00	1	12.73	2	4.77	3	1.73	4	0.90
3.50	1	13.05	2	4.88	3	1.83	4	0.99
4.00	1	13.25	2	4.97	3	1.92	4	1.08
4.50	1	13.40	2	5.04	3	1.98	4	1.14
5.00	1	13.66	2	5.17	3	2.12	4	1.33
6.00	1	13.69	2	5.18	3	2.17	4	1.39
7.00	1	13.77	2	5.20	3	2.22	4	1.50
8.00	1	13.81	2	5.23	3	2.26	4	1.54
9.00	1	13.81	2	5.21	3	2.28	4	1.57

SITE #1
STAGE 1
(9-MINUTE TEST)
NOT EVALUATED

CONSTANT RATE PUMP TEST DRAWDOWN DATA

Union Station Location 1, Test 2 (PW-1B)
 Discharge Rate = 362.9 +/- 5.08 GPM

Elapsed Time (min.)	Pumping Well number?	Observe Well number?	Observe Well number?	Observe Well number?
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4

0.00	1	4.42	2	0.02	3	0.02	4	0.02
0.05	1	3.62	2	0.43	3	0.00	4	0.00
0.10	1	4.77	2	0.94	3	0.03	4	0.00
0.15	1	5.14	2	1.28	3	0.09	4	0.01
0.20	1	5.46	2	1.51	3	0.13	4	0.03
0.25	1	5.83	2	1.68	3	0.17	4	0.04
0.30	1	6.33	2	1.86	3	0.21	4	0.06
0.35	1	6.79	2	2.03	3	0.27	4	0.07
0.40	1	7.37	2	2.24	3	0.32	4	0.09
0.50	1	8.20	2	2.58	3	0.42	4	0.13
0.60	1	8.72	2	2.83	3	0.52	4	0.17
0.70	1	9.18	2	3.03	3	0.61	4	0.21
0.80	1	9.70	2	3.25	3	0.70	4	0.26
0.90	1	10.11	2	3.42	3	0.78	4	0.29
1.00	1	10.57	2	3.61	3	0.87	4	0.33
1.50	1	13.00	2	4.46	3	1.24	4	0.55
2.00	1	14.04	2	4.91	3	1.53	4	0.72
2.50	1	14.65	2	5.20	3	1.76	4	0.88
3.00	1	15.13	2	5.40	3	1.94	4	1.02
3.50	1	15.42	2	5.55	3	2.05	4	1.14
4.00	1	15.69	2	5.63	3	2.17	4	1.24
4.50	1	15.88	2	5.72	3	2.24	4	1.33
5.00	1	16.12	2	5.81	3	2.31	4	1.36
6.00	1	16.38	2	5.95	3	2.44	4	1.54
7.00	1	16.58	2	6.02	3	2.52	4	1.66
8.00	1	16.69	2	6.08	3	2.61	4	1.76
9.00	1	16.92	2	6.13	3	2.67	4	1.83
10.00	1	17.10	2	6.19	3	2.73	4	1.91
11.00	1	17.13	2	6.18	3	2.74	4	1.92
12.00	1	17.25	2	6.19	3	2.77	4	2.00
13.00	1	17.27	2	6.22	3	2.78	4	2.00
14.00	1	17.39	2	6.30	3	2.84	4	2.06
15.00	1	17.48	2	6.32	3	2.87	4	2.11
16.00	1	17.54	2	6.35	3	2.90	4	2.14
17.00	1	17.56	2	6.37	3	2.93	4	2.17
18.00	1	17.56	2	6.37	3	2.95	4	2.19
19.00	1	17.62	2	6.38	3	2.96	4	2.21
20.00	1	17.59	2	6.35	3	2.95	4	2.18
25.00	1	17.88	2	6.45	3	3.03	4	2.29
30.00	1	18.02	2	6.51	3	3.10	4	2.37
35.00	1	18.25	2	6.57	3	3.15	4	2.40
40.00	1	18.40	2	6.61	3	3.21	4	2.45

SITE #1
 STAGE 2
 UNCORRECTED DATA
 1 OF 6

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 1, Test 2 (PW-1B)

PAGE 2

Elapsed Time (min.)	Pumping Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)
	Logger Channel 1	Logger Channel 2	Logger Channel 2	Logger Channel 3	Logger Channel 3	Logger Channel 3	Logger Channel 4	Logger Channel 4
45.00	1	18.48	2	6.64	3	3.23	4	2.50
50.00	1	18.52	2	6.65	3	3.25	4	2.50
55.00	1	18.63	2	6.67	3	3.28	4	2.52
60.00	1	18.72	2	6.70	3	3.30	4	2.55
65.00	1	18.77	2	6.73	3	3.33	4	2.58
70.00	1	18.87	2	6.76	3	3.36	4	2.61
75.00	1	18.87	2	6.79	3	3.39	4	2.64
80.00	1	18.98	2	6.80	3	3.42	4	2.66
100.00	1	19.10	2	6.86	3	3.49	4	2.73
120.00	1	19.39	2	6.93	3	3.56	4	2.78
140.00	1	19.50	2	7.00	3	3.64	4	2.87
160.00	1	19.67	2	7.06	3	3.71	4	2.93
180.00	1	19.87	2	7.12	3	3.78	4	3.00
200.00	1	20.02	2	7.16	3	3.82	4	3.03
220.00	1	20.19	2	7.20	3	3.85	4	3.07
240.00	1	20.33	2	7.26	3	3.91	4	3.13
260.00	1	20.51	2	7.32	3	3.94	4	3.19
280.00	1	20.60	2	7.35	3	3.97	4	3.23
300.00	1	20.94	2	7.48	3	4.04	4	3.29
320.00	1	21.03	2	7.51	3	4.08	4	3.33
340.00	1	21.18	2	7.55	3	4.13	4	3.39
360.00	1	21.29	2	7.60	3	4.19	4	3.44
380.00	1	21.31	2	7.55	3	4.16	4	3.41
400.00	1	21.46	2	7.67	3	4.26	4	3.51
420.00	1	21.72	2	7.75	3	4.33	4	3.56
440.00	1	21.78	2	7.78	3	4.36	4	3.61
460.00	1	21.95	2	7.83	3	4.40	4	3.65
480.00	1	22.01	2	7.86	3	4.43	4	3.68
500.00	1	22.16	2	7.90	3	4.48	4	3.73
520.00	1	22.18	2	7.91	3	4.51	4	3.74
540.00	1	22.24	2	7.94	3	4.53	4	3.77
560.00	1	22.33	2	7.97	3	4.57	4	3.79
580.00	1	22.41	2	8.00	3	4.60	4	3.82
600.00	1	22.56	2	8.01	3	4.63	4	3.85
620.00	1	22.56	2	8.04	3	4.66	4	3.88
640.00	1	22.64	2	8.07	3	4.69	4	3.91
660.00	1	22.70	2	8.09	3	4.72	4	3.94
680.00	1	22.76	2	8.09	3	4.75	4	3.97
700.00	1	22.82	2	8.07	3	4.77	4	3.99
720.00	1	22.91	2	8.07	3	4.81	4	4.01
740.00	1	22.93	2	7.98	3	4.82	4	4.04
760.00	1	22.99	2	7.98	3	4.85	4	4.07

SITE #1
 STAGE 2
 UNCORRECTED DATA
 2 OF 6

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 1, Test 2 (PW-1B)

PAGE 3

Elapsed Time (min.)	Pumping Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	
	Logger Channel 1	Logger Channel 2	Logger Channel 2	Logger Channel 3	Logger Channel 3	Logger Channel 3	Logger Channel 4	
780.00	1	23.08	2	8.01	3	4.89	4	4.08
800.00	1	23.08	2	8.01	3	4.89	4	4.10
820.00	1	23.20	2	8.04	3	4.94	4	4.13
840.00	1	23.22	2	8.07	3	4.95	4	4.16
860.00	1	23.22	2	8.09	3	4.98	4	4.17
880.00	1	23.31	2	8.12	3	5.00	4	4.19
900.00	1	23.34	2	8.13	3	5.03	4	4.20
920.00	1	23.39	2	8.14	3	5.04	4	4.23
940.00	1	23.45	2	8.17	3	5.07	4	4.26
960.00	1	23.49	2	8.18	3	5.08	4	4.27
980.00	1	23.60	2	8.21	3	5.11	4	4.30
1000.00	1	23.68	2	8.23	3	5.14	4	4.31
1020.00	1	23.66	2	8.24	3	5.15	4	4.34
1040.00	1	23.72	2	8.27	3	5.18	4	4.36
1060.00	1	23.74	2	8.29	3	5.20	4	4.37
1080.00	1	23.83	2	8.30	3	5.21	4	4.39
1100.00	1	23.89	2	8.33	3	5.24	4	4.43
1120.00	1	23.95	2	8.35	3	5.26	4	4.45
1140.00	1	23.97	2	8.36	3	5.29	4	4.48
1160.00	1	24.06	2	8.36	3	5.31	4	4.51
1180.00	1	24.09	2	8.35	3	5.31	4	4.51
1200.00	1	24.01	2	8.24	3	5.11	4	4.42
1220.00	1	24.18	2	8.36	3	5.23	4	4.55
1240.00	1	24.18	2	8.36	3	5.33	4	4.55
1260.00	1	24.20	2	8.36	3	5.35	4	4.57
1280.00	1	24.24	2	8.38	3	5.38	4	4.57
1300.00	1	24.32	2	8.39	3	5.41	4	4.60
1320.00	1	24.32	2	8.39	3	5.43	4	4.62
1340.00	1	24.38	2	8.42	3	5.44	4	4.63
1360.00	1	24.41	2	8.42	3	5.46	4	4.63
1380.00	1	24.47	2	8.44	3	5.47	4	4.66
1400.00	1	24.43	2	8.44	3	5.47	4	4.65
1420.00	1	24.47	2	8.44	3	5.47	4	4.65
1440.00	1	24.49	2	8.46	3	5.49	4	4.66
1460.00	1	24.49	2	8.46	3	5.49	4	4.66
1480.00	1	24.49	2	8.47	3	5.50	4	4.68
1500.00	1	24.58	2	8.49	3	5.50	4	4.68
1520.00	1	24.58	2	8.50	3	5.52	4	4.71
1540.00	1	24.58	2	8.52	3	5.55	4	4.72
1560.00	1	24.64	2	8.53	3	5.56	4	4.74
1580.00	1	24.87	2	8.59	3	5.59	4	4.77
1600.00	1	24.90	2	8.61	3	5.61	4	4.79

SITE #1
 STAGE 2
 UNCORRECTED DATA
 3 OF 6

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 1, Test 2 (PW-1B)

PAGE 4

Elapsed Time (min.)	Pumping Well number?	Observe Well number?	Observe Well number?	Observe Well number?
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4

1620.00	1	24.90	2	8.64	3	5.63	4	4.81
1640.00	1	24.95	2	8.65	3	5.64	4	4.82
1660.00	1	24.99	2	8.66	3	5.64	4	4.83
1680.00	1	25.05	2	8.68	3	5.64	4	4.83
1700.00	1	25.10	2	8.69	3	5.64	4	4.86
1720.00	1	25.10	2	8.70	3	5.64	4	4.86
1740.00	1	25.13	2	8.72	3	5.66	4	4.88
1760.00	1	25.16	2	8.73	3	5.67	4	4.91
1780.00	1	25.22	2	8.75	3	5.69	4	4.92
1800.00	1	25.22	2	8.76	3	5.67	4	4.94
1820.00	1	25.33	2	8.81	3	5.69	4	4.95
1840.00	1	25.36	2	8.81	3	5.70	4	4.97
1860.00	1	25.39	2	8.82	3	5.72	4	5.00
1880.00	1	25.45	2	8.85	3	5.75	4	5.01
1900.00	1	25.51	2	8.88	3	5.76	4	5.03
1920.00	1	25.57	2	8.90	3	5.78	4	5.04
1940.00	1	25.59	2	8.90	3	5.79	4	5.05
1960.00	1	25.65	2	8.92	3	5.81	4	5.05
1980.00	1	25.74	2	8.94	3	5.81	4	5.07
2000.00	1	25.80	2	8.96	3	5.82	4	5.08
2020.00	1	25.85	2	8.98	3	5.82	4	5.08
2040.00	1	25.85	2	8.99	3	5.83	4	5.09
2060.00	1	25.88	2	9.01	3	5.85	4	5.11
2080.00	1	25.85	2	8.99	3	5.86	4	5.12
2100.00	1	25.88	2	9.02	3	5.87	4	5.14
2120.00	1	25.94	2	9.04	3	5.89	4	5.14
2140.00	1	25.99	2	9.05	3	5.90	4	5.17
2160.00	1	26.05	2	9.07	3	5.92	4	5.18
2180.00	1	26.11	2	9.08	3	5.93	4	5.20
2200.00	1	26.11	2	9.08	3	5.93	4	5.20
2220.00	1	26.14	2	9.10	3	5.95	4	5.21
2240.00	1	26.20	2	9.11	3	5.96	4	5.23
2260.00	1	26.26	2	9.13	3	5.98	4	5.24
2280.00	1	26.28	2	9.14	3	5.99	4	5.26
2300.00	1	26.32	2	9.16	3	6.01	4	5.26
2320.00	1	26.37	2	9.17	3	6.02	4	5.27
2340.00	1	26.37	2	9.17	3	6.02	4	5.27
2360.00	1	26.40	2	9.18	3	6.04	4	5.29
2380.00	1	26.43	2	9.20	3	6.05	4	5.30
2400.00	1	26.51	2	9.21	3	6.07	4	5.31
2420.00	1	26.55	2	9.21	3	6.08	4	5.31
2440.00	1	26.61	2	9.24	3	6.09	4	5.33

SITE #1
 STAGE 2
 UNCORRECTED DATA
 4 OF 6

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 1, Test 2 (PW-1B)

PAGE 5

Elapsed Time (min.)	Pumping Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?	Observe Well number?
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)
	Logger Channel 1	Logger Channel 2	Logger Channel 2	Logger Channel 3	Logger Channel 3	Logger Channel 3	Logger Channel 3	Logger Channel 4
2460.00	1	26.63	2	9.24	3	6.11	4	5.34
2480.00	1	26.66	2	9.24	3	6.11	4	5.34
2500.00	1	26.69	2	9.25	3	6.12	4	5.35
2520.00	1	26.72	2	9.27	3	6.13	4	5.37
2540.00	1	26.78	2	9.28	3	6.15	4	5.40
2560.00	1	26.78	2	9.28	3	6.15	4	5.40
2580.00	1	26.80	2	9.31	3	6.16	4	5.41
2600.00	1	26.86	2	9.31	3	6.18	4	5.43
2620.00	1	26.92	2	9.31	3	6.18	4	5.43
2640.00	1	26.95	2	9.34	3	6.19	4	5.43
2660.00	1	26.98	2	9.33	3	6.21	4	5.43
2680.00	1	27.03	2	9.34	3	6.21	4	5.44
2700.00	1	27.03	2	9.34	3	6.22	4	5.44
2720.00	1	27.03	2	9.34	3	6.24	4	5.44
2740.00	1	27.03	2	9.36	3	6.24	4	5.44
2760.00	1	27.07	2	9.36	3	6.25	4	5.44
2780.00	1	27.13	2	9.37	3	6.25	4	5.44
2800.00	1	27.15	2	9.39	3	6.27	4	5.43
2820.00	1	27.21	2	9.39	3	6.27	4	5.43
2840.00	1	27.30	2	9.37	3	6.25	4	5.40
2860.00	1	27.24	2	9.36	3	6.24	4	5.38
2880.00	1	27.09	2	9.28	3	6.16	4	5.33
2900.00	1	27.13	2	9.33	3	6.09	4	5.37
2920.00	1	27.24	2	9.34	3	6.09	4	5.37
2940.00	1	27.21	2	9.34	3	6.11	4	5.40
2960.00	1	27.21	2	9.37	3	6.22	4	5.40
2980.00	1	27.24	2	9.37	3	6.24	4	5.40
2999.00	1	27.21	2	9.31	3	6.18	4	5.34

SITE #1
 STAGE 2
 UNCORRECTED DATA
 5 OF 6

CONSTANT RATE PUMP TEST DRAWDOWN DATA
Union Station Location 1, Test 2 (PW-1B)

PAGE 6

Constant Rate Drawdown Test Of Well PW-1B

Pumping was at a rate of 367.6 declining to 357.45 GPM.

Observation Well OW-1 (5-1) @ 15.4 ft. from PW

Observation Well OW-2 @ 61.6 ft. from PW

Observation Well OW-3 @ 119.5 ft. from PW

Pump was turned on at 11:40 HRS. on 06/24/86.

Pump was turned off at 13:40 HRS. on 06/26/86.

Depth to Static Water:

Well PW-1B was 19.11 ft. @ 08:03 HRS. on 06/24/86.

Well OW-1(5-1) was 19.45 ft. @ 07:58 HRS. on 06/24/86.

Well OW-2 was 18.99 ft. @ 07:52 HRS. on 06/24/86.

Well OW-3 was 18.50 ft. @ 07:45 HRS. on 06/24/86.

Depth of Well:

Well PW-1B is 85.5 ft.

Well OW-1(5-1) is 77.5 ft.

Well OW-2 is 78.7 ft.

Well OW-3 is 82.5 ft.

Saturated Thickness of Aquifer in Well:

Well PW-1B is 66.4 ft.

Well OW-1(5-1) is 58.1 ft.

Well OW-2 is 59.7 ft.

Well OW-3 is 64.0 ft.

SITE #1
STAGE 2
UNCORRECTED DATA
6 OF 6

Unconfined Aquifer Reduced Drawdown Data
Well: OW-1 (5-1)

Distance (r): 15.4 feet Thickness (b): 58.1 feet
Discharge Rate: 362.9 ± 5.08 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.0173	0.600E+05	0.142E+08
0.05	0.4316	0.200E+02	0.474E+04
0.10	0.9282	0.100E+02	0.237E+04
0.15	1.2682	0.667E+01	0.158E+04
0.20	1.4937	0.500E+01	0.119E+04
0.25	1.6510	0.400E+01	0.949E+03
0.30	1.8302	0.333E+01	0.790E+03
0.35	1.9977	0.286E+01	0.678E+03
0.40	2.1924	0.250E+01	0.593E+03
0.50	2.5246	0.200E+01	0.474E+03
0.60	2.7614	0.167E+01	0.395E+03
0.70	2.9534	0.143E+01	0.339E+03
0.80	3.1556	0.125E+01	0.296E+03
0.90	3.3189	0.111E+01	0.264E+03
1.00	3.4980	0.100E+01	0.237E+03
1.50	4.2881	0.667E+00	0.158E+03
2.00	4.7024	0.500E+00	0.119E+03
2.50	4.9660	0.400E+00	0.949E+02
3.00	5.1498	0.333E+00	0.791E+02
3.50	5.2806	0.286E+00	0.678E+02
4.00	5.3589	0.250E+00	0.593E+02
4.50	5.4371	0.222E+00	0.527E+02
5.00	5.5151	0.200E+00	0.474E+02
6.00	5.6449	0.167E+00	0.395E+02
7.00	5.7071	0.143E+00	0.339E+02
8.00	5.7588	0.125E+00	0.296E+02
9.00	5.8105	0.111E+00	0.264E+02
10.00	5.8622	0.100E+00	0.237E+02
11.00	5.8518	0.909E-01	0.216E+02
12.00	5.8622	0.833E-01	0.198E+02
13.00	5.8880	0.769E-01	0.182E+02
14.00	5.9550	0.714E-01	0.169E+02
15.00	5.9807	0.667E-01	0.158E+02
16.00	6.0064	0.625E-01	0.148E+02
17.00	6.0167	0.588E-01	0.140E+02
18.00	6.0167	0.556E-01	0.132E+02
19.00	6.0322	0.526E-01	0.125E+02
20.00	6.0064	0.500E-01	0.119E+02
25.00	6.0936	0.400E-01	0.949E+01
30.00	6.1451	0.333E-01	0.791E+01
35.00	6.1964	0.286E-01	0.678E+01
40.00	6.2374	0.250E-01	0.593E+01
45.00	6.2629	0.222E-01	0.527E+01
50.00	6.2732	0.200E-01	0.474E+01

SITE #1
STAGE 2
OW-1 DATA
1 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-1 (5-1) PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
55.00	6.2885	0.182E-01	0.431E+01
60.00	6.3141	0.167E-01	0.395E+01
65.00	6.3396	0.154E-01	0.365E+01
70.00	6.3652	0.143E-01	0.339E+01
75.00	6.3907	0.133E-01	0.316E+01
80.00	6.4009	0.125E-01	0.296E+01
100.00	6.4518	0.100E-01	0.237E+01
120.00	6.5180	0.833E-02	0.198E+01
140.00	6.5790	0.714E-02	0.169E+01
160.00	6.6298	0.625E-02	0.148E+01
180.00	6.6805	0.556E-02	0.132E+01
200.00	6.7211	0.500E-02	0.119E+01
220.00	6.7565	0.455E-02	0.108E+01
240.00	6.8071	0.417E-02	0.988E+00
260.00	6.8576	0.385E-02	0.912E+00
280.00	6.8828	0.357E-02	0.847E+00
300.00	6.9987	0.333E-02	0.791E+00
320.00	7.0239	0.313E-02	0.741E+00
340.00	7.0591	0.294E-02	0.698E+00
360.00	7.0992	0.278E-02	0.659E+00
380.00	7.0591	0.263E-02	0.624E+00
400.00	7.1595	0.250E-02	0.593E+00
420.00	7.2346	0.238E-02	0.565E+00
440.00	7.2596	0.227E-02	0.539E+00
460.00	7.2996	0.217E-02	0.516E+00
480.00	7.3246	0.208E-02	0.494E+00
500.00	7.3596	0.200E-02	0.474E+00
520.00	7.3745	0.192E-02	0.456E+00
540.00	7.3995	0.185E-02	0.439E+00
560.00	7.4244	0.179E-02	0.423E+00
580.00	7.4493	0.172E-02	0.409E+00
600.00	7.4593	0.167E-02	0.395E+00
620.00	7.4842	0.161E-02	0.383E+00
640.00	7.5090	0.156E-02	0.371E+00
660.00	7.5240	0.152E-02	0.359E+00
680.00	7.5240	0.147E-02	0.349E+00
700.00	7.5090	0.143E-02	0.339E+00
720.00	7.5090	0.139E-02	0.329E+00
740.00	7.4344	0.135E-02	0.320E+00
760.00	7.4344	0.132E-02	0.312E+00
780.00	7.4593	0.128E-02	0.304E+00
800.00	7.4593	0.125E-02	0.296E+00
820.00	7.4842	0.122E-02	0.289E+00
840.00	7.5090	0.119E-02	0.282E+00

SITE #1
 STAGE 2
 OW-1 DATA
 2 OF 5

Unconfined Aquifer Reduced Drawdown Data
Well: OW-1 (5-1)

PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
860.00	7.5240	0.116E-02	0.276E+00
880.00	7.5488	0.114E-02	0.269E+00
900.00	7.5588	0.111E-02	0.264E+00
920.00	7.5737	0.109E-02	0.258E+00
940.00	7.5985	0.106E-02	0.252E+00
960.00	7.6084	0.104E-02	0.247E+00
980.00	7.6332	0.102E-02	0.242E+00
1000.00	7.6481	0.100E-02	0.237E+00
1020.00	7.6580	0.980E-03	0.233E+00
1040.00	7.6828	0.962E-03	0.228E+00
1060.00	7.6976	0.943E-03	0.224E+00
1080.00	7.7075	0.926E-03	0.220E+00
1100.00	7.7323	0.909E-03	0.216E+00
1120.00	7.7471	0.893E-03	0.212E+00
1140.00	7.7570	0.877E-03	0.208E+00
1160.00	7.7570	0.862E-03	0.204E+00
1180.00	7.7471	0.847E-03	0.201E+00
1200.00	7.6580	0.833E-03	0.198E+00
1220.00	7.7570	0.820E-03	0.194E+00
1240.00	7.7570	0.806E-03	0.191E+00
1260.00	7.7570	0.794E-03	0.188E+00
1280.00	7.7719	0.781E-03	0.185E+00
1300.00	7.7817	0.769E-03	0.182E+00
1320.00	7.7817	0.758E-03	0.180E+00
1340.00	7.8065	0.746E-03	0.177E+00
1360.00	7.8065	0.735E-03	0.174E+00
1380.00	7.8311	0.725E-03	0.172E+00
1400.00	7.8311	0.714E-03	0.169E+00
1420.00	7.8311	0.704E-03	0.167E+00
1440.00	7.8459	0.694E-03	0.165E+00
1460.00	7.8459	0.685E-03	0.162E+00
1480.00	7.8558	0.676E-03	0.160E+00
1500.00	7.8706	0.667E-03	0.158E+00
1520.00	7.8805	0.658E-03	0.156E+00
1540.00	7.8953	0.649E-03	0.154E+00
1560.00	7.9051	0.641E-03	0.152E+00
1580.00	7.9544	0.633E-03	0.150E+00
1600.00	7.9691	0.625E-03	0.148E+00
1620.00	7.9937	0.617E-03	0.146E+00
1640.00	8.0036	0.610E-03	0.145E+00
1660.00	8.0183	0.602E-03	0.143E+00
1680.00	8.0281	0.595E-03	0.141E+00
1700.00	8.0429	0.588E-03	0.140E+00
1720.00	8.0527	0.581E-03	0.138E+00

SITE #1
STAGE 2
OW-1 DATA
3 OF 5

Unconfined Aquifer Reduced Drawdown Data
Well: OW-1 (5-1)

PAGE 4

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
1740.00	8.0674	0.575E-03	0.136E+00
1760.00	8.0773	0.568E-03	0.135E+00
1780.00	8.0920	0.562E-03	0.133E+00
1800.00	8.1018	0.556E-03	0.132E+00
1820.00	8.1410	0.549E-03	0.130E+00
1840.00	8.1410	0.543E-03	0.129E+00
1860.00	8.1508	0.538E-03	0.128E+00
1880.00	8.1753	0.532E-03	0.126E+00
1900.00	8.1998	0.526E-03	0.125E+00
1920.00	8.2145	0.521E-03	0.124E+00
1940.00	8.2145	0.515E-03	0.122E+00
1960.00	8.2389	0.510E-03	0.121E+00
1980.00	8.2487	0.505E-03	0.120E+00
2000.00	8.2731	0.500E-03	0.119E+00
2020.00	8.2878	0.495E-03	0.117E+00
2040.00	8.2975	0.490E-03	0.116E+00
2060.00	8.3122	0.485E-03	0.115E+00
2080.00	8.2975	0.481E-03	0.114E+00
2100.00	8.3219	0.476E-03	0.113E+00
2120.00	8.3366	0.472E-03	0.112E+00
2140.00	8.3463	0.467E-03	0.111E+00
2160.00	8.3610	0.463E-03	0.110E+00
2180.00	8.3707	0.459E-03	0.109E+00
2200.00	8.3707	0.455E-03	0.108E+00
2220.00	8.3853	0.450E-03	0.107E+00
2240.00	8.3951	0.446E-03	0.106E+00
2260.00	8.4097	0.442E-03	0.105E+00
2280.00	8.4194	0.439E-03	0.104E+00
2300.00	8.4340	0.435E-03	0.103E+00
2320.00	8.4437	0.431E-03	0.102E+00
2340.00	8.4437	0.427E-03	0.101E+00
2360.00	8.4583	0.424E-03	0.100E+00
2380.00	8.4681	0.420E-03	0.996E-01
2400.00	8.4826	0.417E-03	0.988E-01
2420.00	8.4826	0.413E-03	0.980E-01
2440.00	8.5069	0.410E-03	0.972E-01
2460.00	8.5069	0.407E-03	0.964E-01
2480.00	8.5069	0.403E-03	0.956E-01
2500.00	8.5166	0.400E-03	0.949E-01
2520.00	8.5312	0.397E-03	0.941E-01
2540.00	8.5409	0.394E-03	0.934E-01
2560.00	8.5409	0.391E-03	0.926E-01
2580.00	8.5652	0.388E-03	0.919E-01
2600.00	8.5652	0.385E-03	0.912E-01

SITE #1
STAGE 2
OW-1 DATA
4 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-1 (5-1) PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2620.00	8.5652	0.382E-03	0.905E-01
2640.00	8.5894	0.379E-03	0.898E-01
2660.00	8.5797	0.376E-03	0.892E-01
2680.00	8.5894	0.373E-03	0.885E-01
2700.00	8.5894	0.370E-03	0.878E-01
2720.00	8.5894	0.368E-03	0.872E-01
2740.00	8.6040	0.365E-03	0.866E-01
2760.00	8.6040	0.362E-03	0.859E-01
2780.00	8.6137	0.360E-03	0.853E-01
2800.00	8.6282	0.357E-03	0.847E-01
2820.00	8.6282	0.355E-03	0.841E-01
2840.00	8.6137	0.352E-03	0.835E-01
2860.00	8.6040	0.350E-03	0.829E-01
2880.00	8.5409	0.347E-03	0.823E-01
2900.00	8.5797	0.345E-03	0.818E-01
2920.00	8.5894	0.342E-03	0.812E-01
2940.00	8.5894	0.340E-03	0.807E-01
2960.00	8.6137	0.338E-03	0.801E-01
2980.00	8.6137	0.336E-03	0.796E-01
2999.00	8.5652	0.333E-03	0.791E-01

SITE #1
 STAGE 2
 OW-1 DATA
 5 OF 5

Unconfined Aquifer Reduced Drawdown Data
Well: OW-2

Distance (r): 61.6 feet Thickness (b): 59.7 feet
Discharge Rate: 362.9 ± 5.08 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.0173	0.600E+05	0.228E+09
0.05	0.0000	0.200E+02	0.759E+05
0.10	0.0289	0.100E+02	0.379E+05
0.15	0.0866	0.667E+01	0.253E+05
0.20	0.1269	0.500E+01	0.190E+05
0.25	0.1730	0.400E+01	0.152E+05
0.30	0.2133	0.333E+01	0.126E+05
0.35	0.2709	0.286E+01	0.108E+05
0.40	0.3169	0.250E+01	0.949E+04
0.50	0.4144	0.200E+01	0.759E+04
0.60	0.5176	0.167E+01	0.632E+04
0.70	0.6034	0.143E+01	0.542E+04
0.80	0.7005	0.125E+01	0.474E+04
0.90	0.7747	0.111E+01	0.422E+04
1.00	0.8601	0.100E+01	0.379E+04
1.50	1.2290	0.667E+00	0.253E+04
2.00	1.5111	0.500E+00	0.190E+04
2.50	1.7358	0.400E+00	0.152E+04
3.00	1.9037	0.333E+00	0.126E+04
3.50	2.0154	0.286E+00	0.108E+04
4.00	2.1268	0.250E+00	0.949E+03
4.50	2.1936	0.222E+00	0.843E+03
5.00	2.2658	0.200E+00	0.759E+03
6.00	2.3878	0.167E+00	0.632E+03
7.00	2.4709	0.143E+00	0.542E+03
8.00	2.5538	0.125E+00	0.474E+03
9.00	2.6090	0.111E+00	0.422E+03
10.00	2.6641	0.100E+00	0.379E+03
11.00	2.6807	0.909E-01	0.345E+03
12.00	2.7082	0.833E-01	0.316E+03
13.00	2.7192	0.769E-01	0.292E+03
14.00	2.7743	0.714E-01	0.271E+03
15.00	2.8018	0.667E-01	0.253E+03
16.00	2.8293	0.625E-01	0.237E+03
17.00	2.8567	0.588E-01	0.223E+03
18.00	2.8732	0.556E-01	0.211E+03
19.00	2.8842	0.526E-01	0.200E+03
20.00	2.8732	0.500E-01	0.190E+03
25.00	2.9555	0.400E-01	0.152E+03
30.00	3.0213	0.333E-01	0.126E+03
35.00	3.0651	0.286E-01	0.108E+03
40.00	3.1197	0.250E-01	0.949E+02
45.00	3.1471	0.222E-01	0.843E+02
50.00	3.1580	0.200E-01	0.759E+02

SITE #1
STAGE 2
OW-2 DATA
1 of 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-2 PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
55.00	3.1853	0.182E-01	0.690E+02
60.00	3.2126	0.167E-01	0.632E+02
65.00	3.2399	0.154E-01	0.584E+02
70.00	3.2671	0.143E-01	0.542E+02
75.00	3.2944	0.133E-01	0.506E+02
80.00	3.3216	0.125E-01	0.474E+02
100.00	3.3924	0.100E-01	0.379E+02
120.00	3.4576	0.833E-02	0.316E+02
140.00	3.5281	0.714E-02	0.271E+02
160.00	3.5932	0.625E-02	0.237E+02
180.00	3.6636	0.556E-02	0.211E+02
200.00	3.7014	0.500E-02	0.190E+02
220.00	3.7284	0.455E-02	0.172E+02
240.00	3.7824	0.417E-02	0.158E+02
260.00	3.8094	0.385E-02	0.146E+02
280.00	3.8364	0.357E-02	0.136E+02
300.00	3.9065	0.333E-02	0.126E+02
320.00	3.9441	0.313E-02	0.119E+02
340.00	3.9872	0.294E-02	0.112E+02
360.00	4.0409	0.278E-02	0.105E+02
380.00	4.0140	0.263E-02	0.999E+01
400.00	4.1053	0.250E-02	0.949E+01
420.00	4.1750	0.238E-02	0.903E+01
440.00	4.2018	0.227E-02	0.862E+01
460.00	4.2392	0.217E-02	0.825E+01
480.00	4.2660	0.208E-02	0.791E+01
500.00	4.3088	0.200E-02	0.759E+01
520.00	4.3355	0.192E-02	0.730E+01
540.00	4.3622	0.185E-02	0.703E+01
560.00	4.3995	0.179E-02	0.678E+01
580.00	4.4262	0.172E-02	0.654E+01
600.00	4.4528	0.167E-02	0.632E+01
620.00	4.4794	0.161E-02	0.612E+01
640.00	4.5061	0.156E-02	0.593E+01
660.00	4.5327	0.152E-02	0.575E+01
680.00	4.5593	0.147E-02	0.558E+01
700.00	4.5752	0.143E-02	0.542E+01
720.00	4.6124	0.139E-02	0.527E+01
740.00	4.6283	0.135E-02	0.513E+01
760.00	4.6549	0.132E-02	0.499E+01
780.00	4.6920	0.128E-02	0.486E+01
800.00	4.6920	0.125E-02	0.474E+01
820.00	4.7344	0.122E-02	0.463E+01
840.00	4.7450	0.119E-02	0.452E+01

SITE #1
 STAGE 2
 OW-2 DATA
 2 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-2 PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
860.00	4.7715	0.116E-02	0.441E+01
880.00	4.7874	0.114E-02	0.431E+01
900.00	4.8138	0.111E-02	0.422E+01
920.00	4.8244	0.109E-02	0.412E+01
940.00	4.8508	0.106E-02	0.404E+01
960.00	4.8667	0.104E-02	0.395E+01
980.00	4.8931	0.102E-02	0.387E+01
1000.00	4.9195	0.100E-02	0.379E+01
1020.00	4.9301	0.980E-03	0.372E+01
1040.00	4.9565	0.962E-03	0.365E+01
1060.00	4.9723	0.943E-03	0.358E+01
1080.00	4.9828	0.926E-03	0.351E+01
1100.00	5.0092	0.909E-03	0.345E+01
1120.00	5.0250	0.893E-03	0.339E+01
1140.00	5.0513	0.877E-03	0.333E+01
1160.00	5.0776	0.862E-03	0.327E+01
1180.00	5.0776	0.847E-03	0.322E+01
1200.00	4.8931	0.833E-03	0.316E+01
1220.00	4.9986	0.820E-03	0.311E+01
1240.00	5.0882	0.806E-03	0.306E+01
1260.00	5.1145	0.794E-03	0.301E+01
1280.00	5.1407	0.781E-03	0.296E+01
1300.00	5.1670	0.769E-03	0.292E+01
1320.00	5.1828	0.758E-03	0.287E+01
1340.00	5.1933	0.746E-03	0.283E+01
1360.00	5.2090	0.735E-03	0.279E+01
1380.00	5.2195	0.725E-03	0.275E+01
1400.00	5.2195	0.714E-03	0.271E+01
1420.00	5.2195	0.704E-03	0.267E+01
1440.00	5.2352	0.694E-03	0.264E+01
1460.00	5.2352	0.685E-03	0.260E+01
1480.00	5.2457	0.676E-03	0.256E+01
1500.00	5.2457	0.667E-03	0.253E+01
1520.00	5.2615	0.658E-03	0.250E+01
1540.00	5.2877	0.649E-03	0.246E+01
1560.00	5.2981	0.641E-03	0.243E+01
1580.00	5.3243	0.633E-03	0.240E+01
1600.00	5.3505	0.625E-03	0.237E+01
1620.00	5.3662	0.617E-03	0.234E+01
1640.00	5.3767	0.610E-03	0.231E+01
1660.00	5.3767	0.602E-03	0.229E+01
1680.00	5.3767	0.595E-03	0.226E+01
1700.00	5.3767	0.588E-03	0.223E+01
1720.00	5.3767	0.581E-03	0.221E+01

SITE #1
 STAGE 2
 OW-2 DATA
 3 of 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
1740.00	5.3924	0.575E-03	0.218E+01
1760.00	5.4028	0.568E-03	0.216E+01
1780.00	5.4185	0.562E-03	0.213E+01
1800.00	5.4028	0.556E-03	0.211E+01
1820.00	5.4185	0.549E-03	0.208E+01
1840.00	5.4289	0.543E-03	0.206E+01
1860.00	5.4446	0.538E-03	0.204E+01
1880.00	5.4707	0.532E-03	0.202E+01
1900.00	5.4812	0.526E-03	0.200E+01
1920.00	5.4968	0.521E-03	0.198E+01
1940.00	5.5072	0.515E-03	0.196E+01
1960.00	5.5229	0.510E-03	0.194E+01
1980.00	5.5229	0.505E-03	0.192E+01
2000.00	5.5333	0.500E-03	0.190E+01
2020.00	5.5333	0.495E-03	0.188E+01
2040.00	5.5490	0.490E-03	0.186E+01
2060.00	5.5594	0.485E-03	0.184E+01
2080.00	5.5750	0.481E-03	0.182E+01
2100.00	5.5854	0.476E-03	0.181E+01
2120.00	5.6010	0.472E-03	0.179E+01
2140.00	5.6115	0.467E-03	0.177E+01
2160.00	5.6271	0.463E-03	0.176E+01
2180.00	5.6375	0.459E-03	0.174E+01
2200.00	5.6375	0.455E-03	0.172E+01
2220.00	5.6531	0.450E-03	0.171E+01
2240.00	5.6635	0.446E-03	0.169E+01
2260.00	5.6791	0.442E-03	0.168E+01
2280.00	5.6895	0.439E-03	0.166E+01
2300.00	5.7051	0.435E-03	0.165E+01
2320.00	5.7154	0.431E-03	0.164E+01
2340.00	5.7154	0.427E-03	0.162E+01
2360.00	5.7310	0.424E-03	0.161E+01
2380.00	5.7414	0.420E-03	0.159E+01
2400.00	5.7570	0.417E-03	0.158E+01
2420.00	5.7674	0.413E-03	0.157E+01
2440.00	5.7829	0.410E-03	0.156E+01
2460.00	5.7933	0.407E-03	0.154E+01
2480.00	5.7933	0.403E-03	0.153E+01
2500.00	5.8088	0.400E-03	0.152E+01
2520.00	5.8192	0.397E-03	0.151E+01
2540.00	5.8348	0.394E-03	0.149E+01
2560.00	5.8348	0.391E-03	0.148E+01
2580.00	5.8451	0.388E-03	0.147E+01
2600.00	5.8607	0.385E-03	0.146E+01

SITE #1
 STAGE 2
 OW-2 DATA
 4 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-2 PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2620.00	5.8607	0.382E-03	0.145E+01
2640.00	5.8710	0.379E-03	0.144E+01
2660.00	5.8865	0.376E-03	0.143E+01
2680.00	5.8865	0.373E-03	0.142E+01
2700.00	5.8969	0.370E-03	0.141E+01
2720.00	5.9124	0.368E-03	0.140E+01
2740.00	5.9124	0.365E-03	0.138E+01
2760.00	5.9228	0.362E-03	0.137E+01
2780.00	5.9228	0.360E-03	0.136E+01
2800.00	5.9383	0.357E-03	0.136E+01
2820.00	5.9383	0.355E-03	0.135E+01
2840.00	5.9228	0.352E-03	0.134E+01
2860.00	5.9124	0.350E-03	0.133E+01
2880.00	5.8451	0.347E-03	0.132E+01
2900.00	5.7829	0.345E-03	0.131E+01
2920.00	5.7829	0.342E-03	0.130E+01
2940.00	5.7933	0.340E-03	0.129E+01
2960.00	5.8969	0.338E-03	0.128E+01
2980.00	5.9124	0.336E-03	0.127E+01
2999.00	5.8607	0.333E-03	0.127E+01

SITE #1
 STAGE 2
 OW-2 DATA
 5 OF 5

Unconfined Aquifer Reduced Drawdown Data

Well: ~~PW-1B~~ OW-3

Distance (r): ~~0.9~~ ^{119.5} feet Thickness (b): ~~66.4~~ ^{64.0} feet
 Discharge Rate: 362.9 ± 5.08 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.0173	0.600E+05	0.857E+09
0.05	0.0000	0.200E+02	0.286E+06
0.10	0.0000	0.100E+02	0.143E+06
0.15	0.0116	0.667E+01	0.952E+05
0.20	0.0289	0.500E+01	0.714E+05
0.25	0.0404	0.400E+01	0.571E+05
0.30	0.0577	0.333E+01	0.476E+05
0.35	0.0693	0.286E+01	0.408E+05
0.40	0.0866	0.250E+01	0.357E+05
0.50	0.1270	0.200E+01	0.286E+05
0.60	0.1731	0.167E+01	0.238E+05
0.70	0.2134	0.143E+01	0.204E+05
0.80	0.2594	0.125E+01	0.178E+05
0.90	0.2882	0.111E+01	0.159E+05
1.00	0.3284	0.100E+01	0.143E+05
1.50	0.5464	0.667E+00	0.952E+04
2.00	0.7180	0.500E+00	0.714E+04
2.50	0.8720	0.400E+00	0.571E+04
3.00	1.0142	0.333E+00	0.476E+04
3.50	1.1278	0.286E+00	0.408E+04
4.00	1.2298	0.250E+00	0.357E+04
4.50	1.3147	0.222E+00	0.317E+04
5.00	1.3430	0.200E+00	0.286E+04
6.00	1.5237	0.167E+00	0.238E+04
7.00	1.6363	0.143E+00	0.204E+04
8.00	1.7375	0.125E+00	0.179E+04
9.00	1.8049	0.111E+00	0.159E+04
10.00	1.8778	0.100E+00	0.143E+04
11.00	1.8890	0.909E-01	0.130E+04
12.00	1.9730	0.833E-01	0.119E+04
13.00	1.9730	0.769E-01	0.110E+04
14.00	2.0289	0.714E-01	0.102E+04
15.00	2.0736	0.667E-01	0.952E+03
16.00	2.1015	0.625E-01	0.893E+03
17.00	2.1294	0.588E-01	0.840E+03
18.00	2.1573	0.556E-01	0.793E+03
19.00	2.1685	0.526E-01	0.752E+03
20.00	2.1406	0.500E-01	0.714E+03
25.00	2.2521	0.400E-01	0.571E+03
30.00	2.3244	0.333E-01	0.476E+03
35.00	2.3523	0.286E-01	0.408E+03
40.00	2.4078	0.250E-01	0.357E+03
45.00	2.4467	0.222E-01	0.317E+03
50.00	2.4467	0.200E-01	0.286E+03

SITE #1
 STAGE 2
 OW-3 DATA
 1 OF 5

Unconfined Aquifer Reduced Drawdown Data
Well: OW-3 PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
55.00	2.4744	0.182E-01	0.260E+03
60.00	2.5022	0.167E-01	0.238E+03
65.00	2.5299	0.154E-01	0.220E+03
70.00	2.5576	0.143E-01	0.204E+03
75.00	2.5853	0.133E-01	0.190E+03
80.00	2.6019	0.125E-01	0.179E+03
100.00	2.6683	0.100E-01	0.143E+03
120.00	2.7236	0.833E-02	0.119E+03
140.00	2.8064	0.714E-02	0.102E+03
160.00	2.8616	0.625E-02	0.893E+02
180.00	2.9332	0.556E-02	0.793E+02
200.00	2.9607	0.500E-02	0.714E+02
220.00	2.9992	0.455E-02	0.649E+02
240.00	3.0542	0.417E-02	0.595E+02
260.00	3.1091	0.385E-02	0.549E+02
280.00	3.1530	0.357E-02	0.510E+02
300.00	3.2078	0.333E-02	0.476E+02
320.00	3.2461	0.313E-02	0.446E+02
340.00	3.3008	0.294E-02	0.420E+02
360.00	3.3446	0.278E-02	0.397E+02
380.00	3.3173	0.263E-02	0.376E+02
400.00	3.4101	0.250E-02	0.357E+02
420.00	3.4647	0.238E-02	0.340E+02
440.00	3.5083	0.227E-02	0.325E+02
460.00	3.5465	0.217E-02	0.310E+02
480.00	3.5737	0.208E-02	0.298E+02
500.00	3.6172	0.200E-02	0.286E+02
520.00	3.6281	0.192E-02	0.275E+02
540.00	3.6553	0.185E-02	0.264E+02
560.00	3.6825	0.179E-02	0.255E+02
580.00	3.7096	0.172E-02	0.246E+02
600.00	3.7368	0.167E-02	0.238E+02
620.00	3.7639	0.161E-02	0.230E+02
640.00	3.7911	0.156E-02	0.223E+02
660.00	3.8182	0.152E-02	0.216E+02
680.00	3.8453	0.147E-02	0.210E+02
700.00	3.8615	0.143E-02	0.204E+02
720.00	3.8886	0.139E-02	0.198E+02
740.00	3.9157	0.135E-02	0.193E+02
760.00	3.9427	0.132E-02	0.188E+02
780.00	3.9535	0.128E-02	0.183E+02
800.00	3.9697	0.125E-02	0.179E+02
820.00	3.9968	0.122E-02	0.174E+02
840.00	4.0238	0.119E-02	0.170E+02

SITE #1
STAGE 2
OW-3 DATA
2 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-3 PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
860.00	4.0346	0.116E-02	0.166E+02
880.00	4.0508	0.114E-02	0.162E+02
900.00	4.0616	0.111E-02	0.159E+02
920.00	4.0885	0.109E-02	0.155E+02
940.00	4.1155	0.106E-02	0.152E+02
960.00	4.1317	0.104E-02	0.149E+02
980.00	4.1586	0.102E-02	0.146E+02
1000.00	4.1694	0.100E-02	0.143E+02
1020.00	4.1963	0.980E-03	0.140E+02
1040.00	4.2125	0.962E-03	0.137E+02
1060.00	4.2233	0.943E-03	0.135E+02
1080.00	4.2394	0.926E-03	0.132E+02
1100.00	4.2770	0.909E-03	0.130E+02
1120.00	4.2932	0.893E-03	0.128E+02
1140.00	4.3200	0.877E-03	0.125E+02
1160.00	4.3469	0.862E-03	0.123E+02
1180.00	4.3469	0.847E-03	0.121E+02
1200.00	4.2663	0.833E-03	0.119E+02
1220.00	4.3845	0.820E-03	0.117E+02
1240.00	4.3845	0.806E-03	0.115E+02
1260.00	4.4113	0.794E-03	0.113E+02
1280.00	4.4113	0.781E-03	0.112E+02
1300.00	4.4381	0.769E-03	0.110E+02
1320.00	4.4542	0.758E-03	0.108E+02
1340.00	4.4649	0.746E-03	0.107E+02
1360.00	4.4649	0.735E-03	0.105E+02
1380.00	4.4917	0.725E-03	0.103E+02
1400.00	4.4810	0.714E-03	0.102E+02
1420.00	4.4810	0.704E-03	0.101E+02
1440.00	4.4917	0.694E-03	0.992E+01
1460.00	4.4917	0.685E-03	0.978E+01
1480.00	4.5077	0.676E-03	0.965E+01
1500.00	4.5077	0.667E-03	0.952E+01
1520.00	4.5345	0.658E-03	0.939E+01
1540.00	4.5452	0.649E-03	0.927E+01
1560.00	4.5613	0.641E-03	0.915E+01
1580.00	4.5880	0.633E-03	0.904E+01
1600.00	4.6147	0.625E-03	0.893E+01
1620.00	4.6254	0.617E-03	0.881E+01
1640.00	4.6414	0.610E-03	0.871E+01
1660.00	4.6521	0.602E-03	0.860E+01
1680.00	4.6521	0.595E-03	0.850E+01
1700.00	4.6788	0.588E-03	0.840E+01
1720.00	4.6788	0.581E-03	0.830E+01

SITE #1
 STAGE 2
 OW-3 DATA
 3 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-3 PAGE 4

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
1740.00	4.6948	0.575E-03	0.821E+01
1760.00	4.7215	0.568E-03	0.811E+01
1780.00	4.7321	0.562E-03	0.802E+01
1800.00	4.7481	0.556E-03	0.793E+01
1820.00	4.7588	0.549E-03	0.785E+01
1840.00	4.7748	0.543E-03	0.776E+01
1860.00	4.8014	0.538E-03	0.768E+01
1880.00	4.8121	0.532E-03	0.760E+01
1900.00	4.8280	0.526E-03	0.752E+01
1920.00	4.8387	0.521E-03	0.744E+01
1940.00	4.8546	0.515E-03	0.736E+01
1960.00	4.8546	0.510E-03	0.729E+01
1980.00	4.8653	0.505E-03	0.721E+01
2000.00	4.8812	0.500E-03	0.714E+01
2020.00	4.8812	0.495E-03	0.707E+01
2040.00	4.8919	0.490E-03	0.700E+01
2060.00	4.9078	0.485E-03	0.693E+01
2080.00	4.9185	0.481E-03	0.687E+01
2100.00	4.9344	0.476E-03	0.680E+01
2120.00	4.9344	0.472E-03	0.674E+01
2140.00	4.9609	0.467E-03	0.667E+01
2160.00	4.9716	0.463E-03	0.661E+01
2180.00	4.9875	0.459E-03	0.655E+01
2200.00	4.9875	0.455E-03	0.649E+01
2220.00	4.9981	0.450E-03	0.643E+01
2240.00	5.0140	0.446E-03	0.638E+01
2260.00	5.0246	0.442E-03	0.632E+01
2280.00	5.0405	0.439E-03	0.626E+01
2300.00	5.0405	0.435E-03	0.621E+01
2320.00	5.0511	0.431E-03	0.616E+01
2340.00	5.0511	0.427E-03	0.610E+01
2360.00	5.0670	0.424E-03	0.605E+01
2380.00	5.0776	0.420E-03	0.600E+01
2400.00	5.0935	0.417E-03	0.595E+01
2420.00	5.0935	0.413E-03	0.590E+01
2440.00	5.1041	0.410E-03	0.585E+01
2460.00	5.1200	0.407E-03	0.580E+01
2480.00	5.1200	0.403E-03	0.576E+01
2500.00	5.1306	0.400E-03	0.571E+01
2520.00	5.1465	0.397E-03	0.567E+01
2540.00	5.1729	0.394E-03	0.562E+01
2560.00	5.1729	0.391E-03	0.558E+01
2580.00	5.1835	0.388E-03	0.553E+01
2600.00	5.1994	0.385E-03	0.549E+01

SITE #1
 STAGE 2
 OW-3 DATA
 4 OF 5

Unconfined Aquifer Reduced Drawdown Data
 Well: OW-3 PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2620.00	5.1994	0.382E-03	0.545E+01
2640.00	5.1994	0.379E-03	0.541E+01
2660.00	5.1994	0.376E-03	0.537E+01
2680.00	5.2099	0.373E-03	0.533E+01
2700.00	5.2099	0.370E-03	0.529E+01
2720.00	5.2099	0.368E-03	0.525E+01
2740.00	5.2099	0.365E-03	0.521E+01
2760.00	5.2099	0.362E-03	0.517E+01
2780.00	5.2099	0.360E-03	0.514E+01
2800.00	5.1994	0.357E-03	0.510E+01
2820.00	5.1994	0.355E-03	0.506E+01
2840.00	5.1729	0.352E-03	0.503E+01
2860.00	5.1570	0.350E-03	0.499E+01
2880.00	5.1041	0.347E-03	0.496E+01
2900.00	5.1465	0.345E-03	0.492E+01
2920.00	5.1465	0.342E-03	0.489E+01
2940.00	5.1729	0.340E-03	0.486E+01
2960.00	5.1729	0.338E-03	0.482E+01
2980.00	5.1729	0.336E-03	0.479E+01
2999.00	5.1200	0.333E-03	0.476E+01

SITE #1
 STAGE 2
 OW-3 DATA
 5 OF 5

PUMP TEST RECOVERY DATA

Second Test at Union Station - Location 1

Discharge Rate = 362.9 +/- 5.08 GPM

Discharge Duration = 3000 minutes

Elapsed Recovery Time (mins.)	Elapsed Time Ratio	Pumping	Observe	Observe	Observe
		Well PW-1B Residual Drawdown (feet) Channel 1	Well OW-1(5-1) Residual Drawdown (feet) Channel 2	Well OW-2 Residual Drawdown (feet) Channel 3	Well OW-3 Residual Drawdown (feet) Channel 4
0.35	8572.02	1 16.15	2 7.98	3 6.08	4 5.34
0.40	7500.69	1 15.36	2 7.81	3 6.04	4 5.33
0.50	6000.80	1 13.90	2 7.48	3 5.95	4 5.30
0.60	5000.86	1 12.82	2 7.20	3 5.86	4 5.27
0.70	4286.61	1 11.78	2 6.93	3 5.78	4 5.23
0.80	3750.92	1 10.78	2 6.68	3 5.69	4 5.20
0.90	3334.27	1 10.11	2 6.45	3 5.59	4 5.15
1.00	3000.95	1 9.65	2 6.28	3 5.50	4 5.11
1.50	2000.98	1 7.66	2 5.57	3 5.12	4 4.91
2.00	1500.99	1 6.50	2 5.08	3 4.83	4 4.71
2.50	1200.99	1 6.04	2 4.81	3 4.62	4 4.55
3.00	1000.99	1 5.70	2 4.59	3 4.46	4 4.42
3.50	858.14	1 5.46	2 4.45	3 4.33	4 4.30
4.00	751.00	1 5.29	2 4.33	3 4.23	4 4.20
4.50	667.66	1 5.18	2 4.26	3 4.16	4 4.13
5.00	601.00	1 4.94	2 4.08	3 3.99	4 3.88
6.00	501.00	1 4.85	2 4.05	3 3.93	4 3.84
7.00	429.57	1 4.79	2 4.00	3 3.87	4 3.78
8.00	376.00	1 4.77	2 3.96	3 3.81	4 3.74
9.00	334.33	1 4.68	2 3.91	3 3.77	4 3.68
10.00	301.00	1 4.62	2 3.88	3 3.74	4 3.64
11.00	273.73	1 4.56	2 3.84	3 3.70	4 3.58
12.00	251.00	1 4.54	2 3.82	3 3.68	4 3.55
13.00	231.77	1 4.51	2 3.79	3 3.65	4 3.52
14.00	215.29	1 4.48	2 3.78	3 3.64	4 3.51
15.00	201.00	1 4.45	2 3.74	3 3.61	4 3.48
16.00	188.50	1 4.42	2 3.73	3 3.59	4 3.47
17.00	177.47	1 4.42	2 3.70	3 3.56	4 3.44
18.00	167.67	1 4.39	2 3.68	3 3.55	4 3.41
19.00	158.89	1 4.37	2 3.67	3 3.54	4 3.41
24.00	126.00	1 4.25	2 3.58	3 3.45	4 3.30
29.00	104.45	1 4.14	2 3.51	3 3.39	4 3.25
34.00	89.24	1 4.10	2 3.45	3 3.35	4 3.21
39.00	77.92	1 4.02	2 3.39	3 3.29	4 3.15
44.00	69.18	1 3.96	2 3.35	3 3.25	4 3.10
49.00	62.22	1 3.93	2 3.29	3 3.22	4 3.06
54.00	56.56	1 3.87	2 3.25	3 3.18	4 3.02
59.00	51.85	1 3.85	2 3.21	3 3.15	4 2.99
64.00	47.88	1 3.81	2 3.18	3 3.12	4 2.96
69.00	44.48	1 3.75	2 3.13	3 3.09	4 2.93
74.00	41.54	1 3.73	2 3.10	3 3.06	4 2.90
79.00	38.97	1 3.70	2 3.07	3 3.03	4 2.87

PUMP TEST RECOVERY DATA
 Union Station Location 1, Test 2 (Well PW-1B). 2

Elapsed Recovery Time (mins.)	Elapsed Time Ratio	Pumping	Observe	Observe	Observe				
		Well number Residual Drawdown (feet) Channel 1	Well number Residual Drawdown (feet) Channel 2	Well number Residual Drawdown (feet) Channel 3	Well number Residual Drawdown (feet) Channel 4				
84.00	36.71	1	3.67	2	3.04	3	3.00	4	2.86
89.00	34.71	1	3.64	2	3.02	3	2.97	4	2.83
94.00	32.91	1	3.62	2	2.99	3	2.96	4	2.81
99.00	31.30	1	3.56	2	2.97	3	2.93	4	2.78
104.00	29.85	1	3.56	2	2.95	3	2.92	4	2.76
109.00	28.52	1	3.50	2	2.92	3	2.90	4	2.76
119.00	26.21	1	3.44	2	2.87	3	2.84	4	2.69
139.00	22.58	1	3.38	2	2.80	3	2.78	4	2.64
159.00	19.87	1	3.35	2	2.73	3	2.71	4	2.58
179.00	17.76	1	3.23	2	2.67	3	2.67	4	2.54
199.00	16.08	1	3.21	2	2.61	3	2.51	4	2.50
219.00	14.70	1	3.15	2	2.57	3	2.44	4	2.45
239.00	13.55	1	3.10	2	2.52	3	2.41	4	2.43
259.00	12.58	1	3.10	2	2.50	3	2.38	4	2.41

CONSTANT RATE PUMP TEST DRAWDOWN DATA

Union Station Aquifer Test Location 2, Test 1
 Discharge Rate = 295 GPM

Elapsed Time (min.)	Pumping Well PW-2 Drawdown (feet) Logger Channel 1	Observe Well OW-1 Drawdown (feet) Logger Channel 2	Observe Well OW-2 Drawdown (feet) Logger Channel 3	Observe Well OW-3 Drawdown (feet) Logger Channel 4
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0.00	1	1.50	2	0.48	3	0.05	4	0.02
0.05	1	4.39	2	0.75	3	0.14	4	0.00
0.10	1	4.89	2	1.07	3	0.29	4	0.03
0.15	1	4.54	2	1.21	3	0.40	4	0.07
0.20	1	3.85	2	1.23	3	0.49	4	0.13
0.25	1	3.50	2	1.20	3	0.52	4	0.17
0.30	1	3.35	2	1.18	3	0.54	4	0.20
0.35	1	3.35	2	1.18	3	0.57	4	0.23
0.40	1	3.33	2	1.21	3	0.59	4	0.27
0.50	1	3.38	2	1.24	3	0.64	4	0.30
0.60	1	3.38	2	1.27	3	0.66	4	0.33
0.70	1	3.38	2	1.30	3	0.69	4	0.35
0.80	1	3.41	2	1.33	3	0.72	4	0.36
0.90	1	3.41	2	1.35	3	0.75	4	0.38
1.00	1	3.52	2	1.44	3	0.87	4	0.44
1.50	1	3.58	2	1.50	3	0.95	4	0.49
2.00	1	3.64	2	1.55	3	1.01	4	0.50
2.50	1	3.67	2	1.56	3	1.06	4	0.53
3.00	1	3.70	2	1.59	3	1.10	4	0.55
3.50	1	3.70	2	1.62	3	1.14	4	0.56
4.00	1	4.02	2	1.69	3	1.18	4	0.58
4.50	1	4.19	2	1.78	3	1.26	4	0.58
5.00	1	4.45	2	1.91	3	1.39	4	0.64
6.00	1	4.60	2	1.98	3	1.47	4	0.73
7.00	1	4.56	2	1.98	3	1.52	4	0.75
8.00	1	4.60	2	1.99	3	1.53	4	0.75
9.00	1	4.56	2	2.01	3	1.56	4	0.76
10.00	1	4.56	2	2.01	3	1.58	4	0.78
11.00	1	4.56	2	2.01	3	1.59	4	0.78
12.00	1	4.62	2	2.02	3	1.61	4	0.79
13.00	1	5.58	2	2.28	3	1.75	4	0.85
14.00	1	5.64	2	2.43	3	1.88	4	0.88
15.00	1	5.70	2	2.45	3	1.94	4	0.92
16.00	1	5.72	2	2.48	3	1.96	4	0.94
17.00	1	6.18	2	2.57	3	2.02	4	0.95
18.00	1	6.56	2	2.76	3	2.13	4	1.01
19.00	1	6.33	2	2.73	3	2.11	4	1.04
20.00	1	6.18	2	2.66	3	2.05	4	1.02
21.00	1	6.12	2	2.66	3	2.05	4	1.04
22.00	1	6.16	2	2.67	3	2.07	4	1.05
23.00	1	6.18	2	2.69	3	2.07	4	1.05
24.00	1	6.18	2	2.70	3	2.08	4	1.07

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 2

Elapsed Time (min.)	Pumping Well PW-2 Drawdown (feet) Logger Channel 1	Observe Well OW-1 Drawdown (feet) Logger Channel 2	Observe Well OW-2 Drawdown (feet) Logger Channel 3	Observe Well OW-3 Drawdown (feet) Logger Channel 4				
25.00	1	6.18	2	2.70	3	2.08	4	1.08
26.00	1	6.18	2	2.70	3	2.08	4	1.08
27.00	1	6.18	2	2.71	3	2.08	4	1.10
28.00	1	6.16	2	2.70	3	2.10	4	1.11
29.00	1	6.18	2	2.66	3	2.05	4	1.13
34.00	1	6.12	2	2.65	3	2.04	4	1.11
39.00	1	6.18	2	2.76	3	2.13	4	1.14
44.00	1	6.22	2	2.80	3	2.15	4	1.17
49.00	1	6.27	2	2.82	3	2.17	4	1.20
54.00	1	6.30	2	2.83	3	2.18	4	1.21
59.00	1	6.30	2	2.85	3	2.19	4	1.22
64.00	1	6.30	2	2.86	3	2.21	4	1.22
69.00	1	6.35	2	2.89	3	2.22	4	1.25
74.00	1	6.33	2	2.91	3	2.24	4	1.27
79.00	1	6.39	2	2.93	3	2.25	4	1.28
84.00	1	6.41	2	2.95	3	2.28	4	1.30
89.00	1	6.39	2	2.96	3	2.28	4	1.30
94.00	1	6.45	2	2.97	3	2.31	4	1.33
99.00	1	6.45	2	2.99	3	2.33	4	1.34
104.00	1	6.45	2	3.00	3	2.34	4	1.36
109.00	1	6.45	2	3.00	3	2.34	4	1.37
114.00	1	6.47	2	3.03	3	2.37	4	1.39
119.00	1	6.47	2	3.03	3	2.37	4	1.40
124.00	1	6.47	2	3.05	3	2.39	4	1.42
129.00	1	6.45	2	3.06	3	2.40	4	1.42
134.00	1	6.50	2	3.09	3	2.41	4	1.44
139.00	1	6.50	2	3.11	3	2.43	4	1.47
144.00	1	6.56	2	3.12	3	2.44	4	1.48
149.00	1	6.56	2	3.15	3	2.47	4	1.51
154.00	1	6.58	2	3.17	3	2.48	4	1.53
159.00	1	6.62	2	3.18	3	2.50	4	1.54
164.00	1	6.62	2	3.19	3	2.51	4	1.56
169.00	1	6.64	2	3.21	3	2.51	4	1.57
174.00	1	6.68	2	3.22	3	2.53	4	1.59
179.00	1	6.70	2	3.23	3	2.54	4	1.60
184.00	1	6.70	2	3.25	3	2.56	4	1.62
189.00	1	6.70	2	3.25	3	2.57	4	1.63
194.00	1	6.76	2	3.26	3	2.59	4	1.65
199.00	1	6.70	2	3.28	3	2.59	4	1.65
204.00	1	6.76	2	3.28	3	2.60	4	1.66
209.00	1	6.74	2	3.29	3	2.60	4	1.68
214.00	1	6.76	2	3.31	3	2.60	4	1.70

SITE #2
 STAGE 1
 UNCORRECTED DATA
 2 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 3

Elapsed Time (min.)	Pumping Well PW-2	Observe Well OW-1	Observe Well OW-2	Observe Well OW-3				
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)				
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4				
219.00	1	6.79	2	3.32	3	2.60	4	1.72
224.00	1	6.82	2	3.34	3	2.60	4	1.72
229.00	1	6.79	2	3.29	3	2.62	4	1.70
234.00	1	6.79	2	3.32	3	2.65	4	1.73
239.00	1	6.74	2	3.34	3	2.66	4	1.74
244.00	1	6.76	2	3.35	3	2.67	4	1.76
249.00	1	6.82	2	3.35	3	2.67	4	1.77
254.00	1	6.79	2	3.37	3	2.67	4	1.77
259.00	1	6.76	2	3.37	3	2.69	4	1.79
264.00	1	6.79	2	3.38	3	2.69	4	1.80
269.00	1	6.79	2	3.38	3	2.70	4	1.82
274.00	1	6.82	2	3.40	3	2.70	4	1.82
279.00	1	6.85	2	3.41	3	2.71	4	1.83
284.00	1	6.82	2	3.41	3	2.73	4	1.85
289.00	1	6.82	2	3.43	3	2.73	4	1.86
294.00	1	6.79	2	3.41	3	2.73	4	1.86
299.00	1	6.70	2	3.40	3	2.71	4	1.86
304.00	1	6.76	2	3.40	3	2.71	4	1.86
309.00	1	6.64	2	3.37	3	2.70	4	1.86
314.00	1	6.62	2	3.38	3	2.71	4	1.88
319.00	1	6.91	2	3.45	3	2.76	4	1.91
324.00	1	6.91	2	3.47	3	2.79	4	1.92
329.00	1	6.91	2	3.48	3	2.79	4	1.94
334.00	1	6.87	2	3.48	3	2.79	4	1.95
339.00	1	6.91	2	3.48	3	2.80	4	1.95
344.00	1	6.91	2	3.48	3	2.80	4	1.95
349.00	1	6.87	2	3.49	3	2.80	4	1.96
354.00	1	6.91	2	3.49	3	2.80	4	1.96
359.00	1	6.91	2	3.51	3	2.82	4	1.98
364.00	1	6.87	2	3.51	3	2.82	4	1.98
369.00	1	6.87	2	3.51	3	2.83	4	1.99
374.00	1	6.91	2	3.51	3	2.83	4	1.99
379.00	1	6.91	2	3.52	3	2.83	4	2.00
384.00	1	6.93	2	3.52	3	2.85	4	2.02
389.00	1	6.79	2	3.51	3	2.83	4	2.00
394.00	1	6.82	2	3.51	3	2.83	4	2.02
399.00	1	6.82	2	3.51	3	2.83	4	2.02
404.00	1	6.91	2	3.54	3	2.86	4	2.03
409.00	1	6.87	2	3.55	3	2.88	4	2.05
414.00	1	6.93	2	3.55	3	2.88	4	2.06
419.00	1	6.93	2	3.57	3	2.89	4	2.06
424.00	1	6.91	2	3.57	3	2.89	4	2.08

SITE #2
 STAGE 1
 UNCORRECTED DATA
 3 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 4

Elapsed Time (min.)	Pumping Well PW-2 Drawdown (feet) Logger Channel 1	Observe Well OW-1 Drawdown (feet) Logger Channel 2	Observe Well OW-2 Drawdown (feet) Logger Channel 3	Observe Well OW-3 Drawdown (feet) Logger Channel 4				
429.00	1	6.93	2	3.57	3	2.89	4	2.08
434.00	1	6.93	2	3.58	3	2.89	4	2.08
439.00	1	6.93	2	3.58	3	2.91	4	2.09
444.00	1	6.79	2	3.55	3	2.88	4	2.08
449.00	1	6.85	2	3.55	3	2.88	4	2.08
454.00	1	7.31	2	3.70	3	2.96	4	2.15
459.00	1	7.25	2	3.69	3	2.97	4	2.15
464.00	1	7.22	2	3.69	3	2.97	4	2.15
469.00	1	7.20	2	3.70	3	2.97	4	2.17
474.00	1	7.22	2	3.71	3	2.99	4	2.18
479.00	1	7.25	2	3.71	3	2.99	4	2.18
484.00	1	7.22	2	3.71	3	2.99	4	2.18
489.00	1	7.25	2	3.71	3	3.00	4	2.19
494.00	1	7.22	2	3.71	3	3.00	4	2.19
499.00	1	7.22	2	3.71	3	3.00	4	2.19
504.00	1	7.25	2	3.71	3	3.00	4	2.21
509.00	1	7.22	2	3.71	3	3.00	4	2.21
514.00	1	7.25	2	3.73	3	3.02	4	2.22
519.00	1	7.22	2	3.73	3	3.02	4	2.22
524.00	1	7.25	2	3.74	3	3.03	4	2.24
529.00	1	7.28	2	3.74	3	3.03	4	2.24
534.00	1	7.22	2	3.74	3	3.03	4	2.24
539.00	1	7.22	2	3.74	3	3.03	4	2.24
544.00	1	7.22	2	3.74	3	3.03	4	2.25
549.00	1	7.25	2	3.74	3	3.03	4	2.25
554.00	1	7.20	2	3.74	3	3.03	4	2.25
559.00	1	7.20	2	3.75	3	3.05	4	2.26
564.00	1	7.20	2	3.75	3	3.05	4	2.26
569.00	1	7.20	2	3.75	3	3.05	4	2.26
574.00	1	7.20	2	3.77	3	3.06	4	2.28
579.00	1	7.25	2	3.77	3	3.06	4	2.28
584.00	1	7.20	2	3.77	3	3.06	4	2.28
589.00	1	7.25	2	3.77	3	3.06	4	2.29
594.00	1	7.22	2	3.77	3	3.06	4	2.29
599.00	1	7.25	2	3.78	3	3.08	4	2.29
604.00	1	7.22	2	3.78	3	3.08	4	2.31
609.00	1	7.20	2	3.78	3	3.08	4	2.31
614.00	1	7.25	2	3.80	3	3.09	4	2.32
619.00	1	7.25	2	3.80	3	3.09	4	2.32
624.00	1	7.25	2	3.81	3	3.11	4	2.34
629.00	1	7.31	2	3.83	3	3.11	4	2.34
634.00	1	7.28	2	3.83	3	3.12	4	2.35

SITE #2
 STAGE 1
 UNCORRECTED DATA
 4 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 5

Elapsed Time (min.)	Pumping Well PW-2	Observe Well OW-1	Observe Well OW-2	Observe Well OW-3				
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)				
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4				
639.00	1	7.31	2	3.83	3	3.12	4	2.35
644.00	1	7.34	2	3.84	3	3.12	4	2.35
649.00	1	7.31	2	3.84	3	3.14	4	2.37
654.00	1	7.34	2	3.86	3	3.14	4	2.37
659.00	1	7.34	2	3.86	3	3.15	4	2.38
664.00	1	7.39	2	3.87	3	3.15	4	2.38
669.00	1	7.37	2	3.89	3	3.17	4	2.40
674.00	1	7.39	2	3.89	3	3.17	4	2.40
679.00	1	7.37	2	3.89	3	3.17	4	2.40
684.00	1	7.37	2	3.89	3	3.17	4	2.41
689.00	1	7.37	2	3.90	3	3.18	4	2.41
694.00	1	7.43	2	3.90	3	3.18	4	2.43
699.00	1	7.39	2	3.90	3	3.18	4	2.43
704.00	1	7.43	2	3.92	3	3.19	4	2.43
709.00	1	7.45	2	3.92	3	3.19	4	2.44
714.00	1	7.49	2	3.92	3	3.19	4	2.44
719.00	1	7.49	2	3.95	3	3.21	4	2.45
724.00	1	7.49	2	3.95	3	3.21	4	2.45
729.00	1	7.43	2	3.93	3	3.21	4	2.45
734.00	1	7.43	2	3.93	3	3.21	4	2.45
739.00	1	7.45	2	3.93	3	3.21	4	2.45
744.00	1	7.43	2	3.95	3	3.21	4	2.47
749.00	1	7.45	2	3.95	3	3.21	4	2.47
754.00	1	7.49	2	3.96	3	3.22	4	2.48
759.00	1	7.54	2	3.96	3	3.23	4	2.48
764.00	1	7.51	2	3.97	3	3.23	4	2.50
769.00	1	7.49	2	3.97	3	3.25	4	2.50
774.00	1	7.54	2	3.97	3	3.25	4	2.50
779.00	1	7.51	2	3.97	3	3.25	4	2.50
784.00	1	7.54	2	3.99	3	3.25	4	2.51
789.00	1	7.54	2	3.99	3	3.25	4	2.51
794.00	1	7.51	2	3.99	3	3.25	4	2.51
799.00	1	7.54	2	3.99	3	3.25	4	2.51
804.00	1	7.54	2	4.00	3	3.26	4	2.52
809.00	1	7.51	2	4.00	3	3.26	4	2.52
814.00	1	7.57	2	4.00	3	3.28	4	2.54
819.00	1	7.57	2	4.00	3	3.26	4	2.52
824.00	1	7.54	2	4.01	3	3.28	4	2.54
829.00	1	7.57	2	4.01	3	3.28	4	2.55
834.00	1	7.57	2	4.01	3	3.28	4	2.55
839.00	1	7.60	2	4.03	3	3.29	4	2.55
844.00	1	7.62	2	4.03	3	3.29	4	2.55

SITE #2
 STAGE 1
 UNCORRECTED DATA
 5 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 6

Elapsed Time (min.)	Pumping Well PW-2	Observe Well OW-1	Observe Well OW-2	Observe Well OW-3				
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)				
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4				
849.00	1	7.60	2	4.03	3	3.29	4	2.57
854.00	1	7.57	2	4.03	3	3.29	4	2.57
859.00	1	7.57	2	4.04	3	3.31	4	2.57
864.00	1	7.60	2	4.04	3	3.31	4	2.58
869.00	1	7.62	2	4.04	3	3.31	4	2.58
874.00	1	7.60	2	4.04	3	3.31	4	2.58
879.00	1	7.66	2	4.06	3	3.31	4	2.58
884.00	1	7.62	2	4.06	3	3.31	4	2.58
889.00	1	7.62	2	4.06	3	3.32	4	2.60
894.00	1	7.66	2	4.06	3	3.32	4	2.60
899.00	1	7.66	2	4.06	3	3.32	4	2.60
904.00	1	7.60	2	4.07	3	3.32	4	2.60
909.00	1	7.54	2	4.04	3	3.31	4	2.58
914.00	1	7.60	2	4.04	3	3.31	4	2.58
919.00	1	7.54	2	4.04	3	3.31	4	2.58
924.00	1	7.57	2	4.04	3	3.31	4	2.60
929.00	1	7.54	2	4.04	3	3.31	4	2.60
934.00	1	7.57	2	4.06	3	3.28	4	2.60
939.00	1	7.57	2	4.06	3	3.28	4	2.60
944.00	1	7.54	2	4.06	3	3.28	4	2.61
949.00	1	7.57	2	4.06	3	3.28	4	2.61
954.00	1	7.54	2	4.06	3	3.28	4	2.61
959.00	1	7.57	2	4.06	3	3.28	4	2.61
964.00	1	7.51	2	4.06	3	3.28	4	2.61
969.00	1	7.60	2	4.09	3	3.29	4	2.63
974.00	1	7.54	2	4.07	3	3.29	4	2.63
979.00	1	7.54	2	4.07	3	3.28	4	2.63
984.00	1	7.54	2	4.07	3	3.29	4	2.63
989.00	1	7.60	2	4.07	3	3.28	4	2.63
994.00	1	7.60	2	4.07	3	3.29	4	2.63
1001.00	1	7.57	2	4.07	3	3.28	4	2.61
1021.00	1	7.51	2	4.07	3	3.32	4	2.64
1041.00	1	7.60	2	4.10	3	3.35	4	2.66
1061.00	1	7.66	2	4.13	3	3.37	4	2.67
1081.00	1	7.66	2	4.13	3	3.38	4	2.69
1101.00	1	7.68	2	4.15	3	3.38	4	2.70
1121.00	1	7.66	2	4.16	3	3.38	4	2.70
1141.00	1	7.72	2	4.16	3	3.40	4	2.71
1161.00	1	7.66	2	4.18	3	3.40	4	2.71
1181.00	1	7.62	2	4.16	3	3.40	4	2.71
1201.00	1	7.62	2	4.15	3	3.38	4	2.71
1221.00	1	7.62	2	4.16	3	3.40	4	2.74

SITE # 2
 STAGE 1
 UNCORRECTED DATA
 6 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 7

Elapsed Time (min.)	Pumping Well PW-2	Observe Well OW-1	Observe Well OW-2	Observe Well OW-3
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4

1241.00	1	7.66	2	4.16	3	3.40	4	2.73
1261.00	1	7.66	2	4.15	3	3.38	4	2.71
1281.00	1	7.60	2	4.10	3	3.32	4	2.66
1301.00	1	7.45	2	4.12	3	3.35	4	2.69
1321.00	1	7.49	2	4.15	3	3.37	4	2.71
1341.00	1	7.43	2	4.13	3	3.37	4	2.71
1361.00	1	7.72	2	4.21	3	3.41	4	2.73
1381.00	1	7.74	2	4.23	3	3.44	4	2.77
1401.00	1	7.72	2	4.23	3	3.44	4	2.77
1421.00	1	7.77	2	4.26	3	3.47	4	2.80
1441.00	1	7.86	2	4.29	3	3.49	4	2.83
1461.00	1	7.45	2	4.07	3	3.29	4	2.66
1481.00	1	7.49	2	4.09	3	3.32	4	2.74
1501.00	1	7.51	2	4.22	3	3.45	4	2.78
1521.00	1	7.62	2	4.25	3	3.47	4	2.81
1541.00	1	7.60	2	4.26	3	3.48	4	2.83
1561.00	1	7.66	2	4.25	3	3.48	4	2.84
1581.00	1	7.66	2	4.27	3	3.51	4	2.87
1601.00	1	7.72	2	4.30	3	3.52	4	2.89
1621.00	1	7.72	2	4.32	3	3.54	4	2.90
1641.00	1	7.74	2	4.35	3	3.57	4	2.93
1661.00	1	7.74	2	4.36	3	3.58	4	2.95
1681.00	1	7.74	2	4.36	3	3.58	4	2.96
1701.00	1	7.72	2	4.36	3	3.58	4	2.96
1721.00	1	7.68	2	4.36	3	3.58	4	2.96
1741.00	1	7.74	2	4.39	3	3.61	4	2.99
1761.00	1	7.77	2	4.39	3	3.61	4	2.99
1781.00	1	7.77	2	4.39	3	3.61	4	3.00
1801.00	1	7.77	2	4.41	3	3.63	4	3.02
1821.00	1	7.80	2	4.42	3	3.64	4	3.02
1841.00	1	7.86	2	4.44	3	3.66	4	3.03
1861.00	1	7.95	2	4.47	3	3.69	4	3.06
1881.00	1	7.97	2	4.49	3	3.70	4	3.07
1901.00	1	8.01	2	4.52	3	3.71	4	3.09
1921.00	1	8.03	2	4.52	3	3.71	4	3.10
1941.00	1	8.01	2	4.52	3	3.73	4	3.10
1961.00	1	8.06	2	4.53	3	3.74	4	3.12
1981.00	1	8.03	2	4.53	3	3.74	4	3.12
2001.00	1	8.03	2	4.55	3	3.74	4	3.13
2021.00	1	8.06	2	4.56	3	3.75	4	3.13
2041.00	1	8.01	2	4.55	3	3.75	4	3.13
2061.00	1	8.06	2	4.56	3	3.75	4	3.15

SITE #2
 STAGE 1
 UNCORRECTED DATA
 7 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 1

PAGE 8

Elapsed Time (min.)	Pumping Well PW-2 Drawdown (feet) Logger Channel 1	Observe Well OW-1 Drawdown (feet) Logger Channel 2	Observe Well OW-2 Drawdown (feet) Logger Channel 3	Observe Well OW-3 Drawdown (feet) Logger Channel 4				
2081.00	1	8.03	2	4.56	3	3.77	4	3.15
2101.00	1	8.09	2	4.56	3	3.77	4	3.16
2121.00	1	8.09	2	4.58	3	3.77	4	3.16
2141.00	1	8.06	2	4.58	3	3.77	4	3.16
2161.00	1	8.03	2	4.58	3	3.78	4	3.16
2181.00	1	8.03	2	4.58	3	3.78	4	3.18
2201.00	1	8.12	2	4.61	3	3.80	4	3.19
2221.00	1	8.09	2	4.61	3	3.81	4	3.19
2241.00	1	8.09	2	4.61	3	3.81	4	3.19
2261.00	1	8.12	2	4.62	3	3.81	4	3.21
2281.00	1	8.12	2	4.62	3	3.81	4	3.22
2301.00	1	8.14	2	4.64	3	3.83	4	3.22
2321.00	1	8.18	2	4.64	3	3.83	4	3.22
2341.00	1	8.18	2	4.64	3	3.83	4	3.22
2361.00	1	8.14	2	4.65	3	3.84	4	3.22
2381.00	1	8.24	2	4.68	3	3.86	4	3.25
2401.00	1	8.24	2	4.68	3	3.87	4	3.25
2421.00	1	8.29	2	4.68	3	3.86	4	3.25
2441.00	1	8.14	2	4.65	3	3.84	4	3.23
2461.00	1	8.14	2	4.65	3	3.83	4	3.22
2481.00	1	8.24	2	4.65	3	3.83	4	3.22
2501.00	1	8.18	2	4.65	3	3.83	4	3.22
2521.00	1	8.18	2	4.65	3	3.81	4	3.22
2541.00	1	8.12	2	4.64	3	3.81	4	3.21
2561.00	1	8.12	2	4.62	3	3.78	4	3.18
2581.00	1	8.03	2	4.61	3	3.77	4	3.18
2601.00	1	8.06	2	4.61	3	3.75	4	3.16
2621.00	1	8.06	2	4.59	3	3.75	4	3.16
2641.00	1	7.97	2	4.59	3	3.74	4	3.15
2661.00	1	7.97	2	4.62	3	3.77	4	3.18
2681.00	1	8.03	2	4.62	3	3.77	4	3.18
2701.00	1	8.09	2	4.62	3	3.78	4	3.19
2721.00	1	8.01	2	4.62	3	3.78	4	3.18
2741.00	1	8.01	2	4.64	3	3.80	4	3.21
2761.00	1	8.06	2	4.64	3	3.80	4	3.21
2781.00	1	8.09	2	4.65	3	3.81	4	3.22
2801.00	1	8.06	2	4.65	3	3.83	4	3.23
2821.00	1	8.09	2	4.64	3	3.83	4	3.23
2841.00	1	8.03	2	4.58	3	3.75	4	3.21
2861.00	1	7.89	2	4.64	3	3.83	4	3.23

SITE #2
 STAGE 1
 UNCORRECTED DATA
 8 OF 9

CONSTANT RATE PUMP TEST DRAWDOWN DATA
Union Station Location 2, Test 1

PAGE 9

"Constant Rate" Drawdown Test Of Well PW-2

Pumping was at a rate of 295 GPM.

Observation Well OW-1 @ 25.0 ft. from PW

Observation Well OW-2 @ 52.0 ft. from PW

Observation Well OW-3 @ 99.1 ft. from PW

Pump was turned on at 16:18 HRS. on 06/06/86.

Pump rate changed and then failed between 16:18 and 16:29

HRS. on 06/08/86.

Depth to Static Water:

Well PW-2 was 24.91 ft. @ 06:15 HRS. on 06/06/86

Well OW-1 was 25.04 ft. @ 06:25 HRS. on 06/06/86

Well OW-2 was 25.28 ft. @ 06:33 HRS. on 06/06/86

Well OW-3 was 25.98 ft. @ 06:44 HRS. on 06/06/86

Depth of Well:

Well PW-2 is 85 ft.

Well OW-1 is 89 ft.

Well OW-2 is 81 ft.

Well OW-3 is 78.5 ft.

Saturated Thickness of Aquifer in Well:

Well PW-2 is 59.09 ft.

Well OW-1 is 63.96 ft.

Well OW-2 is 55.72 ft.

Well OW-3 is 52.52 ft.

SITE #2
STAGE 1
UNCORRECTED DATA
9 OF 9

Unconfined Aquifer Reduced Drawdown Data
Well: PW-2

Distance (r): 0.9 feet Thickness (b): 59.09 feet
Discharge Rate: 295 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	1.4827	0.600E+05	0.216E+05
0.05	4.2269	0.200E+02	0.720E+01
0.10	4.6846	0.100E+02	0.360E+01
0.15	4.3657	0.667E+01	0.240E+01
0.20	3.7218	0.500E+01	0.180E+01
0.25	3.3967	0.400E+01	0.144E+01
0.30	3.2553	0.333E+01	0.120E+01
0.35	3.2553	0.286E+01	0.103E+01
0.40	3.2335	0.250E+01	0.900E+00
0.50	3.2879	0.200E+01	0.720E+00
0.60	3.2879	0.167E+01	0.600E+00
0.70	3.2879	0.143E+01	0.514E+00
0.80	3.3097	0.125E+01	0.450E+00
0.90	3.3097	0.111E+01	0.400E+00
1.00	3.4185	0.100E+01	0.360E+00
1.50	3.4728	0.667E+00	0.240E+00
2.00	3.5270	0.500E+00	0.180E+00
2.50	3.5595	0.400E+00	0.144E+00
3.00	3.5812	0.333E+00	0.120E+00
3.50	3.5812	0.286E+00	0.103E+00
4.00	3.8835	0.250E+00	0.900E-01
4.50	4.0448	0.222E+00	0.800E-01
5.00	4.2803	0.200E+00	0.720E-01
6.00	4.4190	0.167E+00	0.600E-01
7.00	4.3870	0.143E+00	0.514E-01
8.00	4.4190	0.125E+00	0.450E-01
9.00	4.3870	0.111E+00	0.400E-01
10.00	4.3870	0.100E+00	0.360E-01
11.00	4.3870	0.909E-01	0.327E-01
12.00	4.4403	0.833E-01	0.300E-01
13.00	5.3164	0.769E-01	0.277E-01
14.00	5.3687	0.714E-01	0.257E-01
15.00	5.4209	0.667E-01	0.240E-01
16.00	5.4418	0.625E-01	0.225E-01
17.00	5.8574	0.588E-01	0.212E-01
18.00	6.1975	0.556E-01	0.200E-01
19.00	5.9916	0.526E-01	0.189E-01
20.00	5.8574	0.500E-01	0.180E-01
21.00	5.8056	0.476E-01	0.171E-01
22.00	5.8367	0.455E-01	0.164E-01
23.00	5.8574	0.435E-01	0.157E-01
24.00	5.8574	0.417E-01	0.150E-01
25.00	5.8574	0.400E-01	0.144E-01
26.00	5.8574	0.385E-01	0.138E-01

SITE #2
STAGE 1
PUMP WELL DATA
1 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
27.00	5.8574	0.370E-01	0.133E-01
28.00	5.8367	0.357E-01	0.129E-01
29.00	5.8574	0.345E-01	0.124E-01
34.00	5.8056	0.294E-01	0.106E-01
39.00	5.8574	0.256E-01	0.923E-02
44.00	5.8884	0.227E-01	0.818E-02
49.00	5.9400	0.204E-01	0.735E-02
54.00	5.9607	0.185E-01	0.667E-02
59.00	5.9607	0.169E-01	0.610E-02
64.00	5.9607	0.156E-01	0.563E-02
69.00	6.0123	0.145E-01	0.522E-02
74.00	5.9916	0.135E-01	0.486E-02
79.00	6.0432	0.127E-01	0.456E-02
84.00	6.0638	0.119E-01	0.429E-02
89.00	6.0432	0.112E-01	0.404E-02
94.00	6.0947	0.106E-01	0.383E-02
99.00	6.0947	0.101E-01	0.364E-02
104.00	6.0947	0.962E-02	0.346E-02
109.00	6.0947	0.917E-02	0.330E-02
114.00	6.1153	0.877E-02	0.316E-02
119.00	6.1153	0.840E-02	0.303E-02
124.00	6.1153	0.806E-02	0.290E-02
129.00	6.0947	0.775E-02	0.279E-02
134.00	6.1461	0.746E-02	0.269E-02
139.00	6.1461	0.719E-02	0.259E-02
144.00	6.1975	0.694E-02	0.250E-02
149.00	6.1975	0.671E-02	0.242E-02
154.00	6.2180	0.649E-02	0.234E-02
159.00	6.2488	0.629E-02	0.226E-02
164.00	6.2488	0.610E-02	0.220E-02
169.00	6.2693	0.592E-02	0.213E-02
174.00	6.3001	0.575E-02	0.207E-02
179.00	6.3206	0.559E-02	0.201E-02
184.00	6.3206	0.543E-02	0.196E-02
189.00	6.3206	0.529E-02	0.190E-02
194.00	6.3717	0.515E-02	0.186E-02
199.00	6.3206	0.503E-02	0.181E-02
204.00	6.3717	0.490E-02	0.176E-02
209.00	6.3513	0.478E-02	0.172E-02
214.00	6.3717	0.467E-02	0.168E-02
219.00	6.4024	0.457E-02	0.164E-02
224.00	6.4229	0.446E-02	0.161E-02
229.00	6.4024	0.437E-02	0.157E-02
234.00	6.4024	0.427E-02	0.154E-02

SITE #2
 STAGE 1
 Pump Well DATA

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
239.00	6.3513	0.418E-02	0.151E-02
244.00	6.3717	0.410E-02	0.148E-02
249.00	6.4229	0.402E-02	0.145E-02
254.00	6.4024	0.394E-02	0.142E-02
259.00	6.3717	0.386E-02	0.139E-02
264.00	6.4024	0.379E-02	0.136E-02
269.00	6.4024	0.372E-02	0.134E-02
274.00	6.4229	0.365E-02	0.131E-02
279.00	6.4535	0.358E-02	0.129E-02
284.00	6.4229	0.352E-02	0.127E-02
289.00	6.4229	0.346E-02	0.125E-02
294.00	6.4024	0.340E-02	0.122E-02
299.00	6.3206	0.334E-02	0.120E-02
304.00	6.3717	0.329E-02	0.118E-02
309.00	6.2693	0.324E-02	0.117E-02
314.00	6.2488	0.318E-02	0.115E-02
319.00	6.5046	0.313E-02	0.113E-02
324.00	6.5046	0.309E-02	0.111E-02
329.00	6.5046	0.304E-02	0.109E-02
334.00	6.4739	0.299E-02	0.108E-02
339.00	6.5046	0.295E-02	0.106E-02
344.00	6.5046	0.291E-02	0.105E-02
349.00	6.4739	0.287E-02	0.103E-02
354.00	6.5046	0.282E-02	0.102E-02
359.00	6.5046	0.279E-02	0.100E-02
364.00	6.4739	0.275E-02	0.989E-03
369.00	6.4739	0.271E-02	0.976E-03
374.00	6.5046	0.267E-02	0.963E-03
379.00	6.5046	0.264E-02	0.950E-03
384.00	6.5250	0.260E-02	0.938E-03
389.00	6.4024	0.257E-02	0.925E-03
394.00	6.4229	0.254E-02	0.914E-03
399.00	6.4229	0.251E-02	0.902E-03
404.00	6.5046	0.248E-02	0.891E-03
409.00	6.4739	0.244E-02	0.880E-03
414.00	6.5250	0.242E-02	0.870E-03
419.00	6.5250	0.239E-02	0.859E-03
424.00	6.5046	0.236E-02	0.849E-03
429.00	6.5250	0.233E-02	0.839E-03
434.00	6.5250	0.230E-02	0.829E-03
439.00	6.5250	0.228E-02	0.820E-03
444.00	6.4024	0.225E-02	0.811E-03
449.00	6.4535	0.223E-02	0.802E-03
454.00	6.8602	0.220E-02	0.793E-03

SITE #2
 STAGE 1
 PUMP WELL DATA
 3 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 4

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
459.00	6.8096	0.218E-02	0.784E-03
464.00	6.7792	0.216E-02	0.776E-03
469.00	6.7589	0.213E-02	0.768E-03
474.00	6.7792	0.211E-02	0.759E-03
479.00	6.8096	0.209E-02	0.752E-03
484.00	6.7792	0.207E-02	0.744E-03
489.00	6.8096	0.204E-02	0.736E-03
494.00	6.7792	0.202E-02	0.729E-03
499.00	6.7792	0.200E-02	0.721E-03
504.00	6.8096	0.198E-02	0.714E-03
509.00	6.7792	0.196E-02	0.707E-03
514.00	6.8096	0.195E-02	0.700E-03
519.00	6.7792	0.193E-02	0.694E-03
524.00	6.8096	0.191E-02	0.687E-03
529.00	6.8299	0.189E-02	0.681E-03
534.00	6.7792	0.187E-02	0.674E-03
539.00	6.7792	0.186E-02	0.668E-03
544.00	6.7792	0.184E-02	0.662E-03
549.00	6.8096	0.182E-02	0.656E-03
554.00	6.7589	0.181E-02	0.650E-03
559.00	6.7589	0.179E-02	0.644E-03
564.00	6.7589	0.177E-02	0.638E-03
569.00	6.7589	0.176E-02	0.633E-03
574.00	6.7589	0.174E-02	0.627E-03
579.00	6.8096	0.173E-02	0.622E-03
584.00	6.7589	0.171E-02	0.616E-03
589.00	6.8096	0.170E-02	0.611E-03
594.00	6.7792	0.168E-02	0.606E-03
599.00	6.8096	0.167E-02	0.601E-03
604.00	6.7792	0.166E-02	0.596E-03
609.00	6.7589	0.164E-02	0.591E-03
614.00	6.8096	0.163E-02	0.586E-03
619.00	6.8096	0.162E-02	0.582E-03
624.00	6.8096	0.160E-02	0.577E-03
629.00	6.8602	0.159E-02	0.572E-03
634.00	6.8299	0.158E-02	0.568E-03
639.00	6.8602	0.156E-02	0.563E-03
644.00	6.8805	0.155E-02	0.559E-03
649.00	6.8602	0.154E-02	0.555E-03
654.00	6.8805	0.153E-02	0.550E-03
659.00	6.8805	0.152E-02	0.546E-03
664.00	6.9310	0.151E-02	0.542E-03
669.00	6.9108	0.149E-02	0.538E-03
674.00	6.9310	0.148E-02	0.534E-03

SITE # 2
 STAGE 1
 PUMP Well DATA
 4 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
679.00	6.9108	0.147E-02	0.530E-03
684.00	6.9108	0.146E-02	0.526E-03
689.00	6.9108	0.145E-02	0.522E-03
694.00	6.9614	0.144E-02	0.519E-03
699.00	6.9310	0.143E-02	0.515E-03
704.00	6.9614	0.142E-02	0.511E-03
709.00	6.9815	0.141E-02	0.508E-03
714.00	7.0118	0.140E-02	0.504E-03
719.00	7.0118	0.139E-02	0.501E-03
724.00	7.0118	0.138E-02	0.497E-03
729.00	6.9614	0.137E-02	0.494E-03
734.00	6.9614	0.136E-02	0.490E-03
739.00	6.9815	0.135E-02	0.487E-03
744.00	6.9614	0.134E-02	0.484E-03
749.00	6.9815	0.134E-02	0.481E-03
754.00	7.0118	0.133E-02	0.477E-03
759.00	7.0622	0.132E-02	0.474E-03
764.00	7.0320	0.131E-02	0.471E-03
769.00	7.0118	0.130E-02	0.468E-03
774.00	7.0622	0.129E-02	0.465E-03
779.00	7.0320	0.128E-02	0.462E-03
784.00	7.0622	0.128E-02	0.459E-03
789.00	7.0622	0.127E-02	0.456E-03
794.00	7.0320	0.126E-02	0.453E-03
799.00	7.0622	0.125E-02	0.451E-03
804.00	7.0622	0.124E-02	0.448E-03
809.00	7.0320	0.124E-02	0.445E-03
814.00	7.0824	0.123E-02	0.442E-03
819.00	7.0824	0.122E-02	0.440E-03
824.00	7.0622	0.121E-02	0.437E-03
829.00	7.0824	0.121E-02	0.434E-03
834.00	7.0824	0.120E-02	0.432E-03
839.00	7.1126	0.119E-02	0.429E-03
844.00	7.1327	0.118E-02	0.427E-03
849.00	7.1126	0.118E-02	0.424E-03
854.00	7.0824	0.117E-02	0.422E-03
859.00	7.0824	0.116E-02	0.419E-03
864.00	7.1126	0.116E-02	0.417E-03
869.00	7.1327	0.115E-02	0.414E-03
874.00	7.1126	0.114E-02	0.412E-03
879.00	7.1629	0.114E-02	0.410E-03
884.00	7.1327	0.113E-02	0.407E-03
889.00	7.1327	0.112E-02	0.405E-03
894.00	7.1629	0.112E-02	0.403E-03

SITE #2
 STAGE 1
 PUMP WELL DATA
 5 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 6

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
899.00	7.1629	0.111E-02	0.400E-03
904.00	7.1126	0.111E-02	0.398E-03
909.00	7.0622	0.110E-02	0.396E-03
914.00	7.1126	0.109E-02	0.394E-03
919.00	7.0622	0.109E-02	0.392E-03
924.00	7.0824	0.108E-02	0.390E-03
929.00	7.0622	0.108E-02	0.388E-03
934.00	7.0824	0.107E-02	0.385E-03
939.00	7.0824	0.106E-02	0.383E-03
944.00	7.0622	0.106E-02	0.381E-03
949.00	7.0824	0.105E-02	0.379E-03
954.00	7.0622	0.105E-02	0.377E-03
959.00	7.0824	0.104E-02	0.375E-03
964.00	7.0320	0.104E-02	0.373E-03
969.00	7.1126	0.103E-02	0.372E-03
974.00	7.0622	0.103E-02	0.370E-03
979.00	7.0622	0.102E-02	0.368E-03
984.00	7.0622	0.102E-02	0.366E-03
989.00	7.1126	0.101E-02	0.364E-03
994.00	7.1126	0.101E-02	0.362E-03
1001.00	7.0824	0.999E-03	0.360E-03
1021.00	7.0320	0.979E-03	0.353E-03
1041.00	7.1126	0.961E-03	0.346E-03
1061.00	7.1629	0.943E-03	0.339E-03
1081.00	7.1629	0.925E-03	0.333E-03
1101.00	7.1830	0.908E-03	0.327E-03
1121.00	7.1629	0.892E-03	0.321E-03
1141.00	7.2132	0.876E-03	0.316E-03
1161.00	7.1629	0.861E-03	0.310E-03
1181.00	7.1327	0.847E-03	0.305E-03
1201.00	7.1327	0.833E-03	0.300E-03
1221.00	7.1327	0.819E-03	0.295E-03
1241.00	7.1629	0.806E-03	0.290E-03
1261.00	7.1629	0.793E-03	0.285E-03
1281.00	7.1126	0.781E-03	0.281E-03
1301.00	6.9815	0.769E-03	0.277E-03
1321.00	7.0118	0.757E-03	0.273E-03
1341.00	6.9614	0.746E-03	0.268E-03
1361.00	7.2132	0.735E-03	0.265E-03
1381.00	7.2332	0.724E-03	0.261E-03
1401.00	7.2132	0.714E-03	0.257E-03
1421.00	7.2633	0.704E-03	0.253E-03
1441.00	7.3335	0.694E-03	0.250E-03
1461.00	6.9815	0.684E-03	0.246E-03

SITE # 2
 STAGE 1
 PUMP WELL DATA
 6 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 7

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
1481.00	7.0118	0.675E-03	0.243E-03
1501.00	7.0320	0.666E-03	0.240E-03
1521.00	7.1327	0.657E-03	0.237E-03
1541.00	7.1126	0.649E-03	0.234E-03
1561.00	7.1629	0.641E-03	0.231E-03
1581.00	7.1629	0.633E-03	0.228E-03
1601.00	7.2132	0.625E-03	0.225E-03
1621.00	7.2132	0.617E-03	0.222E-03
1641.00	7.2332	0.609E-03	0.219E-03
1661.00	7.2332	0.602E-03	0.217E-03
1681.00	7.2332	0.595E-03	0.214E-03
1701.00	7.2132	0.588E-03	0.212E-03
1721.00	7.1830	0.581E-03	0.209E-03
1741.00	7.2332	0.574E-03	0.207E-03
1761.00	7.2633	0.568E-03	0.204E-03
1781.00	7.2633	0.561E-03	0.202E-03
1801.00	7.2633	0.555E-03	0.200E-03
1821.00	7.2834	0.549E-03	0.198E-03
1841.00	7.3335	0.543E-03	0.196E-03
1861.00	7.4136	0.537E-03	0.193E-03
1881.00	7.4336	0.532E-03	0.191E-03
1901.00	7.4635	0.526E-03	0.189E-03
1921.00	7.4835	0.521E-03	0.187E-03
1941.00	7.4635	0.515E-03	0.185E-03
1961.00	7.5135	0.510E-03	0.184E-03
1981.00	7.4835	0.505E-03	0.182E-03
2001.00	7.4835	0.500E-03	0.180E-03
2021.00	7.5135	0.495E-03	0.178E-03
2041.00	7.4635	0.490E-03	0.176E-03
2061.00	7.5135	0.485E-03	0.175E-03
2081.00	7.4835	0.481E-03	0.173E-03
2101.00	7.5334	0.476E-03	0.171E-03
2121.00	7.5334	0.471E-03	0.170E-03
2141.00	7.5135	0.467E-03	0.168E-03
2161.00	7.4835	0.463E-03	0.167E-03
2181.00	7.4835	0.459E-03	0.165E-03
2201.00	7.5633	0.454E-03	0.164E-03
2221.00	7.5334	0.450E-03	0.162E-03
2241.00	7.5334	0.446E-03	0.161E-03
2261.00	7.5633	0.442E-03	0.159E-03
2281.00	7.5633	0.438E-03	0.158E-03
2301.00	7.5832	0.435E-03	0.156E-03
2321.00	7.6131	0.431E-03	0.155E-03
2341.00	7.6131	0.427E-03	0.154E-03

SITE # 2
 STAGE 1
 PUMP WELL DATA
 7 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well PW-2. PAGE 8

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2361.00	7.5832	0.424E-03	0.152E-03
2381.00	7.6628	0.420E-03	0.151E-03
2401.00	7.6628	0.416E-03	0.150E-03
2421.00	7.7125	0.413E-03	0.149E-03
2441.00	7.5832	0.410E-03	0.147E-03
2461.00	7.5832	0.406E-03	0.146E-03
2481.00	7.6628	0.403E-03	0.145E-03
2501.00	7.6131	0.400E-03	0.144E-03
2521.00	7.6131	0.397E-03	0.143E-03
2541.00	7.5633	0.394E-03	0.142E-03
2561.00	7.5633	0.390E-03	0.141E-03
2581.00	7.4835	0.387E-03	0.139E-03
2601.00	7.5135	0.384E-03	0.138E-03
2621.00	7.5135	0.382E-03	0.137E-03
2641.00	7.4336	0.379E-03	0.136E-03
2661.00	7.4336	0.376E-03	0.135E-03
2681.00	7.4835	0.373E-03	0.134E-03
2701.00	7.5334	0.370E-03	0.133E-03
2721.00	7.4635	0.368E-03	0.132E-03
2741.00	7.4635	0.365E-03	0.131E-03
2761.00	7.5135	0.362E-03	0.130E-03
2781.00	7.5334	0.360E-03	0.129E-03
2801.00	7.5135	0.357E-03	0.129E-03
2821.00	7.5334	0.354E-03	0.128E-03
2841.00	7.4835	0.352E-03	0.127E-03
2861.00	7.3636	0.350E-03	0.126E-03

SITE #2
 STAGE 1
 Pump Well DATA

Unconfined Aquifer Reduced Drawdown Data
Well: OW-1

Distance (r): 25.0 feet Thickness (b): 63.96 feet
Discharge Rate: 295 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.4776	0.600E+05	0.375E+08
0.05	0.7465	0.200E+02	0.125E+05
0.10	1.0597	0.100E+02	0.625E+04
0.15	1.2015	0.667E+01	0.417E+04
0.20	1.2185	0.500E+01	0.312E+04
0.25	1.1902	0.400E+01	0.250E+04
0.30	1.1732	0.333E+01	0.208E+04
0.35	1.1732	0.286E+01	0.179E+04
0.40	1.2015	0.250E+01	0.156E+04
0.50	1.2298	0.200E+01	0.125E+04
0.60	1.2582	0.167E+01	0.104E+04
0.70	1.2865	0.143E+01	0.893E+03
0.80	1.3147	0.125E+01	0.781E+03
0.90	1.3317	0.111E+01	0.694E+03
1.00	1.4278	0.100E+01	0.625E+03
1.50	1.4842	0.667E+00	0.417E+03
2.00	1.5293	0.500E+00	0.312E+03
2.50	1.5406	0.400E+00	0.250E+03
3.00	1.5687	0.333E+00	0.208E+03
3.50	1.5969	0.286E+00	0.179E+03
4.00	1.6700	0.250E+00	0.156E+03
4.50	1.7543	0.222E+00	0.139E+03
5.00	1.8778	0.200E+00	0.125E+03
6.00	1.9506	0.167E+00	0.104E+03
7.00	1.9506	0.143E+00	0.893E+02
8.00	1.9618	0.125E+00	0.781E+02
9.00	1.9785	0.111E+00	0.694E+02
10.00	1.9785	0.100E+00	0.625E+02
11.00	1.9785	0.909E-01	0.568E+02
12.00	1.9897	0.833E-01	0.521E+02
13.00	2.2409	0.769E-01	0.481E+02
14.00	2.3800	0.714E-01	0.446E+02
15.00	2.4078	0.667E-01	0.417E+02
16.00	2.4356	0.625E-01	0.391E+02
17.00	2.5188	0.588E-01	0.368E+02
18.00	2.7015	0.556E-01	0.347E+02
19.00	2.6738	0.526E-01	0.329E+02
20.00	2.6019	0.500E-01	0.313E+02
21.00	2.6019	0.476E-01	0.298E+02
22.00	2.6185	0.455E-01	0.284E+02
23.00	2.6296	0.435E-01	0.272E+02
24.00	2.6462	0.417E-01	0.260E+02
25.00	2.6462	0.400E-01	0.250E+02
26.00	2.6462	0.385E-01	0.240E+02

SITE #2
STAGE 1
OW-1 DATA
1 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
27.00	2.6572	0.370E-01	0.231E+02
28.00	2.6462	0.357E-01	0.223E+02
29.00	2.6019	0.345E-01	0.216E+02
34.00	2.5908	0.294E-01	0.184E+02
39.00	2.7015	0.256E-01	0.160E+02
44.00	2.7401	0.227E-01	0.142E+02
49.00	2.7567	0.204E-01	0.128E+02
54.00	2.7677	0.185E-01	0.116E+02
59.00	2.7843	0.169E-01	0.106E+02
64.00	2.7953	0.156E-01	0.977E+01
69.00	2.8229	0.145E-01	0.906E+01
74.00	2.8395	0.135E-01	0.845E+01
79.00	2.8670	0.127E-01	0.791E+01
84.00	2.8780	0.119E-01	0.744E+01
89.00	2.8946	0.112E-01	0.702E+01
94.00	2.9056	0.106E-01	0.665E+01
99.00	2.9221	0.101E-01	0.631E+01
104.00	2.9331	0.962E-02	0.601E+01
109.00	2.9331	0.917E-02	0.573E+01
114.00	2.9606	0.877E-02	0.548E+01
119.00	2.9606	0.840E-02	0.525E+01
124.00	2.9771	0.806E-02	0.504E+01
129.00	2.9881	0.775E-02	0.484E+01
134.00	3.0156	0.746E-02	0.466E+01
139.00	3.0321	0.719E-02	0.450E+01
144.00	3.0431	0.694E-02	0.434E+01
149.00	3.0706	0.671E-02	0.419E+01
154.00	3.0871	0.649E-02	0.406E+01
159.00	3.0980	0.629E-02	0.393E+01
164.00	3.1145	0.610E-02	0.381E+01
169.00	3.1255	0.592E-02	0.370E+01
174.00	3.1419	0.575E-02	0.359E+01
179.00	3.1529	0.559E-02	0.349E+01
184.00	3.1694	0.543E-02	0.340E+01
189.00	3.1694	0.529E-02	0.331E+01
194.00	3.1803	0.515E-02	0.322E+01
199.00	3.1968	0.503E-02	0.314E+01
204.00	3.1968	0.490E-02	0.306E+01
209.00	3.2077	0.478E-02	0.299E+01
214.00	3.2242	0.467E-02	0.292E+01
219.00	3.2351	0.457E-02	0.285E+01
224.00	3.2515	0.446E-02	0.279E+01
229.00	3.2077	0.437E-02	0.273E+01
234.00	3.2351	0.427E-02	0.267E+01

SITE # 2
 STAGE 1
 OW-1 DATA
 2 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
239.00	3.2515	0.418E-02	0.262E+01
244.00	3.2625	0.410E-02	0.256E+01
249.00	3.2625	0.402E-02	0.251E+01
254.00	3.2789	0.394E-02	0.246E+01
259.00	3.2789	0.386E-02	0.241E+01
264.00	3.2898	0.379E-02	0.237E+01
269.00	3.2898	0.372E-02	0.232E+01
274.00	3.3063	0.365E-02	0.228E+01
279.00	3.3172	0.358E-02	0.224E+01
284.00	3.3172	0.352E-02	0.220E+01
289.00	3.3336	0.346E-02	0.216E+01
294.00	3.3172	0.340E-02	0.213E+01
299.00	3.3063	0.334E-02	0.209E+01
304.00	3.3063	0.329E-02	0.206E+01
309.00	3.2789	0.324E-02	0.202E+01
314.00	3.2898	0.318E-02	0.199E+01
319.00	3.3609	0.313E-02	0.196E+01
324.00	3.3719	0.309E-02	0.193E+01
329.00	3.3882	0.304E-02	0.190E+01
334.00	3.3882	0.299E-02	0.187E+01
339.00	3.3882	0.295E-02	0.184E+01
344.00	3.3882	0.291E-02	0.182E+01
349.00	3.3992	0.287E-02	0.179E+01
354.00	3.3992	0.282E-02	0.177E+01
359.00	3.4155	0.279E-02	0.174E+01
364.00	3.4155	0.275E-02	0.172E+01
369.00	3.4155	0.271E-02	0.169E+01
374.00	3.4155	0.267E-02	0.167E+01
379.00	3.4265	0.264E-02	0.165E+01
384.00	3.4265	0.260E-02	0.163E+01
389.00	3.4155	0.257E-02	0.161E+01
394.00	3.4155	0.254E-02	0.159E+01
399.00	3.4155	0.251E-02	0.157E+01
404.00	3.4428	0.248E-02	0.155E+01
409.00	3.4537	0.244E-02	0.153E+01
414.00	3.4537	0.242E-02	0.151E+01
419.00	3.4701	0.239E-02	0.149E+01
424.00	3.4701	0.236E-02	0.147E+01
429.00	3.4701	0.233E-02	0.146E+01
434.00	3.4810	0.230E-02	0.144E+01
439.00	3.4810	0.228E-02	0.142E+01
444.00	3.4537	0.225E-02	0.141E+01
449.00	3.4537	0.223E-02	0.139E+01
454.00	3.5900	0.220E-02	0.138E+01

SITE # 2
 STAGE 1
 OW-1 DATA
 3 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 4

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
459.00	3.5791	0.218E-02	0.136E+01
464.00	3.5791	0.216E-02	0.135E+01
469.00	3.5900	0.213E-02	0.133E+01
474.00	3.6063	0.211E-02	0.132E+01
479.00	3.6063	0.209E-02	0.130E+01
484.00	3.6063	0.207E-02	0.129E+01
489.00	3.6063	0.204E-02	0.128E+01
494.00	3.6063	0.202E-02	0.127E+01
499.00	3.6063	0.200E-02	0.125E+01
504.00	3.6063	0.198E-02	0.124E+01
509.00	3.6063	0.196E-02	0.123E+01
514.00	3.6172	0.195E-02	0.122E+01
519.00	3.6172	0.193E-02	0.120E+01
524.00	3.6335	0.191E-02	0.119E+01
529.00	3.6335	0.189E-02	0.118E+01
534.00	3.6335	0.187E-02	0.117E+01
539.00	3.6335	0.186E-02	0.116E+01
544.00	3.6335	0.184E-02	0.115E+01
549.00	3.6335	0.182E-02	0.114E+01
554.00	3.6335	0.181E-02	0.113E+01
559.00	3.6444	0.179E-02	0.112E+01
564.00	3.6444	0.177E-02	0.111E+01
569.00	3.6444	0.176E-02	0.110E+01
574.00	3.6607	0.174E-02	0.109E+01
579.00	3.6607	0.173E-02	0.108E+01
584.00	3.6607	0.171E-02	0.107E+01
589.00	3.6607	0.170E-02	0.106E+01
594.00	3.6607	0.168E-02	0.105E+01
599.00	3.6715	0.167E-02	0.104E+01
604.00	3.6715	0.166E-02	0.103E+01
609.00	3.6715	0.164E-02	0.103E+01
614.00	3.6878	0.163E-02	0.102E+01
619.00	3.6878	0.162E-02	0.101E+01
624.00	3.6987	0.160E-02	0.100E+01
629.00	3.7150	0.159E-02	0.994E+00
634.00	3.7150	0.158E-02	0.986E+00
639.00	3.7150	0.156E-02	0.978E+00
644.00	3.7259	0.155E-02	0.970E+00
649.00	3.7259	0.154E-02	0.963E+00
654.00	3.7421	0.153E-02	0.956E+00
659.00	3.7421	0.152E-02	0.948E+00
664.00	3.7530	0.151E-02	0.941E+00
669.00	3.7693	0.149E-02	0.934E+00
674.00	3.7693	0.148E-02	0.927E+00

SITE #2
 STAGE 1
 OW-1 DATA

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
679.00	3.7693	0.147E-02	0.920E+00
684.00	3.7693	0.146E-02	0.914E+00
689.00	3.7801	0.145E-02	0.907E+00
694.00	3.7801	0.144E-02	0.901E+00
699.00	3.7801	0.143E-02	0.894E+00
704.00	3.7964	0.142E-02	0.888E+00
709.00	3.7964	0.141E-02	0.882E+00
714.00	3.7964	0.140E-02	0.875E+00
719.00	3.8235	0.139E-02	0.869E+00
724.00	3.8235	0.138E-02	0.863E+00
729.00	3.8072	0.137E-02	0.857E+00
734.00	3.8072	0.136E-02	0.851E+00
739.00	3.8072	0.135E-02	0.846E+00
744.00	3.8235	0.134E-02	0.840E+00
749.00	3.8235	0.134E-02	0.834E+00
754.00	3.8343	0.133E-02	0.829E+00
759.00	3.8343	0.132E-02	0.823E+00
764.00	3.8506	0.131E-02	0.818E+00
769.00	3.8506	0.130E-02	0.813E+00
774.00	3.8506	0.129E-02	0.807E+00
779.00	3.8506	0.128E-02	0.802E+00
784.00	3.8614	0.128E-02	0.797E+00
789.00	3.8614	0.127E-02	0.792E+00
794.00	3.8614	0.126E-02	0.787E+00
799.00	3.8614	0.125E-02	0.782E+00
804.00	3.8777	0.124E-02	0.777E+00
809.00	3.8777	0.124E-02	0.773E+00
814.00	3.8777	0.123E-02	0.768E+00
819.00	3.8777	0.122E-02	0.763E+00
824.00	3.8885	0.121E-02	0.758E+00
829.00	3.8885	0.121E-02	0.754E+00
834.00	3.8885	0.120E-02	0.749E+00
839.00	3.9047	0.119E-02	0.745E+00
844.00	3.9047	0.118E-02	0.741E+00
849.00	3.9047	0.118E-02	0.736E+00
854.00	3.9047	0.117E-02	0.732E+00
859.00	3.9156	0.116E-02	0.728E+00
864.00	3.9156	0.116E-02	0.723E+00
869.00	3.9156	0.115E-02	0.719E+00
874.00	3.9156	0.114E-02	0.715E+00
879.00	3.9318	0.114E-02	0.711E+00
884.00	3.9318	0.113E-02	0.707E+00
889.00	3.9318	0.112E-02	0.703E+00
894.00	3.9318	0.112E-02	0.699E+00

SITE #2
 STAGE 1
 OW-1 DATA
 5 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 6

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
899.00	3.9318	0.111E-02	0.695E+00
904.00	3.9426	0.111E-02	0.691E+00
909.00	3.9156	0.110E-02	0.688E+00
914.00	3.9156	0.109E-02	0.684E+00
919.00	3.9156	0.109E-02	0.680E+00
924.00	3.9156	0.108E-02	0.676E+00
929.00	3.9156	0.108E-02	0.673E+00
934.00	3.9318	0.107E-02	0.669E+00
939.00	3.9318	0.106E-02	0.666E+00
944.00	3.9318	0.106E-02	0.662E+00
949.00	3.9318	0.105E-02	0.659E+00
954.00	3.9318	0.105E-02	0.655E+00
959.00	3.9318	0.104E-02	0.652E+00
964.00	3.9318	0.104E-02	0.648E+00
969.00	3.9588	0.103E-02	0.645E+00
974.00	3.9426	0.103E-02	0.642E+00
979.00	3.9426	0.102E-02	0.638E+00
984.00	3.9426	0.102E-02	0.635E+00
989.00	3.9426	0.101E-02	0.632E+00
994.00	3.9426	0.101E-02	0.629E+00
1001.00	3.9426	0.999E-03	0.624E+00
1021.00	3.9426	0.979E-03	0.612E+00
1041.00	3.9697	0.961E-03	0.600E+00
1061.00	3.9967	0.943E-03	0.589E+00
1081.00	3.9967	0.925E-03	0.578E+00
1101.00	4.0129	0.908E-03	0.568E+00
1121.00	4.0237	0.892E-03	0.558E+00
1141.00	4.0237	0.876E-03	0.548E+00
1161.00	4.0399	0.861E-03	0.538E+00
1181.00	4.0237	0.847E-03	0.529E+00
1201.00	4.0129	0.833E-03	0.520E+00
1221.00	4.0237	0.819E-03	0.512E+00
1241.00	4.0237	0.806E-03	0.504E+00
1261.00	4.0129	0.793E-03	0.496E+00
1281.00	3.9697	0.781E-03	0.488E+00
1301.00	3.9859	0.769E-03	0.480E+00
1321.00	4.0129	0.757E-03	0.473E+00
1341.00	3.9967	0.746E-03	0.466E+00
1361.00	4.0669	0.735E-03	0.459E+00
1381.00	4.0939	0.724E-03	0.453E+00
1401.00	4.0939	0.714E-03	0.446E+00
1421.00	4.1208	0.704E-03	0.440E+00
1441.00	4.1478	0.694E-03	0.434E+00
1461.00	3.9426	0.684E-03	0.428E+00

SITE #2
 STAGE 1
 OW-1 DATA
 6 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 7

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
1481.00	3.9588	0.675E-03	0.422E+00
1501.00	4.0777	0.666E-03	0.416E+00
1521.00	4.1046	0.657E-03	0.411E+00
1541.00	4.1208	0.649E-03	0.406E+00
1561.00	4.1046	0.641E-03	0.400E+00
1581.00	4.1316	0.633E-03	0.395E+00
1601.00	4.1585	0.625E-03	0.390E+00
1621.00	4.1747	0.617E-03	0.386E+00
1641.00	4.2016	0.609E-03	0.381E+00
1661.00	4.2124	0.602E-03	0.376E+00
1681.00	4.2124	0.595E-03	0.372E+00
1701.00	4.2124	0.588E-03	0.367E+00
1721.00	4.2124	0.581E-03	0.363E+00
1741.00	4.2393	0.574E-03	0.359E+00
1761.00	4.2393	0.568E-03	0.355E+00
1781.00	4.2393	0.561E-03	0.351E+00
1801.00	4.2554	0.555E-03	0.347E+00
1821.00	4.2662	0.549E-03	0.343E+00
1841.00	4.2823	0.543E-03	0.339E+00
1861.00	4.3092	0.537E-03	0.336E+00
1881.00	4.3360	0.532E-03	0.332E+00
1901.00	4.3629	0.526E-03	0.329E+00
1921.00	4.3629	0.521E-03	0.325E+00
1941.00	4.3629	0.515E-03	0.322E+00
1961.00	4.3736	0.510E-03	0.319E+00
1981.00	4.3736	0.505E-03	0.315E+00
2001.00	4.3897	0.500E-03	0.312E+00
2021.00	4.4005	0.495E-03	0.309E+00
2041.00	4.3897	0.490E-03	0.306E+00
2061.00	4.4005	0.485E-03	0.303E+00
2081.00	4.4005	0.481E-03	0.300E+00
2101.00	4.4005	0.476E-03	0.297E+00
2121.00	4.4165	0.471E-03	0.295E+00
2141.00	4.4165	0.467E-03	0.292E+00
2161.00	4.4165	0.463E-03	0.289E+00
2181.00	4.4165	0.459E-03	0.287E+00
2201.00	4.4434	0.454E-03	0.284E+00
2221.00	4.4434	0.450E-03	0.281E+00
2241.00	4.4434	0.446E-03	0.279E+00
2261.00	4.4541	0.442E-03	0.276E+00
2281.00	4.4541	0.438E-03	0.274E+00
2301.00	4.4701	0.435E-03	0.272E+00
2321.00	4.4701	0.431E-03	0.269E+00
2341.00	4.4701	0.427E-03	0.267E+00

SITE #2
 STAGE 1
 OW-1 DATA
 7 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-1. PAGE 8

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2361.00	4.4809	0.424E-03	0.265E+00
2381.00	4.5076	0.420E-03	0.262E+00
2401.00	4.5076	0.416E-03	0.260E+00
2421.00	4.5076	0.413E-03	0.258E+00
2441.00	4.4809	0.410E-03	0.256E+00
2461.00	4.4809	0.406E-03	0.254E+00
2481.00	4.4809	0.403E-03	0.252E+00
2501.00	4.4809	0.400E-03	0.250E+00
2521.00	4.4809	0.397E-03	0.248E+00
2541.00	4.4701	0.394E-03	0.246E+00
2561.00	4.4541	0.390E-03	0.244E+00
2581.00	4.4434	0.387E-03	0.242E+00
2601.00	4.4434	0.384E-03	0.240E+00
2621.00	4.4273	0.382E-03	0.238E+00
2641.00	4.4273	0.379E-03	0.237E+00
2661.00	4.4541	0.376E-03	0.235E+00
2681.00	4.4541	0.373E-03	0.233E+00
2701.00	4.4541	0.370E-03	0.231E+00
2721.00	4.4541	0.368E-03	0.230E+00
2741.00	4.4701	0.365E-03	0.228E+00
2761.00	4.4701	0.362E-03	0.226E+00
2781.00	4.4809	0.360E-03	0.225E+00
2801.00	4.4809	0.357E-03	0.223E+00
2821.00	4.4701	0.354E-03	0.222E+00
2841.00	4.4165	0.352E-03	0.220E+00
2861.00	4.4701	0.350E-03	0.218E+00

SITE # 2
 STAGE 1
 OW-1 DATA
 8 OF 8

Unconfined Aquifer Reduced Drawdown Data
Well: OW-2

Distance (r): 52.0 feet Thickness (b): 55.72 feet
Discharge Rate: 295 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.0462	0.600E+05	0.162E+09
0.05	0.1442	0.200E+02	0.541E+05
0.10	0.2881	0.100E+02	0.270E+05
0.15	0.4029	0.667E+01	0.180E+05
0.20	0.4888	0.500E+01	0.135E+05
0.25	0.5174	0.400E+01	0.108E+05
0.30	0.5346	0.333E+01	0.901E+04
0.35	0.5632	0.286E+01	0.773E+04
0.40	0.5918	0.250E+01	0.676E+04
0.50	0.6318	0.200E+01	0.541E+04
0.60	0.6603	0.167E+01	0.451E+04
0.70	0.6888	0.143E+01	0.386E+04
0.80	0.7174	0.125E+01	0.338E+04
0.90	0.7459	0.111E+01	0.300E+04
1.00	0.8597	0.100E+01	0.270E+04
1.50	0.9449	0.667E+00	0.180E+04
2.00	1.0017	0.500E+00	0.135E+04
2.50	1.0470	0.400E+00	0.108E+04
3.00	1.0867	0.333E+00	0.901E+03
3.50	1.1320	0.286E+00	0.773E+03
4.00	1.1715	0.250E+00	0.676E+03
4.50	1.2450	0.222E+00	0.601E+03
5.00	1.3691	0.200E+00	0.541E+03
6.00	1.4535	0.167E+00	0.451E+03
7.00	1.4984	0.143E+00	0.386E+03
8.00	1.5097	0.125E+00	0.338E+03
9.00	1.5378	0.111E+00	0.300E+03
10.00	1.5546	0.100E+00	0.270E+03
11.00	1.5658	0.909E-01	0.246E+03
12.00	1.5827	0.833E-01	0.225E+03
13.00	1.7227	0.769E-01	0.208E+03
14.00	1.8457	0.714E-01	0.193E+03
15.00	1.9014	0.667E-01	0.180E+03
16.00	1.9293	0.625E-01	0.169E+03
17.00	1.9850	0.588E-01	0.159E+03
18.00	2.0851	0.556E-01	0.150E+03
19.00	2.0684	0.526E-01	0.142E+03
20.00	2.0128	0.500E-01	0.135E+03
21.00	2.0128	0.476E-01	0.129E+03
22.00	2.0295	0.455E-01	0.123E+03
23.00	2.0295	0.435E-01	0.118E+03
24.00	2.0406	0.417E-01	0.113E+03
25.00	2.0406	0.400E-01	0.108E+03
26.00	2.0406	0.385E-01	0.104E+03

SITE #2
STAGE 1
OW-2 DATA

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
27.00	2.0406	0.370E-01	0.100E+03
28.00	2.0573	0.357E-01	0.966E+02
29.00	2.0128	0.345E-01	0.932E+02
34.00	2.0017	0.294E-01	0.795E+02
39.00	2.0851	0.256E-01	0.693E+02
44.00	2.1129	0.227E-01	0.615E+02
49.00	2.1240	0.204E-01	0.552E+02
54.00	2.1406	0.185E-01	0.501E+02
59.00	2.1517	0.169E-01	0.458E+02
64.00	2.1684	0.156E-01	0.423E+02
69.00	2.1795	0.145E-01	0.392E+02
74.00	2.1961	0.135E-01	0.365E+02
79.00	2.2072	0.127E-01	0.342E+02
84.00	2.2349	0.119E-01	0.322E+02
89.00	2.2349	0.112E-01	0.304E+02
94.00	2.2626	0.106E-01	0.288E+02
99.00	2.2792	0.101E-01	0.273E+02
104.00	2.2903	0.962E-02	0.260E+02
109.00	2.2903	0.917E-02	0.248E+02
114.00	2.3179	0.877E-02	0.237E+02
119.00	2.3179	0.840E-02	0.227E+02
124.00	2.3345	0.806E-02	0.218E+02
129.00	2.3456	0.775E-02	0.210E+02
134.00	2.3622	0.746E-02	0.202E+02
139.00	2.3732	0.719E-02	0.195E+02
144.00	2.3898	0.694E-02	0.188E+02
149.00	2.4174	0.671E-02	0.181E+02
154.00	2.4284	0.649E-02	0.176E+02
159.00	2.4450	0.629E-02	0.170E+02
164.00	2.4560	0.610E-02	0.165E+02
169.00	2.4560	0.592E-02	0.160E+02
174.00	2.4726	0.575E-02	0.155E+02
179.00	2.4836	0.559E-02	0.151E+02
184.00	2.5001	0.543E-02	0.147E+02
189.00	2.5111	0.529E-02	0.143E+02
194.00	2.5277	0.515E-02	0.139E+02
199.00	2.5277	0.503E-02	0.136E+02
204.00	2.5387	0.490E-02	0.133E+02
209.00	2.5387	0.478E-02	0.129E+02
214.00	2.5387	0.467E-02	0.126E+02
219.00	2.5387	0.457E-02	0.123E+02
224.00	2.5387	0.446E-02	0.121E+02
229.00	2.5552	0.437E-02	0.118E+02
234.00	2.5827	0.427E-02	0.116E+02

SITE #2
 STAGE 1
 OW-2 DATA

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
239.00	2.5937	0.418E-02	0.113E+02
244.00	2.6102	0.410E-02	0.111E+02
249.00	2.6102	0.402E-02	0.109E+02
254.00	2.6102	0.394E-02	0.106E+02
259.00	2.6212	0.386E-02	0.104E+02
264.00	2.6212	0.379E-02	0.102E+02
269.00	2.6377	0.372E-02	0.101E+02
274.00	2.6377	0.365E-02	0.987E+01
279.00	2.6487	0.358E-02	0.969E+01
284.00	2.6652	0.352E-02	0.952E+01
289.00	2.6652	0.346E-02	0.936E+01
294.00	2.6652	0.340E-02	0.920E+01
299.00	2.6487	0.334E-02	0.904E+01
304.00	2.6487	0.329E-02	0.889E+01
309.00	2.6377	0.324E-02	0.875E+01
314.00	2.6487	0.318E-02	0.861E+01
319.00	2.6926	0.313E-02	0.848E+01
324.00	2.7201	0.309E-02	0.835E+01
329.00	2.7201	0.304E-02	0.822E+01
334.00	2.7201	0.299E-02	0.810E+01
339.00	2.7311	0.295E-02	0.798E+01
344.00	2.7311	0.291E-02	0.786E+01
349.00	2.7311	0.287E-02	0.775E+01
354.00	2.7311	0.282E-02	0.764E+01
359.00	2.7475	0.279E-02	0.753E+01
364.00	2.7475	0.275E-02	0.743E+01
369.00	2.7585	0.271E-02	0.733E+01
374.00	2.7585	0.267E-02	0.723E+01
379.00	2.7585	0.264E-02	0.713E+01
384.00	2.7749	0.260E-02	0.704E+01
389.00	2.7585	0.257E-02	0.695E+01
394.00	2.7585	0.254E-02	0.686E+01
399.00	2.7585	0.251E-02	0.678E+01
404.00	2.7859	0.248E-02	0.669E+01
409.00	2.8023	0.244E-02	0.661E+01
414.00	2.8023	0.242E-02	0.653E+01
419.00	2.8133	0.239E-02	0.645E+01
424.00	2.8133	0.236E-02	0.638E+01
429.00	2.8133	0.233E-02	0.630E+01
434.00	2.8133	0.230E-02	0.623E+01
439.00	2.8297	0.228E-02	0.616E+01
444.00	2.8023	0.225E-02	0.609E+01
449.00	2.8023	0.223E-02	0.602E+01
454.00	2.8844	0.220E-02	0.596E+01

SITE #2
 STAGE 1
 OW-2 DATA
 3 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 4

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
459.00	2.8954	0.218E-02	0.589E+01
464.00	2.8954	0.216E-02	0.583E+01
469.00	2.8954	0.213E-02	0.577E+01
474.00	2.9118	0.211E-02	0.570E+01
479.00	2.9118	0.209E-02	0.565E+01
484.00	2.9118	0.207E-02	0.559E+01
489.00	2.9227	0.204E-02	0.553E+01
494.00	2.9227	0.202E-02	0.547E+01
499.00	2.9227	0.200E-02	0.542E+01
504.00	2.9227	0.198E-02	0.537E+01
509.00	2.9227	0.196E-02	0.531E+01
514.00	2.9391	0.195E-02	0.526E+01
519.00	2.9391	0.193E-02	0.521E+01
524.00	2.9500	0.191E-02	0.516E+01
529.00	2.9500	0.189E-02	0.511E+01
534.00	2.9500	0.187E-02	0.506E+01
539.00	2.9500	0.186E-02	0.502E+01
544.00	2.9500	0.184E-02	0.497E+01
549.00	2.9500	0.182E-02	0.493E+01
554.00	2.9500	0.181E-02	0.488E+01
559.00	2.9664	0.179E-02	0.484E+01
564.00	2.9664	0.177E-02	0.479E+01
569.00	2.9664	0.176E-02	0.475E+01
574.00	2.9773	0.174E-02	0.471E+01
579.00	2.9773	0.173E-02	0.467E+01
584.00	2.9773	0.171E-02	0.463E+01
589.00	2.9773	0.170E-02	0.459E+01
594.00	2.9773	0.168E-02	0.455E+01
599.00	2.9937	0.167E-02	0.451E+01
604.00	2.9937	0.166E-02	0.448E+01
609.00	2.9937	0.164E-02	0.444E+01
614.00	3.0046	0.163E-02	0.440E+01
619.00	3.0046	0.162E-02	0.437E+01
624.00	3.0210	0.160E-02	0.433E+01
629.00	3.0210	0.159E-02	0.430E+01
634.00	3.0319	0.158E-02	0.426E+01
639.00	3.0319	0.156E-02	0.423E+01
644.00	3.0319	0.155E-02	0.420E+01
649.00	3.0482	0.154E-02	0.417E+01
654.00	3.0482	0.153E-02	0.413E+01
659.00	3.0591	0.152E-02	0.410E+01
664.00	3.0591	0.151E-02	0.407E+01
669.00	3.0755	0.149E-02	0.404E+01
674.00	3.0755	0.148E-02	0.401E+01

SITE #2
 STAGE 1
 OW-2 DATA
 4 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
679.00	3.0755	0.147E-02	0.398E+01
684.00	3.0755	0.146E-02	0.395E+01
689.00	3.0864	0.145E-02	0.392E+01
694.00	3.0864	0.144E-02	0.390E+01
699.00	3.0864	0.143E-02	0.387E+01
704.00	3.1027	0.142E-02	0.384E+01
709.00	3.1027	0.141E-02	0.381E+01
714.00	3.1027	0.140E-02	0.379E+01
719.00	3.1136	0.139E-02	0.376E+01
724.00	3.1136	0.138E-02	0.373E+01
729.00	3.1136	0.137E-02	0.371E+01
734.00	3.1136	0.136E-02	0.368E+01
739.00	3.1136	0.135E-02	0.366E+01
744.00	3.1136	0.134E-02	0.363E+01
749.00	3.1136	0.134E-02	0.361E+01
754.00	3.1299	0.133E-02	0.359E+01
759.00	3.1408	0.132E-02	0.356E+01
764.00	3.1408	0.131E-02	0.354E+01
769.00	3.1571	0.130E-02	0.352E+01
774.00	3.1571	0.129E-02	0.349E+01
779.00	3.1571	0.128E-02	0.347E+01
784.00	3.1571	0.128E-02	0.345E+01
789.00	3.1571	0.127E-02	0.343E+01
794.00	3.1571	0.126E-02	0.341E+01
799.00	3.1571	0.125E-02	0.338E+01
804.00	3.1680	0.124E-02	0.336E+01
809.00	3.1680	0.124E-02	0.334E+01
814.00	3.1843	0.123E-02	0.332E+01
819.00	3.1680	0.122E-02	0.330E+01
824.00	3.1843	0.121E-02	0.328E+01
829.00	3.1843	0.121E-02	0.326E+01
834.00	3.1843	0.120E-02	0.324E+01
839.00	3.1952	0.119E-02	0.322E+01
844.00	3.1952	0.118E-02	0.320E+01
849.00	3.1952	0.118E-02	0.318E+01
854.00	3.1952	0.117E-02	0.317E+01
859.00	3.2115	0.116E-02	0.315E+01
864.00	3.2115	0.116E-02	0.313E+01
869.00	3.2115	0.115E-02	0.311E+01
874.00	3.2115	0.114E-02	0.309E+01
879.00	3.2115	0.114E-02	0.308E+01
884.00	3.2115	0.113E-02	0.306E+01
889.00	3.2224	0.112E-02	0.304E+01
894.00	3.2224	0.112E-02	0.302E+01

SITE #2
 STAGE 1
 OW-2 DATA
 5 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 6

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
899.00	3.2224	0.111E-02	0.301E+01
904.00	3.2224	0.111E-02	0.299E+01
909.00	3.2115	0.110E-02	0.297E+01
914.00	3.2115	0.109E-02	0.296E+01
919.00	3.2115	0.109E-02	0.294E+01
924.00	3.2115	0.108E-02	0.293E+01
929.00	3.2115	0.108E-02	0.291E+01
934.00	3.1843	0.107E-02	0.290E+01
939.00	3.1843	0.106E-02	0.288E+01
944.00	3.1843	0.106E-02	0.286E+01
949.00	3.1843	0.105E-02	0.285E+01
954.00	3.1843	0.105E-02	0.283E+01
959.00	3.1843	0.104E-02	0.282E+01
964.00	3.1843	0.104E-02	0.280E+01
969.00	3.1952	0.103E-02	0.279E+01
974.00	3.1952	0.103E-02	0.278E+01
979.00	3.1843	0.102E-02	0.276E+01
984.00	3.1952	0.102E-02	0.275E+01
989.00	3.1843	0.101E-02	0.273E+01
994.00	3.1952	0.101E-02	0.272E+01
1001.00	3.1843	0.999E-03	0.270E+01
1021.00	3.2224	0.979E-03	0.265E+01
1041.00	3.2495	0.961E-03	0.260E+01
1061.00	3.2658	0.943E-03	0.255E+01
1081.00	3.2766	0.925E-03	0.250E+01
1101.00	3.2766	0.908E-03	0.246E+01
1121.00	3.2766	0.892E-03	0.241E+01
1141.00	3.2929	0.876E-03	0.237E+01
1161.00	3.2929	0.861E-03	0.233E+01
1181.00	3.2929	0.847E-03	0.229E+01
1201.00	3.2766	0.833E-03	0.225E+01
1221.00	3.2929	0.819E-03	0.221E+01
1241.00	3.2929	0.806E-03	0.218E+01
1261.00	3.2766	0.793E-03	0.214E+01
1281.00	3.2224	0.781E-03	0.211E+01
1301.00	3.2495	0.769E-03	0.208E+01
1321.00	3.2658	0.757E-03	0.205E+01
1341.00	3.2658	0.746E-03	0.202E+01
1361.00	3.3038	0.735E-03	0.199E+01
1381.00	3.3309	0.724E-03	0.196E+01
1401.00	3.3309	0.714E-03	0.193E+01
1421.00	3.3580	0.704E-03	0.190E+01
1441.00	3.3850	0.694E-03	0.188E+01
1461.00	3.1952	0.684E-03	0.185E+01

SITE #2
 STAGE 1
 OW-2 DATA
 6 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 7

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
1481.00	3.2224	0.675E-03	0.183E+01
1501.00	3.3471	0.666E-03	0.180E+01
1521.00	3.3580	0.657E-03	0.178E+01
1541.00	3.3742	0.649E-03	0.175E+01
1561.00	3.3742	0.641E-03	0.173E+01
1581.00	3.4013	0.633E-03	0.171E+01
1601.00	3.4121	0.625E-03	0.169E+01
1621.00	3.4283	0.617E-03	0.167E+01
1641.00	3.4554	0.609E-03	0.165E+01
1661.00	3.4662	0.602E-03	0.163E+01
1681.00	3.4662	0.595E-03	0.161E+01
1701.00	3.4662	0.588E-03	0.159E+01
1721.00	3.4662	0.581E-03	0.157E+01
1741.00	3.4932	0.574E-03	0.155E+01
1761.00	3.4932	0.568E-03	0.154E+01
1781.00	3.4932	0.561E-03	0.152E+01
1801.00	3.5094	0.555E-03	0.150E+01
1821.00	3.5202	0.549E-03	0.148E+01
1841.00	3.5364	0.543E-03	0.147E+01
1861.00	3.5634	0.537E-03	0.145E+01
1881.00	3.5742	0.532E-03	0.144E+01
1901.00	3.5903	0.526E-03	0.142E+01
1921.00	3.5903	0.521E-03	0.141E+01
1941.00	3.6011	0.515E-03	0.139E+01
1961.00	3.6173	0.510E-03	0.138E+01
1981.00	3.6173	0.505E-03	0.136E+01
2001.00	3.6173	0.500E-03	0.135E+01
2021.00	3.6281	0.495E-03	0.134E+01
2041.00	3.6281	0.490E-03	0.132E+01
2061.00	3.6281	0.485E-03	0.131E+01
2081.00	3.6442	0.481E-03	0.130E+01
2101.00	3.6442	0.476E-03	0.129E+01
2121.00	3.6442	0.471E-03	0.127E+01
2141.00	3.6442	0.467E-03	0.126E+01
2161.00	3.6550	0.463E-03	0.125E+01
2181.00	3.6550	0.459E-03	0.124E+01
2201.00	3.6711	0.454E-03	0.123E+01
2221.00	3.6819	0.450E-03	0.122E+01
2241.00	3.6819	0.446E-03	0.121E+01
2261.00	3.6819	0.442E-03	0.120E+01
2281.00	3.6819	0.438E-03	0.119E+01
2301.00	3.6980	0.435E-03	0.118E+01
2321.00	3.6980	0.431E-03	0.117E+01
2341.00	3.6980	0.427E-03	0.116E+01

SITE #2
 STAGE 1
 OW-2 DATA
 7 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-2. PAGE 8

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2361.00	3.7088	0.424E-03	0.115E+01
2381.00	3.7249	0.420E-03	0.114E+01
2401.00	3.7357	0.416E-03	0.113E+01
2421.00	3.7249	0.413E-03	0.112E+01
2441.00	3.7088	0.410E-03	0.111E+01
2461.00	3.6980	0.406E-03	0.110E+01
2481.00	3.6980	0.403E-03	0.109E+01
2501.00	3.6980	0.400E-03	0.108E+01
2521.00	3.6819	0.397E-03	0.107E+01
2541.00	3.6819	0.394E-03	0.106E+01
2561.00	3.6550	0.390E-03	0.106E+01
2581.00	3.6442	0.387E-03	0.105E+01
2601.00	3.6281	0.384E-03	0.104E+01
2621.00	3.6281	0.382E-03	0.103E+01
2641.00	3.6173	0.379E-03	0.102E+01
2661.00	3.6442	0.376E-03	0.102E+01
2681.00	3.6442	0.373E-03	0.101E+01
2701.00	3.6550	0.370E-03	0.100E+01
2721.00	3.6550	0.368E-03	0.994E+00
2741.00	3.6711	0.365E-03	0.987E+00
2761.00	3.6711	0.362E-03	0.979E+00
2781.00	3.6819	0.360E-03	0.972E+00
2801.00	3.6980	0.357E-03	0.965E+00
2821.00	3.6980	0.354E-03	0.959E+00
2841.00	3.6281	0.352E-03	0.952E+00
2861.00	3.6980	0.350E-03	0.945E+00

SITE # 2
 STAGE 1
 OW-2 DATA
 8 OF 8

Unconfined Aquifer Reduced Drawdown Data
Well: OW-3

Distance (r): 99.1 feet Thickness (b): 52.52 feet
Discharge Rate: 295 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.0173	0.600E+05	0.589E+09
0.05	0.0000	0.200E+02	0.196E+06
0.10	0.0289	0.100E+02	0.982E+05
0.15	0.0693	0.667E+01	0.655E+05
0.20	0.1269	0.500E+01	0.491E+05
0.25	0.1730	0.400E+01	0.393E+05
0.30	0.2018	0.333E+01	0.327E+05
0.35	0.2305	0.286E+01	0.281E+05
0.40	0.2708	0.250E+01	0.246E+05
0.50	0.2995	0.200E+01	0.196E+05
0.60	0.3282	0.167E+01	0.164E+05
0.70	0.3454	0.143E+01	0.140E+05
0.80	0.3569	0.125E+01	0.123E+05
0.90	0.3741	0.111E+01	0.109E+05
1.00	0.4429	0.100E+01	0.982E+04
1.50	0.4887	0.667E+00	0.655E+04
2.00	0.5001	0.500E+00	0.491E+04
2.50	0.5287	0.400E+00	0.393E+04
3.00	0.5459	0.333E+00	0.327E+04
3.50	0.5573	0.286E+00	0.281E+04
4.00	0.5744	0.250E+00	0.246E+04
4.50	0.5744	0.222E+00	0.218E+04
5.00	0.6315	0.200E+00	0.196E+04
6.00	0.7285	0.167E+00	0.164E+04
7.00	0.7455	0.143E+00	0.140E+04
8.00	0.7455	0.125E+00	0.123E+04
9.00	0.7569	0.111E+00	0.109E+04
10.00	0.7740	0.100E+00	0.982E+03
11.00	0.7740	0.909E-01	0.893E+03
12.00	0.7854	0.833E-01	0.818E+03
13.00	0.8422	0.769E-01	0.755E+03
14.00	0.8707	0.714E-01	0.701E+03
15.00	0.9161	0.667E-01	0.655E+03
16.00	0.9274	0.625E-01	0.614E+03
17.00	0.9444	0.588E-01	0.578E+03
18.00	1.0011	0.556E-01	0.546E+03
19.00	1.0294	0.526E-01	0.517E+03
20.00	1.0124	0.500E-01	0.491E+03
21.00	1.0294	0.476E-01	0.468E+03
22.00	1.0408	0.455E-01	0.446E+03
23.00	1.0408	0.435E-01	0.427E+03
24.00	1.0577	0.417E-01	0.409E+03
25.00	1.0691	0.400E-01	0.393E+03
26.00	1.0691	0.385E-01	0.378E+03

SITE # 2
STAGE 1
OW-3 DATA
1 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
27.00	1.0860	0.370E-01	0.364E+03
28.00	1.0973	0.357E-01	0.351E+03
29.00	1.1143	0.345E-01	0.339E+03
34.00	1.0973	0.294E-01	0.289E+03
39.00	1.1256	0.256E-01	0.252E+03
44.00	1.1538	0.227E-01	0.223E+03
49.00	1.1821	0.204E-01	0.200E+03
54.00	1.1990	0.185E-01	0.182E+03
59.00	1.2103	0.169E-01	0.166E+03
64.00	1.2103	0.156E-01	0.153E+03
69.00	1.2385	0.145E-01	0.142E+03
74.00	1.2554	0.135E-01	0.133E+03
79.00	1.2667	0.127E-01	0.124E+03
84.00	1.2836	0.119E-01	0.117E+03
89.00	1.2836	0.112E-01	0.110E+03
94.00	1.3117	0.106E-01	0.104E+03
99.00	1.3230	0.101E-01	0.992E+02
104.00	1.3399	0.962E-02	0.944E+02
109.00	1.3511	0.917E-02	0.901E+02
114.00	1.3680	0.877E-02	0.861E+02
119.00	1.3793	0.840E-02	0.825E+02
124.00	1.3961	0.806E-02	0.792E+02
129.00	1.3961	0.775E-02	0.761E+02
134.00	1.4242	0.746E-02	0.733E+02
139.00	1.4523	0.719E-02	0.707E+02
144.00	1.4635	0.694E-02	0.682E+02
149.00	1.4916	0.671E-02	0.659E+02
154.00	1.5084	0.649E-02	0.638E+02
159.00	1.5196	0.629E-02	0.618E+02
164.00	1.5364	0.610E-02	0.599E+02
169.00	1.5476	0.592E-02	0.581E+02
174.00	1.5644	0.575E-02	0.564E+02
179.00	1.5756	0.559E-02	0.549E+02
184.00	1.5924	0.543E-02	0.534E+02
189.00	1.6036	0.529E-02	0.520E+02
194.00	1.6204	0.515E-02	0.506E+02
199.00	1.6204	0.503E-02	0.494E+02
204.00	1.6316	0.490E-02	0.481E+02
209.00	1.6484	0.478E-02	0.470E+02
214.00	1.6764	0.467E-02	0.459E+02
219.00	1.6875	0.457E-02	0.448E+02
224.00	1.6875	0.446E-02	0.438E+02
229.00	1.6764	0.437E-02	0.429E+02
234.00	1.7043	0.427E-02	0.420E+02

SITE #2
 STAGE 1
 OW-3 DATA
 2 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
239.00	1.7155	0.418E-02	0.411E+02
244.00	1.7322	0.410E-02	0.402E+02
249.00	1.7434	0.402E-02	0.394E+02
254.00	1.7434	0.394E-02	0.387E+02
259.00	1.7601	0.386E-02	0.379E+02
264.00	1.7713	0.379E-02	0.372E+02
269.00	1.7880	0.372E-02	0.365E+02
274.00	1.7880	0.365E-02	0.358E+02
279.00	1.7992	0.358E-02	0.352E+02
284.00	1.8159	0.352E-02	0.346E+02
289.00	1.8270	0.346E-02	0.340E+02
294.00	1.8270	0.340E-02	0.334E+02
299.00	1.8270	0.334E-02	0.328E+02
304.00	1.8270	0.329E-02	0.323E+02
309.00	1.8270	0.324E-02	0.318E+02
314.00	1.8437	0.318E-02	0.313E+02
319.00	1.8716	0.313E-02	0.308E+02
324.00	1.8827	0.309E-02	0.303E+02
329.00	1.8994	0.304E-02	0.299E+02
334.00	1.9105	0.299E-02	0.294E+02
339.00	1.9105	0.295E-02	0.290E+02
344.00	1.9105	0.291E-02	0.285E+02
349.00	1.9272	0.287E-02	0.281E+02
354.00	1.9272	0.282E-02	0.277E+02
359.00	1.9383	0.279E-02	0.274E+02
364.00	1.9383	0.275E-02	0.270E+02
369.00	1.9550	0.271E-02	0.266E+02
374.00	1.9550	0.267E-02	0.263E+02
379.00	1.9661	0.264E-02	0.259E+02
384.00	1.9828	0.260E-02	0.256E+02
389.00	1.9661	0.257E-02	0.252E+02
394.00	1.9828	0.254E-02	0.249E+02
399.00	1.9828	0.251E-02	0.246E+02
404.00	1.9939	0.248E-02	0.243E+02
409.00	2.0105	0.244E-02	0.240E+02
414.00	2.0216	0.242E-02	0.237E+02
419.00	2.0216	0.239E-02	0.234E+02
424.00	2.0383	0.236E-02	0.232E+02
429.00	2.0383	0.233E-02	0.229E+02
434.00	2.0383	0.230E-02	0.226E+02
439.00	2.0494	0.228E-02	0.224E+02
444.00	2.0383	0.225E-02	0.221E+02
449.00	2.0383	0.223E-02	0.219E+02
454.00	2.1048	0.220E-02	0.216E+02

SITE # 2
 STAGE 1
 OW-3 DATA

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 4

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
459.00	2.1048	0.218E-02	0.214E+02
464.00	2.1048	0.216E-02	0.212E+02
469.00	2.1214	0.213E-02	0.209E+02
474.00	2.1325	0.211E-02	0.207E+02
479.00	2.1325	0.209E-02	0.205E+02
484.00	2.1325	0.207E-02	0.203E+02
489.00	2.1491	0.204E-02	0.201E+02
494.00	2.1491	0.202E-02	0.199E+02
499.00	2.1491	0.200E-02	0.197E+02
504.00	2.1602	0.198E-02	0.195E+02
509.00	2.1602	0.196E-02	0.193E+02
514.00	2.1768	0.195E-02	0.191E+02
519.00	2.1768	0.193E-02	0.189E+02
524.00	2.1878	0.191E-02	0.187E+02
529.00	2.1878	0.189E-02	0.186E+02
534.00	2.1878	0.187E-02	0.184E+02
539.00	2.1878	0.186E-02	0.182E+02
544.00	2.2044	0.184E-02	0.181E+02
549.00	2.2044	0.182E-02	0.179E+02
554.00	2.2044	0.181E-02	0.177E+02
559.00	2.2155	0.179E-02	0.176E+02
564.00	2.2155	0.177E-02	0.174E+02
569.00	2.2155	0.176E-02	0.173E+02
574.00	2.2321	0.174E-02	0.171E+02
579.00	2.2321	0.173E-02	0.170E+02
584.00	2.2321	0.171E-02	0.168E+02
589.00	2.2431	0.170E-02	0.167E+02
594.00	2.2431	0.168E-02	0.165E+02
599.00	2.2431	0.167E-02	0.164E+02
604.00	2.2597	0.166E-02	0.163E+02
609.00	2.2597	0.164E-02	0.161E+02
614.00	2.2707	0.163E-02	0.160E+02
619.00	2.2707	0.162E-02	0.159E+02
624.00	2.2873	0.160E-02	0.157E+02
629.00	2.2873	0.159E-02	0.156E+02
634.00	2.2983	0.158E-02	0.155E+02
639.00	2.2983	0.156E-02	0.154E+02
644.00	2.2983	0.155E-02	0.152E+02
649.00	2.3149	0.154E-02	0.151E+02
654.00	2.3149	0.153E-02	0.150E+02
659.00	2.3259	0.152E-02	0.149E+02
664.00	2.3259	0.151E-02	0.148E+02
669.00	2.3424	0.149E-02	0.147E+02
674.00	2.3424	0.148E-02	0.146E+02

SITE #2
 STAGE 1
 OW-3 DATA
 4 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 5

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
679.00	2.3424	0.147E-02	0.145E+02
684.00	2.3535	0.146E-02	0.144E+02
689.00	2.3535	0.145E-02	0.143E+02
694.00	2.3700	0.144E-02	0.142E+02
699.00	2.3700	0.143E-02	0.140E+02
704.00	2.3700	0.142E-02	0.140E+02
709.00	2.3810	0.141E-02	0.139E+02
714.00	2.3810	0.140E-02	0.138E+02
719.00	2.3975	0.139E-02	0.137E+02
724.00	2.3975	0.138E-02	0.136E+02
729.00	2.3975	0.137E-02	0.135E+02
734.00	2.3975	0.136E-02	0.134E+02
739.00	2.3975	0.135E-02	0.133E+02
744.00	2.4085	0.134E-02	0.132E+02
749.00	2.4085	0.134E-02	0.131E+02
754.00	2.4251	0.133E-02	0.130E+02
759.00	2.4251	0.132E-02	0.129E+02
764.00	2.4361	0.131E-02	0.129E+02
769.00	2.4361	0.130E-02	0.128E+02
774.00	2.4361	0.129E-02	0.127E+02
779.00	2.4361	0.128E-02	0.126E+02
784.00	2.4526	0.128E-02	0.125E+02
789.00	2.4526	0.127E-02	0.124E+02
794.00	2.4526	0.126E-02	0.124E+02
799.00	2.4526	0.125E-02	0.123E+02
804.00	2.4636	0.124E-02	0.122E+02
809.00	2.4636	0.124E-02	0.121E+02
814.00	2.4801	0.123E-02	0.121E+02
819.00	2.4636	0.122E-02	0.120E+02
824.00	2.4801	0.121E-02	0.119E+02
829.00	2.4910	0.121E-02	0.118E+02
834.00	2.4910	0.120E-02	0.118E+02
839.00	2.4910	0.119E-02	0.117E+02
844.00	2.4910	0.118E-02	0.116E+02
849.00	2.5075	0.118E-02	0.116E+02
854.00	2.5075	0.117E-02	0.115E+02
859.00	2.5075	0.116E-02	0.114E+02
864.00	2.5185	0.116E-02	0.114E+02
869.00	2.5185	0.115E-02	0.113E+02
874.00	2.5185	0.114E-02	0.112E+02
879.00	2.5185	0.114E-02	0.112E+02
884.00	2.5185	0.113E-02	0.111E+02
889.00	2.5350	0.112E-02	0.110E+02
894.00	2.5350	0.112E-02	0.110E+02

SITE #2
 STAGE 1
 OW-3 DATA
 5 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 6

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
899.00	2.5350	0.111E-02	0.109E+02
904.00	2.5350	0.111E-02	0.109E+02
909.00	2.5185	0.110E-02	0.108E+02
914.00	2.5185	0.109E-02	0.107E+02
919.00	2.5185	0.109E-02	0.107E+02
924.00	2.5350	0.108E-02	0.106E+02
929.00	2.5350	0.108E-02	0.106E+02
934.00	2.5350	0.107E-02	0.105E+02
939.00	2.5350	0.106E-02	0.105E+02
944.00	2.5460	0.106E-02	0.104E+02
949.00	2.5460	0.105E-02	0.103E+02
954.00	2.5460	0.105E-02	0.103E+02
959.00	2.5460	0.104E-02	0.102E+02
964.00	2.5460	0.104E-02	0.102E+02
969.00	2.5624	0.103E-02	0.101E+02
974.00	2.5624	0.103E-02	0.101E+02
979.00	2.5624	0.102E-02	0.100E+02
984.00	2.5624	0.102E-02	0.998E+01
989.00	2.5624	0.101E-02	0.993E+01
994.00	2.5624	0.101E-02	0.988E+01
1001.00	2.5460	0.999E-03	0.981E+01
1021.00	2.5734	0.979E-03	0.962E+01
1041.00	2.5899	0.961E-03	0.943E+01
1061.00	2.6008	0.943E-03	0.926E+01
1081.00	2.6173	0.925E-03	0.908E+01
1101.00	2.6282	0.908E-03	0.892E+01
1121.00	2.6282	0.892E-03	0.876E+01
1141.00	2.6447	0.876E-03	0.861E+01
1161.00	2.6447	0.861E-03	0.846E+01
1181.00	2.6447	0.847E-03	0.832E+01
1201.00	2.6447	0.833E-03	0.818E+01
1221.00	2.6720	0.819E-03	0.804E+01
1241.00	2.6556	0.806E-03	0.791E+01
1261.00	2.6447	0.793E-03	0.779E+01
1281.00	2.5899	0.781E-03	0.767E+01
1301.00	2.6173	0.769E-03	0.755E+01
1321.00	2.6447	0.757E-03	0.743E+01
1341.00	2.6447	0.746E-03	0.732E+01
1361.00	2.6556	0.735E-03	0.722E+01
1381.00	2.6994	0.724E-03	0.711E+01
1401.00	2.6994	0.714E-03	0.701E+01
1421.00	2.7268	0.704E-03	0.691E+01
1441.00	2.7541	0.694E-03	0.682E+01
1461.00	2.5899	0.684E-03	0.672E+01

SITE # 2
 STAGE 1
 OW-3 DATA
 6 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 7

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
1481.00	2.6720	0.675E-03	0.663E+01
1501.00	2.7104	0.666E-03	0.654E+01
1521.00	2.7377	0.657E-03	0.646E+01
1541.00	2.7541	0.649E-03	0.637E+01
1561.00	2.7650	0.641E-03	0.629E+01
1581.00	2.7923	0.633E-03	0.621E+01
1601.00	2.8087	0.625E-03	0.613E+01
1621.00	2.8196	0.617E-03	0.606E+01
1641.00	2.8469	0.609E-03	0.598E+01
1661.00	2.8633	0.602E-03	0.591E+01
1681.00	2.8742	0.595E-03	0.584E+01
1701.00	2.8742	0.588E-03	0.577E+01
1721.00	2.8742	0.581E-03	0.571E+01
1741.00	2.9014	0.574E-03	0.564E+01
1761.00	2.9014	0.568E-03	0.558E+01
1781.00	2.9178	0.561E-03	0.551E+01
1801.00	2.9286	0.555E-03	0.545E+01
1821.00	2.9286	0.549E-03	0.539E+01
1841.00	2.9450	0.543E-03	0.533E+01
1861.00	2.9722	0.537E-03	0.528E+01
1881.00	2.9831	0.532E-03	0.522E+01
1901.00	2.9994	0.526E-03	0.517E+01
1921.00	3.0102	0.521E-03	0.511E+01
1941.00	3.0102	0.515E-03	0.506E+01
1961.00	3.0266	0.510E-03	0.501E+01
1981.00	3.0266	0.505E-03	0.496E+01
2001.00	3.0374	0.500E-03	0.491E+01
2021.00	3.0374	0.495E-03	0.486E+01
2041.00	3.0374	0.490E-03	0.481E+01
2061.00	3.0537	0.485E-03	0.477E+01
2081.00	3.0537	0.481E-03	0.472E+01
2101.00	3.0646	0.476E-03	0.467E+01
2121.00	3.0646	0.471E-03	0.463E+01
2141.00	3.0646	0.467E-03	0.459E+01
2161.00	3.0646	0.463E-03	0.454E+01
2181.00	3.0809	0.459E-03	0.450E+01
2201.00	3.0917	0.454E-03	0.446E+01
2221.00	3.0917	0.450E-03	0.442E+01
2241.00	3.0917	0.446E-03	0.438E+01
2261.00	3.1080	0.442E-03	0.434E+01
2281.00	3.1188	0.438E-03	0.431E+01
2301.00	3.1188	0.435E-03	0.427E+01
2321.00	3.1188	0.431E-03	0.423E+01
2341.00	3.1188	0.427E-03	0.420E+01

SITE #2
 STAGE 1
 OW-3 DATA
 7 OF 8

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 1, Well OW-3. PAGE 8

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
2361.00	3.1188	0.424E-03	0.416E+01
2381.00	3.1459	0.420E-03	0.412E+01
2401.00	3.1459	0.416E-03	0.409E+01
2421.00	3.1459	0.413E-03	0.406E+01
2441.00	3.1351	0.410E-03	0.402E+01
2461.00	3.1188	0.406E-03	0.399E+01
2481.00	3.1188	0.403E-03	0.396E+01
2501.00	3.1188	0.400E-03	0.393E+01
2521.00	3.1188	0.397E-03	0.390E+01
2541.00	3.1080	0.394E-03	0.386E+01
2561.00	3.0809	0.390E-03	0.383E+01
2581.00	3.0809	0.387E-03	0.381E+01
2601.00	3.0646	0.384E-03	0.378E+01
2621.00	3.0646	0.382E-03	0.375E+01
2641.00	3.0537	0.379E-03	0.372E+01
2661.00	3.0809	0.376E-03	0.369E+01
2681.00	3.0809	0.373E-03	0.366E+01
2701.00	3.0917	0.370E-03	0.364E+01
2721.00	3.0809	0.368E-03	0.361E+01
2741.00	3.1080	0.365E-03	0.358E+01
2761.00	3.1080	0.362E-03	0.356E+01
2781.00	3.1188	0.360E-03	0.353E+01
2801.00	3.1351	0.357E-03	0.351E+01
2821.00	3.1351	0.354E-03	0.348E+01
2841.00	3.1080	0.352E-03	0.346E+01
2861.00	3.1351	0.350E-03	0.343E+01

SITE #2
 STAGE 1
 OW-3 DATA
 8 OF 8

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Aquifer Test Location 2, Test 2

Discharge Rate = 572 GPM

Elapsed Time (min.)	Pumping Well PW-2	Observe Well OW-1	Observe Well OW-2	Observe Well OW-3				
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)				
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4				
0.00	1	4.12	2	0.13	3	0.10	4	0.05
0.05	1	1.99	2	0.12	3	0.06	4	0.03
0.10	1	3.81	2	0.54	3	0.06	4	0.06
0.15	1	4.93	2	0.92	3	0.23	4	0.12
0.20	1	5.74	2	1.21	3	0.38	4	0.19
0.25	1	6.38	2	1.43	3	0.50	4	0.26
0.30	1	6.84	2	1.62	3	0.64	4	0.35
0.35	1	7.24	2	1.76	3	0.73	4	0.42
0.40	1	7.62	2	1.89	3	0.82	4	0.49
0.50	1	8.28	2	2.13	3	0.99	4	0.62
0.60	1	8.75	2	2.31	3	1.13	4	0.72
0.70	1	9.07	2	2.44	3	1.24	4	0.83
0.80	1	9.32	2	2.54	3	1.33	4	0.90
0.90	1	9.53	2	2.65	3	1.40	4	0.95
1.00	1	9.76	2	2.71	3	1.46	4	1.01
1.50	1	10.46	2	3.00	3	1.70	4	1.26
2.00	1	10.82	2	3.17	3	1.85	4	1.42
2.50	1	11.03	2	3.26	3	1.96	4	1.55
3.00	1	11.21	2	3.34	3	2.03	4	1.65
3.50	1	11.34	2	3.40	3	2.11	4	1.73
4.00	1	11.46	2	3.44	3	2.15	4	1.81
4.50	1	11.55	2	3.48	3	2.19	4	1.87
5.00	1	11.61	2	3.51	3	2.21	4	1.82
6.00	1	11.81	2	3.64	3	2.32	4	1.94
7.00	1	11.86	2	3.67	3	2.38	4	2.07
8.00	1	11.98	2	3.73	3	2.43	4	2.05
9.00	1	12.01	2	3.77	3	2.47	4	2.11
10.00	1	12.04	2	3.80	3	2.50	4	2.15
11.00	1	12.13	2	3.83	3	2.52	4	2.18
12.00	1	12.15	2	3.81	3	2.52	4	2.27
13.00	1	12.19	2	3.83	3	2.54	4	2.25
14.00	1	12.19	2	3.83	3	2.54	4	2.27
15.00	1	12.21	2	3.84	3	2.54	4	2.27
16.00	1	12.27	2	3.86	3	2.57	4	2.28
17.00	1	12.27	2	3.87	3	2.57	4	2.21
18.00	1	12.36	2	3.93	3	2.63	4	2.25
19.00	1	12.38	2	3.95	3	2.66	4	2.27
20.00	1	12.38	2	3.97	3	2.67	4	2.30
21.00	1	12.38	2	3.99	3	2.70	4	2.31
22.00	1	12.48	2	4.01	3	2.70	4	2.33
23.00	1	12.42	2	3.99	3	2.70	4	2.41
24.00	1	12.42	2	4.01	3	2.71	4	2.34

SITE # 2
 STAGE 2
 UNCORRECTED DATA

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 2

PAGE 2

Elapsed Time (min.)	Pumping Well PW-2	Observe Well OW-1	Observe Well OW-2	Observe Well OW-3				
	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)	Drawdown (feet)				
	Logger Channel 1	Logger Channel 2	Logger Channel 3	Logger Channel 4				
25.00	1	12.48	2	4.03	3	2.74	4	2.36
26.00	1	12.48	2	4.04	3	2.76	4	2.37
27.00	1	12.53	2	4.06	3	2.77	4	2.39
28.00	1	12.53	2	4.07	3	2.78	4	2.39
29.00	1	12.53	2	4.07	3	2.80	4	2.40
30.00	1	12.48	2	4.03	3	2.74	4	2.37
35.00	1	12.59	2	4.12	3	2.83	4	2.43
40.00	1	12.77	2	4.19	3	2.90	4	2.47
45.00	1	12.88	2	4.22	3	2.93	4	2.50
50.00	1	12.94	2	4.27	3	2.99	4	2.54
55.00	1	13.02	2	4.27	3	3.02	4	2.54
60.00	1	13.00	2	4.25	3	2.99	4	2.50
65.00	1	13.14	2	4.33	3	3.07	4	2.57
70.00	1	13.19	2	4.38	3	3.10	4	2.60
75.00	1	13.23	2	4.39	3	3.12	4	2.62
80.00	1	13.29	2	4.41	3	3.13	4	2.63
85.00	1	13.29	2	4.42	3	3.15	4	2.65
90.00	1	13.40	2	4.45	3	3.18	4	2.66
110.00	1	13.54	2	4.51	3	3.23	4	2.70
130.00	1	13.60	2	4.55	3	3.28	4	2.73
150.00	1	13.77	2	4.62	3	3.33	4	2.79
170.00	1	13.86	2	4.67	3	3.38	4	2.82
190.00	1	13.92	2	4.70	3	3.41	4	2.85
210.00	1	13.92	2	4.71	3	3.42	4	2.86
230.00	1	14.06	2	4.77	3	3.47	4	2.89
250.00	1	14.09	2	4.79	3	3.49	4	2.91
270.00	1	14.21	2	4.87	3	3.56	4	2.96
290.00	1	14.33	2	4.91	3	3.61	4	3.00
310.00	1	14.38	2	4.96	3	3.62	4	3.02
330.00	1	14.33	2	4.96	3	3.64	4	3.02
350.00	1	14.41	2	4.98	3	3.67	4	3.03
370.00	1	14.41	2	5.00	3	3.68	4	3.05
390.00	1	14.46	2	5.03	3	3.71	4	3.08
410.00	1	14.52	2	5.05	3	3.74	4	3.09
430.00	1	14.56	2	5.07	3	3.75	4	3.11
450.00	1	14.61	2	5.10	3	3.77	4	3.12
470.00	1	14.64	2	5.13	3	3.79	4	3.14
490.00	1	14.64	2	5.14	3	3.81	4	3.15
510.00	1	14.67	2	5.16	3	3.82	4	3.17
530.00	1	14.73	2	5.17	3	3.84	4	3.18
550.00	1	14.73	2	5.19	3	3.87	4	3.19
570.00	1	14.75	2	5.20	3	3.88	4	3.21

SITE #2
 STAGE 2
 UNCORRECTED DATA
 2 OF 4

CONSTANT RATE PUMP TEST DRAWDOWN DATA
 Union Station Location 2, Test 2

PAGE 3

Elapsed Time (min.)	Pumping Well PW-2 Drawdown (feet) Logger Channel 1	Observe Well OW-1 Drawdown (feet) Logger Channel 2	Observe Well OW-2 Drawdown (feet) Logger Channel 3	Observe Well OW-3 Drawdown (feet) Logger Channel 4
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590.00	1	14.81	2	5.22	3	3.88	4	3.21
610.00	1	14.81	2	5.23	3	3.90	4	3.22
630.00	1	14.81	2	5.24	3	3.93	4	3.23
650.00	1	14.81	2	5.26	3	3.94	4	3.25
670.00	1	14.84	2	5.27	3	3.94	4	3.25
690.00	1	14.93	2	5.29	3	3.97	4	3.28
710.00	1	14.87	2	5.23	3	3.91	4	3.22
730.00	1	14.93	2	5.30	3	3.99	4	3.28
750.00	1	14.93	2	5.30	3	3.99	4	3.28
770.00	1	14.90	2	5.31	3	3.99	4	3.28
790.00	1	14.87	2	5.30	3	3.97	4	3.26
810.00	1	14.81	2	5.30	3	3.97	4	3.26
830.00	1	14.90	2	5.31	3	3.99	4	3.28
850.00	1	14.87	2	5.31	3	3.99	4	3.28
870.00	1	14.84	2	5.33	3	3.99	4	3.28
890.00	1	14.84	2	5.31	3	3.99	4	3.28
910.00	1	14.87	2	5.33	3	3.99	4	3.26
930.00	1	14.87	2	5.33	3	3.99	4	3.26
950.00	1	14.84	2	5.33	3	3.99	4	3.28
970.00	1	14.87	2	5.34	3	4.00	4	3.28
990.00	1	14.81	2	5.34	3	4.00	4	3.28
1010.00	1	14.87	2	5.34	3	4.00	4	3.28
1030.00	1	14.84	2	5.34	3	4.00	4	3.28
1050.00	1	14.75	2	5.27	3	3.94	4	3.26
1070.00	1	14.87	2	5.34	3	4.00	4	3.28
1090.00	1	14.81	2	5.36	3	4.01	4	3.28
1110.00	1	14.81	2	5.36	3	4.03	4	3.29
1130.00	1	14.84	2	5.36	3	4.03	4	3.29
1150.00	1	14.87	2	5.37	3	4.04	4	3.31
1170.00	1	14.84	2	5.37	3	4.05	4	3.31
1190.00	1	14.87	2	5.40	3	4.07	4	3.34
1210.00	1	14.84	2	5.40	3	4.07	4	3.34
1230.00	1	14.90	2	5.42	3	4.08	4	3.35
1250.00	1	14.90	2	5.43	3	4.11	4	3.37

SITE #2
 STAGE 2
 UNCORRECTED DATA
 3 OF 4

CONSTANT RATE PUMP TEST DRAWDOWN DATA
Union Station Location 2, Test 2

PAGE 4

"Constant Rate" Drawdown Test Of Well PW-2

Pumping was at a rate of 572 GPM.
Observation Well OW-1 @ 25.0 ft. from PW
Observation Well OW-2 @ 52.0 ft. from PW
Observation Well OW-3 @ 99.1 ft. from PW
Pump was turned on at 17:56 HRS. on 06/08/86.
Pump was turned off at 15:29 HRS. on 06/09/86.

Depth to Static Water:

Well PW-2 was 24.91 ft. @ 06:15 HRS. on 06/06/86
Well OW-1 was 25.04 ft. @ 06:25 HRS. on 06/06/86
Well OW-2 was 25.28 ft. @ 06:33 HRS. on 06/06/86
Well OW-3 was 25.98 ft. @ 06:44 HRS. on 06/06/86

Depth of Well:

Well PW-2 is 85 ft.
Well OW-1 is 89 ft.
Well OW-2 is 81 ft.
Well OW-3 is 78.5 ft.

Saturated Thickness of Aquifer in Well:

Well PW-2 is 59.09 ft.
Well OW-1 is 63.96 ft.
Well OW-2 is 55.72 ft.
Well OW-3 is 52.52 ft.

SITE #2
STAGE 2
UNCORRECTED DATA
4 OF 4

Unconfined Aquifer Reduced Drawdown Data
Well: PW-2

Distance (r): 0.9 feet Thickness (b): 59.09 feet
Discharge Rate: 572 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	3.9803	0.600E+05	0.216E+05
0.05	1.9536	0.200E+02	0.720E+01
0.10	3.6893	0.100E+02	0.360E+01
0.15	4.7270	0.667E+01	0.240E+01
0.20	5.4626	0.500E+01	0.180E+01
0.25	6.0329	0.400E+01	0.144E+01
0.30	6.4433	0.333E+01	0.120E+01
0.35	6.7995	0.286E+01	0.103E+01
0.40	7.1327	0.250E+01	0.900E+00
0.50	7.7026	0.200E+01	0.720E+00
0.60	8.0981	0.167E+01	0.600E+00
0.70	8.3728	0.143E+01	0.514E+00
0.80	8.5874	0.125E+01	0.450E+00
0.90	8.7622	0.111E+01	0.400E+00
1.00	8.9555	0.100E+01	0.360E+00
1.50	9.5301	0.667E+00	0.240E+00
2.00	9.8332	0.500E+00	0.180E+00
2.50	10.0027	0.400E+00	0.144E+00
3.00	10.1434	0.333E+00	0.120E+00
3.50	10.2555	0.286E+00	0.103E+00
4.00	10.3488	0.250E+00	0.900E-01
4.50	10.4232	0.222E+00	0.800E-01
5.00	10.4696	0.200E+00	0.720E-01
6.00	10.6271	0.167E+00	0.600E-01
7.00	10.6733	0.143E+00	0.514E-01
8.00	10.7655	0.125E+00	0.450E-01
9.00	10.7932	0.111E+00	0.400E-01
10.00	10.8116	0.100E+00	0.360E-01
11.00	10.8851	0.909E-01	0.327E-01
12.00	10.9034	0.833E-01	0.300E-01
13.00	10.9310	0.769E-01	0.277E-01
14.00	10.9310	0.714E-01	0.257E-01
15.00	10.9493	0.667E-01	0.240E-01
16.00	10.9951	0.625E-01	0.225E-01
17.00	10.9951	0.588E-01	0.212E-01
18.00	11.0682	0.556E-01	0.200E-01
19.00	11.0865	0.526E-01	0.189E-01
20.00	11.0865	0.500E-01	0.180E-01
21.00	11.0865	0.476E-01	0.171E-01
22.00	11.1595	0.455E-01	0.164E-01
23.00	11.1139	0.435E-01	0.157E-01
24.00	11.1139	0.417E-01	0.150E-01
25.00	11.1595	0.400E-01	0.144E-01
26.00	11.1595	0.385E-01	0.138E-01

SITE #2
STAGE 2
PUMP WELL DATA

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well PW-2. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
27.00	11.2050	0.370E-01	0.133E-01
28.00	11.2050	0.357E-01	0.129E-01
29.00	11.2050	0.345E-01	0.124E-01
30.00	11.1595	0.333E-01	0.120E-01
35.00	11.2505	0.286E-01	0.103E-01
40.00	11.3866	0.250E-01	0.900E-02
45.00	11.4771	0.222E-01	0.800E-02
50.00	11.5222	0.200E-01	0.720E-02
55.00	11.5853	0.182E-01	0.655E-02
60.00	11.5673	0.167E-01	0.600E-02
65.00	11.6753	0.154E-01	0.554E-02
70.00	11.7202	0.143E-01	0.514E-02
75.00	11.7471	0.133E-01	0.480E-02
80.00	11.7919	0.125E-01	0.450E-02
85.00	11.7919	0.118E-01	0.424E-02
90.00	11.8813	0.111E-01	0.400E-02
110.00	11.9883	0.909E-02	0.327E-02
130.00	12.0328	0.769E-02	0.277E-02
150.00	12.1660	0.667E-02	0.240E-02
170.00	12.2368	0.588E-02	0.212E-02
190.00	12.2810	0.526E-02	0.189E-02
210.00	12.2810	0.476E-02	0.171E-02
230.00	12.3868	0.435E-02	0.157E-02
250.00	12.4132	0.400E-02	0.144E-02
270.00	12.5011	0.370E-02	0.133E-02
290.00	12.5887	0.345E-02	0.124E-02
310.00	12.6324	0.323E-02	0.116E-02
330.00	12.5887	0.303E-02	0.109E-02
350.00	12.6499	0.286E-02	0.103E-02
370.00	12.6499	0.270E-02	0.973E-03
390.00	12.6936	0.256E-02	0.923E-03
410.00	12.7371	0.244E-02	0.878E-03
430.00	12.7633	0.233E-02	0.837E-03
450.00	12.8068	0.222E-02	0.800E-03
470.00	12.8242	0.213E-02	0.766E-03
490.00	12.8242	0.204E-02	0.735E-03
510.00	12.8502	0.196E-02	0.706E-03
530.00	12.8936	0.189E-02	0.679E-03
550.00	12.8936	0.182E-02	0.655E-03
570.00	12.9110	0.175E-02	0.632E-03
590.00	12.9543	0.169E-02	0.610E-03
610.00	12.9543	0.164E-02	0.590E-03
630.00	12.9543	0.159E-02	0.571E-03
650.00	12.9543	0.154E-02	0.554E-03

SITE #2
 STAGE 2
 PUMP WELL DATA
 2 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well PW-2. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
670.00	12.9802	0.149E-02	0.537E-03
690.00	13.0407	0.145E-02	0.522E-03
710.00	12.9975	0.141E-02	0.507E-03
730.00	13.0407	0.137E-02	0.493E-03
750.00	13.0407	0.133E-02	0.480E-03
770.00	13.0235	0.130E-02	0.468E-03
790.00	12.9975	0.127E-02	0.456E-03
810.00	12.9543	0.123E-02	0.444E-03
830.00	13.0235	0.120E-02	0.434E-03
850.00	12.9975	0.118E-02	0.424E-03
870.00	12.9802	0.115E-02	0.414E-03
890.00	12.9802	0.112E-02	0.404E-03
910.00	12.9975	0.110E-02	0.396E-03
930.00	12.9975	0.108E-02	0.387E-03
950.00	12.9802	0.105E-02	0.379E-03
970.00	12.9975	0.103E-02	0.371E-03
990.00	12.9543	0.101E-02	0.364E-03
1010.00	12.9975	0.990E-03	0.356E-03
1030.00	12.9802	0.971E-03	0.350E-03
1050.00	12.9110	0.952E-03	0.343E-03
1070.00	12.9975	0.935E-03	0.336E-03
1090.00	12.9543	0.917E-03	0.330E-03
1110.00	12.9543	0.901E-03	0.324E-03
1130.00	12.9802	0.885E-03	0.319E-03
1150.00	12.9975	0.870E-03	0.313E-03
1170.00	12.9802	0.855E-03	0.308E-03
1190.00	12.9975	0.840E-03	0.303E-03
1210.00	12.9802	0.826E-03	0.298E-03
1230.00	13.0235	0.813E-03	0.293E-03
1250.00	13.0235	0.800E-03	0.288E-03

SITE #2
 STAGE 2
 PUMP WELL DATA
 3 OF 3

Unconfined Aquifer Reduced Drawdown Data
Well: OW-1

Distance (r): 25.0 feet Thickness (b): 63.96 feet
Discharge Rate: 572 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.1270	0.600E+05	0.375E+08
0.05	0.1154	0.200E+02	0.125E+05
0.10	0.5349	0.100E+02	0.625E+04
0.15	0.9175	0.667E+01	0.417E+04
0.20	1.2015	0.500E+01	0.312E+04
0.25	1.4165	0.400E+01	0.250E+04
0.30	1.5969	0.333E+01	0.208E+04
0.35	1.7375	0.286E+01	0.179E+04
0.40	1.8665	0.250E+01	0.156E+04
0.50	2.0903	0.200E+01	0.125E+04
0.60	2.2688	0.167E+01	0.104E+04
0.70	2.3967	0.143E+01	0.893E+03
0.80	2.4911	0.125E+01	0.781E+03
0.90	2.5908	0.111E+01	0.694E+03
1.00	2.6572	0.100E+01	0.625E+03
1.50	2.9331	0.667E+00	0.417E+03
2.00	3.0871	0.500E+00	0.312E+03
2.50	3.1803	0.400E+00	0.250E+03
3.00	3.2515	0.333E+00	0.208E+03
3.50	3.3063	0.286E+00	0.179E+03
4.00	3.3445	0.250E+00	0.156E+03
4.50	3.3882	0.222E+00	0.139E+03
5.00	3.4155	0.200E+00	0.125E+03
6.00	3.5355	0.167E+00	0.104E+03
7.00	3.5627	0.143E+00	0.893E+02
8.00	3.6172	0.125E+00	0.781E+02
9.00	3.6607	0.111E+00	0.694E+02
10.00	3.6878	0.100E+00	0.625E+02
11.00	3.7150	0.909E-01	0.568E+02
12.00	3.6987	0.833E-01	0.521E+02
13.00	3.7150	0.769E-01	0.481E+02
14.00	3.7150	0.714E-01	0.446E+02
15.00	3.7259	0.667E-01	0.417E+02
16.00	3.7421	0.625E-01	0.391E+02
17.00	3.7530	0.588E-01	0.368E+02
18.00	3.8072	0.556E-01	0.347E+02
19.00	3.8235	0.526E-01	0.329E+02
20.00	3.8506	0.500E-01	0.313E+02
21.00	3.8614	0.476E-01	0.298E+02
22.00	3.8885	0.455E-01	0.284E+02
23.00	3.8614	0.435E-01	0.272E+02
24.00	3.8885	0.417E-01	0.260E+02
25.00	3.9047	0.400E-01	0.250E+02
26.00	3.9156	0.385E-01	0.240E+02

SITE #2
STAGE 2
OW-1 DATA
1 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well OW-1. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
27.00	3.9318	0.370E-01	0.231E+02
28.00	3.9426	0.357E-01	0.223E+02
29.00	3.9426	0.345E-01	0.216E+02
30.00	3.9047	0.333E-01	0.208E+02
35.00	3.9859	0.286E-01	0.179E+02
40.00	4.0507	0.250E-01	0.156E+02
45.00	4.0777	0.222E-01	0.139E+02
50.00	4.1316	0.200E-01	0.125E+02
55.00	4.1316	0.182E-01	0.114E+02
60.00	4.1046	0.167E-01	0.104E+02
65.00	4.1855	0.154E-01	0.962E+01
70.00	4.2285	0.143E-01	0.893E+01
75.00	4.2393	0.133E-01	0.833E+01
80.00	4.2554	0.125E-01	0.781E+01
85.00	4.2662	0.118E-01	0.735E+01
90.00	4.2931	0.111E-01	0.694E+01
110.00	4.3468	0.909E-02	0.568E+01
130.00	4.3897	0.769E-02	0.481E+01
150.00	4.4541	0.667E-02	0.417E+01
170.00	4.4969	0.588E-02	0.368E+01
190.00	4.5237	0.526E-02	0.329E+01
210.00	4.5344	0.476E-02	0.298E+01
230.00	4.5879	0.435E-02	0.272E+01
250.00	4.6146	0.400E-02	0.250E+01
270.00	4.6840	0.370E-02	0.231E+01
290.00	4.7214	0.345E-02	0.216E+01
310.00	4.7640	0.323E-02	0.202E+01
330.00	4.7640	0.303E-02	0.189E+01
350.00	4.7906	0.286E-02	0.179E+01
370.00	4.8013	0.270E-02	0.169E+01
390.00	4.8279	0.256E-02	0.160E+01
410.00	4.8545	0.244E-02	0.152E+01
430.00	4.8705	0.233E-02	0.145E+01
450.00	4.8971	0.222E-02	0.139E+01
470.00	4.9236	0.213E-02	0.133E+01
490.00	4.9343	0.204E-02	0.128E+01
510.00	4.9502	0.196E-02	0.123E+01
530.00	4.9608	0.189E-02	0.118E+01
550.00	4.9767	0.182E-02	0.114E+01
570.00	4.9874	0.175E-02	0.110E+01
590.00	5.0033	0.169E-02	0.106E+01
610.00	5.0139	0.164E-02	0.102E+01
630.00	5.0298	0.159E-02	0.992E+00
650.00	5.0404	0.154E-02	0.962E+00

SITE #2
 STAGE 2
 OW-1 DATA
 2 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well OW-1. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
670.00	5.0563	0.149E-02	0.933E+00
690.00	5.0669	0.145E-02	0.906E+00
710.00	5.0139	0.141E-02	0.880E+00
730.00	5.0828	0.137E-02	0.856E+00
750.00	5.0828	0.133E-02	0.833E+00
770.00	5.0934	0.130E-02	0.812E+00
790.00	5.0828	0.127E-02	0.791E+00
810.00	5.0828	0.123E-02	0.772E+00
830.00	5.0934	0.120E-02	0.753E+00
850.00	5.0934	0.118E-02	0.735E+00
870.00	5.1093	0.115E-02	0.718E+00
890.00	5.0934	0.112E-02	0.702E+00
910.00	5.1093	0.110E-02	0.687E+00
930.00	5.1093	0.108E-02	0.672E+00
950.00	5.1093	0.105E-02	0.658E+00
970.00	5.1199	0.103E-02	0.644E+00
990.00	5.1199	0.101E-02	0.631E+00
1010.00	5.1199	0.990E-03	0.619E+00
1030.00	5.1199	0.971E-03	0.607E+00
1050.00	5.0563	0.952E-03	0.595E+00
1070.00	5.1199	0.935E-03	0.584E+00
1090.00	5.1357	0.917E-03	0.573E+00
1110.00	5.1357	0.901E-03	0.563E+00
1130.00	5.1357	0.885E-03	0.553E+00
1150.00	5.1463	0.870E-03	0.543E+00
1170.00	5.1463	0.855E-03	0.534E+00
1190.00	5.1728	0.840E-03	0.525E+00
1210.00	5.1728	0.826E-03	0.517E+00
1230.00	5.1886	0.813E-03	0.508E+00
1250.00	5.1992	0.800E-03	0.500E+00

SITE #2
 STAGE 2
 OW-1 DATA
 3 OF 3

Unconfined Aquifer Reduced Drawdown Data
Well: OW-2

Distance (r): 52.0 feet Thickness (b): 55.72 feet
Discharge Rate: 572 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.1039	0.600E+05	0.162E+09
0.05	0.0577	0.200E+02	0.541E+05
0.10	0.0577	0.100E+02	0.270E+05
0.15	0.2306	0.667E+01	0.180E+05
0.20	0.3742	0.500E+01	0.135E+05
0.25	0.5003	0.400E+01	0.108E+05
0.30	0.6318	0.333E+01	0.901E+04
0.35	0.7288	0.286E+01	0.773E+04
0.40	0.8142	0.250E+01	0.676E+04
0.50	0.9847	0.200E+01	0.541E+04
0.60	1.1150	0.167E+01	0.451E+04
0.70	1.2281	0.143E+01	0.386E+04
0.80	1.3127	0.125E+01	0.338E+04
0.90	1.3803	0.111E+01	0.300E+04
1.00	1.4366	0.100E+01	0.270E+04
1.50	1.6779	0.667E+00	0.180E+04
2.00	1.8177	0.500E+00	0.135E+04
2.50	1.9293	0.400E+00	0.108E+04
3.00	1.9961	0.333E+00	0.901E+03
3.50	2.0684	0.286E+00	0.773E+03
4.00	2.1073	0.250E+00	0.676E+03
4.50	2.1517	0.222E+00	0.601E+03
5.00	2.1628	0.200E+00	0.541E+03
6.00	2.2737	0.167E+00	0.451E+03
7.00	2.3290	0.143E+00	0.386E+03
8.00	2.3732	0.125E+00	0.338E+03
9.00	2.4119	0.111E+00	0.300E+03
10.00	2.4395	0.100E+00	0.270E+03
11.00	2.4670	0.909E-01	0.246E+03
12.00	2.4670	0.833E-01	0.225E+03
13.00	2.4836	0.769E-01	0.208E+03
14.00	2.4836	0.714E-01	0.193E+03
15.00	2.4836	0.667E-01	0.180E+03
16.00	2.5111	0.625E-01	0.169E+03
17.00	2.5111	0.588E-01	0.159E+03
18.00	2.5662	0.556E-01	0.150E+03
19.00	2.5937	0.526E-01	0.142E+03
20.00	2.6047	0.500E-01	0.135E+03
21.00	2.6322	0.476E-01	0.129E+03
22.00	2.6322	0.455E-01	0.123E+03
23.00	2.6322	0.435E-01	0.118E+03
24.00	2.6487	0.417E-01	0.113E+03
25.00	2.6762	0.400E-01	0.108E+03
26.00	2.6871	0.385E-01	0.104E+03

SITE #2
STAGE 2
OW-2 DATA
1 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well OW-2. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
27.00	2.7036	0.370E-01	0.100E+03
28.00	2.7146	0.357E-01	0.966E+02
29.00	2.7311	0.345E-01	0.932E+02
30.00	2.6762	0.333E-01	0.901E+02
35.00	2.7585	0.286E-01	0.773E+02
40.00	2.8242	0.250E-01	0.676E+02
45.00	2.8516	0.222E-01	0.601E+02
50.00	2.9063	0.200E-01	0.541E+02
55.00	2.9336	0.182E-01	0.492E+02
60.00	2.9063	0.167E-01	0.451E+02
65.00	2.9882	0.154E-01	0.416E+02
70.00	3.0155	0.143E-01	0.386E+02
75.00	3.0319	0.133E-01	0.361E+02
80.00	3.0428	0.125E-01	0.338E+02
85.00	3.0591	0.118E-01	0.318E+02
90.00	3.0864	0.111E-01	0.300E+02
110.00	3.1408	0.909E-02	0.246E+02
130.00	3.1789	0.769E-02	0.208E+02
150.00	3.2332	0.667E-02	0.180E+02
170.00	3.2766	0.588E-02	0.159E+02
190.00	3.3038	0.526E-02	0.142E+02
210.00	3.3146	0.476E-02	0.129E+02
230.00	3.3580	0.435E-02	0.118E+02
250.00	3.3850	0.400E-02	0.108E+02
270.00	3.4500	0.370E-02	0.100E+02
290.00	3.4932	0.345E-02	0.932E+01
310.00	3.5040	0.323E-02	0.872E+01
330.00	3.5202	0.303E-02	0.819E+01
350.00	3.5472	0.286E-02	0.773E+01
370.00	3.5580	0.270E-02	0.731E+01
390.00	3.5849	0.256E-02	0.693E+01
410.00	3.6119	0.244E-02	0.660E+01
430.00	3.6281	0.233E-02	0.629E+01
450.00	3.6388	0.222E-02	0.601E+01
470.00	3.6658	0.213E-02	0.575E+01
490.00	3.6819	0.204E-02	0.552E+01
510.00	3.6927	0.196E-02	0.530E+01
530.00	3.7088	0.189E-02	0.510E+01
550.00	3.7357	0.182E-02	0.492E+01
570.00	3.7464	0.175E-02	0.474E+01
590.00	3.7464	0.169E-02	0.458E+01
610.00	3.7626	0.164E-02	0.443E+01
630.00	3.7894	0.159E-02	0.429E+01
650.00	3.8001	0.154E-02	0.416E+01

SITE # 2
 STAGE 2
 OW-2 DATA
 2 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well OW-2. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	l/t	r2/t
670.00	3.8001	0.149E-02	0.404E+01
690.00	3.8270	0.145E-02	0.392E+01
710.00	3.7733	0.141E-02	0.381E+01
730.00	3.8431	0.137E-02	0.370E+01
750.00	3.8431	0.133E-02	0.361E+01
770.00	3.8431	0.130E-02	0.351E+01
790.00	3.8270	0.127E-02	0.342E+01
810.00	3.8270	0.123E-02	0.334E+01
830.00	3.8431	0.120E-02	0.326E+01
850.00	3.8431	0.118E-02	0.318E+01
870.00	3.8431	0.115E-02	0.311E+01
890.00	3.8431	0.112E-02	0.304E+01
910.00	3.8431	0.110E-02	0.297E+01
930.00	3.8431	0.108E-02	0.291E+01
950.00	3.8431	0.105E-02	0.285E+01
970.00	3.8538	0.103E-02	0.279E+01
990.00	3.8538	0.101E-02	0.273E+01
1010.00	3.8538	0.990E-03	0.268E+01
1030.00	3.8538	0.971E-03	0.263E+01
1050.00	3.8001	0.952E-03	0.258E+01
1070.00	3.8538	0.935E-03	0.253E+01
1090.00	3.8699	0.917E-03	0.248E+01
1110.00	3.8806	0.901E-03	0.244E+01
1130.00	3.8806	0.885E-03	0.239E+01
1150.00	3.8967	0.870E-03	0.235E+01
1170.00	3.9074	0.855E-03	0.231E+01
1190.00	3.9234	0.840E-03	0.227E+01
1210.00	3.9234	0.826E-03	0.223E+01
1230.00	3.9342	0.813E-03	0.220E+01
1250.00	3.9609	0.800E-03	0.216E+01

SITE #2
 STAGE 2
 OW-2 DATA
 3 OF 3

Unconfined Aquifer Reduced Drawdown Data
Well: OW-3

Distance (r): 99.1 feet Thickness (b): 52.52 feet
Discharge Rate: 572 GPM

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r ² /t
0.00	0.0462	0.600E+05	0.589E+09
0.05	0.0289	0.200E+02	0.196E+06
0.10	0.0577	0.100E+02	0.982E+05
0.15	0.1154	0.667E+01	0.655E+05
0.20	0.1903	0.500E+01	0.491E+05
0.25	0.2593	0.400E+01	0.393E+05
0.30	0.3454	0.333E+01	0.327E+05
0.35	0.4200	0.286E+01	0.281E+05
0.40	0.4887	0.250E+01	0.246E+05
0.50	0.6201	0.200E+01	0.196E+05
0.60	0.7171	0.167E+01	0.164E+05
0.70	0.8195	0.143E+01	0.140E+05
0.80	0.8877	0.125E+01	0.123E+05
0.90	0.9444	0.111E+01	0.109E+05
1.00	1.0011	0.100E+01	0.982E+04
1.50	1.2441	0.667E+00	0.655E+04
2.00	1.3961	0.500E+00	0.491E+04
2.50	1.5252	0.400E+00	0.393E+04
3.00	1.6204	0.333E+00	0.327E+04
3.50	1.7043	0.286E+00	0.281E+04
4.00	1.7768	0.250E+00	0.246E+04
4.50	1.8326	0.222E+00	0.218E+04
5.00	1.7880	0.200E+00	0.196E+04
6.00	1.8994	0.167E+00	0.164E+04
7.00	2.0272	0.143E+00	0.140E+04
8.00	2.0105	0.125E+00	0.123E+04
9.00	2.0660	0.111E+00	0.109E+04
10.00	2.1103	0.100E+00	0.982E+03
11.00	2.1380	0.909E-01	0.893E+03
12.00	2.2210	0.833E-01	0.818E+03
13.00	2.2044	0.769E-01	0.755E+03
14.00	2.2210	0.714E-01	0.701E+03
15.00	2.2210	0.667E-01	0.655E+03
16.00	2.2321	0.625E-01	0.614E+03
17.00	2.1657	0.588E-01	0.578E+03
18.00	2.2044	0.556E-01	0.546E+03
19.00	2.2210	0.526E-01	0.517E+03
20.00	2.2486	0.500E-01	0.491E+03
21.00	2.2597	0.476E-01	0.468E+03
22.00	2.2762	0.455E-01	0.446E+03
23.00	2.3590	0.435E-01	0.427E+03
24.00	2.2873	0.417E-01	0.409E+03
25.00	2.3038	0.400E-01	0.393E+03
26.00	2.3149	0.385E-01	0.378E+03

SITE #2
STAGE 2
OW-3
1 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well OW-3. PAGE 2

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
27.00	2.3314	0.370E-01	0.364E+03
28.00	2.3314	0.357E-01	0.351E+03
29.00	2.3424	0.345E-01	0.339E+03
30.00	2.3149	0.333E-01	0.327E+03
35.00	2.3700	0.286E-01	0.281E+03
40.00	2.4140	0.250E-01	0.246E+03
45.00	2.4416	0.222E-01	0.218E+03
50.00	2.4801	0.200E-01	0.196E+03
55.00	2.4801	0.182E-01	0.179E+03
60.00	2.4416	0.167E-01	0.164E+03
65.00	2.5075	0.154E-01	0.151E+03
70.00	2.5350	0.143E-01	0.140E+03
75.00	2.5515	0.133E-01	0.131E+03
80.00	2.5624	0.125E-01	0.123E+03
85.00	2.5789	0.118E-01	0.116E+03
90.00	2.5899	0.111E-01	0.109E+03
110.00	2.6337	0.909E-02	0.893E+02
130.00	2.6611	0.769E-02	0.755E+02
150.00	2.7158	0.667E-02	0.655E+02
170.00	2.7432	0.588E-02	0.578E+02
190.00	2.7705	0.526E-02	0.517E+02
210.00	2.7814	0.476E-02	0.468E+02
230.00	2.8087	0.435E-02	0.427E+02
250.00	2.8251	0.400E-02	0.393E+02
270.00	2.8796	0.370E-02	0.364E+02
290.00	2.9178	0.345E-02	0.339E+02
310.00	2.9341	0.323E-02	0.317E+02
330.00	2.9341	0.303E-02	0.298E+02
350.00	2.9450	0.286E-02	0.281E+02
370.00	2.9613	0.270E-02	0.265E+02
390.00	2.9885	0.256E-02	0.252E+02
410.00	2.9994	0.244E-02	0.240E+02
430.00	3.0157	0.233E-02	0.228E+02
450.00	3.0266	0.222E-02	0.218E+02
470.00	3.0428	0.213E-02	0.209E+02
490.00	3.0537	0.204E-02	0.200E+02
510.00	3.0700	0.196E-02	0.193E+02
530.00	3.0809	0.189E-02	0.185E+02
550.00	3.0971	0.182E-02	0.179E+02
570.00	3.1080	0.175E-02	0.172E+02
590.00	3.1080	0.169E-02	0.166E+02
610.00	3.1242	0.164E-02	0.161E+02
630.00	3.1351	0.159E-02	0.156E+02
650.00	3.1513	0.154E-02	0.151E+02

SITE #2
 STAGE 2
 OW-3 DATA
 2 OF 3

Unconfined Aquifer Reduced Drawdown Data
 Union Station Location 2, Test 2, Well OW-3. PAGE 3

Elapsed Time (mins.)	Jacobs' Corrected Drawdown s' (feet)	1/t	r2/t
670.00	3.1513	0.149E-02	0.147E+02
690.00	3.1784	0.145E-02	0.142E+02
710.00	3.1242	0.141E-02	0.138E+02
730.00	3.1784	0.137E-02	0.135E+02
750.00	3.1784	0.133E-02	0.131E+02
770.00	3.1784	0.130E-02	0.128E+02
790.00	3.1622	0.127E-02	0.124E+02
810.00	3.1622	0.123E-02	0.121E+02
830.00	3.1784	0.120E-02	0.118E+02
850.00	3.1784	0.118E-02	0.116E+02
870.00	3.1784	0.115E-02	0.113E+02
890.00	3.1784	0.112E-02	0.110E+02
910.00	3.1622	0.110E-02	0.108E+02
930.00	3.1622	0.108E-02	0.106E+02
950.00	3.1784	0.105E-02	0.103E+02
970.00	3.1784	0.103E-02	0.101E+02
990.00	3.1784	0.101E-02	0.992E+01
1010.00	3.1784	0.990E-03	0.972E+01
1030.00	3.1784	0.971E-03	0.953E+01
1050.00	3.1622	0.952E-03	0.935E+01
1070.00	3.1784	0.935E-03	0.918E+01
1090.00	3.1784	0.917E-03	0.901E+01
1110.00	3.1893	0.901E-03	0.885E+01
1130.00	3.1893	0.885E-03	0.869E+01
1150.00	3.2055	0.870E-03	0.854E+01
1170.00	3.2055	0.855E-03	0.839E+01
1190.00	3.2326	0.840E-03	0.825E+01
1210.00	3.2326	0.826E-03	0.812E+01
1230.00	3.2434	0.813E-03	0.798E+01
1250.00	3.2596	0.800E-03	0.786E+01

SITE #2
 STAGE 2
 OW-3 DATA
 3 OF 3

PUMP TEST RECOVERY DATA

Union Station Aquifer Test Location 2, Test 2 - Recovery
 Discharge Rate = 572 GPM for test 2.
 Discharge Duration = 1251 minutes

Elapsed Recovery Time (mins.)	Elapsed Time Ratio	Pumping	Observe	Observe	Observe				
		Well PW-2 Residual Drawdown (feet) Channel 1	Well OW-1 Residual Drawdown (feet) Channel 2	Well OW-2 Residual Drawdown (feet) Channel 3	Well OW-3 Residual Drawdown (feet) Channel 4				
0.15	8340.07	1	7.24	2	4.51	3	3.74	4	3.19
0.20	6255.48	1	6.20	2	4.27	3	3.61	4	3.11
0.25	5004.67	1	5.91	2	4.07	3	3.52	4	3.03
0.30	4170.77	1	5.31	2	3.90	3	3.42	4	2.95
0.35	3575.12	1	5.05	2	3.75	3	3.33	4	2.88
0.40	3128.37	1	4.64	2	3.64	3	3.25	4	2.80
0.50	2502.92	1	4.16	2	3.45	3	3.12	4	2.67
0.60	2085.94	1	3.81	2	3.31	3	3.02	4	2.56
0.70	1788.10	1	3.58	2	3.19	3	2.95	4	2.45
0.80	1564.72	1	3.41	2	3.09	3	2.89	4	2.37
0.90	1390.97	1	3.29	2	3.00	3	2.84	4	2.30
1.00	1251.98	1	3.18	2	2.93	3	2.80	4	2.24
1.50	834.99	1	2.95	2	2.70	3	2.64	4	1.99
2.00	626.49	1	2.80	2	2.54	3	2.55	4	1.91
2.50	501.40	1	2.71	2	2.45	3	2.50	4	1.85
3.00	418.00	1	2.68	2	2.40	3	2.44	4	1.81
3.50	358.43	1	2.62	2	2.34	3	2.40	4	1.78
4.00	313.75	1	2.56	2	2.30	3	2.37	4	1.76
4.50	279.00	1	2.54	2	2.25	3	2.32	4	1.73
5.00	251.20	1	2.43	2	2.19	3	2.29	4	1.65
6.00	209.50	1	2.37	2	2.17	3	2.26	4	1.63
7.00	179.71	1	2.31	2	2.13	3	2.24	4	1.63
8.00	157.38	1	2.28	2	2.10	3	2.22	4	1.62
9.00	140.00	1	2.25	2	2.07	3	2.19	4	1.61
10.00	126.10	1	2.19	2	2.04	3	2.17	4	1.62
11.00	114.73	1	2.16	2	1.99	3	2.14	4	1.61
12.00	105.25	1	2.16	2	1.98	3	2.11	4	1.61
13.00	97.23	1	2.14	2	1.95	3	2.09	4	1.59
14.00	90.36	1	2.10	2	1.92	3	2.06	4	1.58
15.00	84.40	1	2.08	2	1.89	3	2.03	4	1.56
16.00	79.19	1	2.04	2	1.84	3	1.96	4	1.53
17.00	74.59	1	2.02	2	1.79	3	1.95	4	1.58
18.00	70.50	1	1.96	2	1.75	3	1.91	4	1.55
19.00	66.84	1	1.91	2	1.72	3	1.88	4	1.53
20.00	63.55	1	1.87	2	1.69	3	1.85	4	1.50
21.00	60.57	1	1.87	2	1.66	3	1.83	4	1.50
22.00	57.86	1	1.85	2	1.63	3	1.79	4	1.47
23.00	55.39	1	1.79	2	1.61	3	1.76	4	1.40
24.00	53.13	1	1.81	2	1.63	3	1.79	4	1.43
25.00	51.04	1	1.81	2	1.63	3	1.77	4	1.43
26.00	49.12	1	1.76	2	1.58	3	1.73	4	1.46
27.00	47.33	1	1.70	2	1.55	3	1.70	4	1.44

PUMP TEST RECOVERY DATA
 Union Station Locastion 2, Test 2

PAGE 2

Elapsed Recovery Time (mins.)	Elapsed Time Ratio	Pumping Well PW-2 Residual Drawdown (feet) Channel 1	Observe Well OW-1 Residual Drawdown (feet) Channel 2	Observe Well OW-2 Residual Drawdown (feet) Channel 3	Observe Well OW-3 Residual Drawdown (feet) Channel 4
28.00	45.68	1 1.68	2 1.53	3 1.69	4 1.43
29.00	44.14	1 1.64	2 1.50	3 1.66	4 1.42
30.00	42.70	1 1.64	2 1.53	3 1.68	4 1.37
31.00	41.35	1 1.64	2 1.53	3 1.68	4 1.39
32.00	40.09	1 1.64	2 1.53	3 1.68	4 1.39
33.00	38.91	1 1.64	2 1.53	3 1.66	4 1.39
34.00	37.79	1 1.64	2 1.52	3 1.66	4 1.39
35.00	36.74	1 1.64	2 1.50	3 1.65	4 1.39
36.00	35.75	1 1.64	2 1.49	3 1.63	4 1.39
37.00	34.81	1 1.62	2 1.47	3 1.62	4 1.39
38.00	33.92	1 1.58	2 1.47	3 1.60	4 1.39
39.00	33.08	1 1.58	2 1.46	3 1.59	4 1.37
40.00	32.28	1 1.56	2 1.44	3 1.59	4 1.37
41.00	31.51	1 1.56	2 1.44	3 1.57	4 1.37
42.00	30.79	1 1.56	2 1.43	3 1.56	4 1.36
43.00	30.09	1 1.52	2 1.42	3 1.54	4 1.36
44.00	29.43	1 1.52	2 1.40	3 1.53	4 1.36
45.00	28.80	1 1.52	2 1.40	3 1.51	4 1.36
46.00	28.20	1 1.52	2 1.39	3 1.50	4 1.35
47.00	27.62	1 1.50	2 1.37	3 1.50	4 1.35
48.00	27.06	1 1.47	2 1.36	3 1.48	4 1.35
49.00	26.53	1 1.47	2 1.36	3 1.47	4 1.35
50.00	26.02	1 1.47	2 1.35	3 1.46	4 1.33
51.00	25.53	1 1.47	2 1.35	3 1.46	4 1.33
52.00	25.06	1 1.47	2 1.33	3 1.44	4 1.33
53.00	24.60	1 1.44	2 1.27	3 1.39	4 1.29
54.00	24.17	1 1.41	2 1.24	3 1.37	4 1.33
55.00	23.75	1 1.39	2 1.21	3 1.34	4 1.32
56.00	23.34	1 1.35	2 1.20	3 1.33	4 1.30
57.00	22.95	1 1.33	2 1.18	3 1.30	4 1.23
58.00	22.57	1 1.35	2 1.23	3 1.34	4 1.26
59.00	22.20	1 1.33	2 1.23	3 1.33	4 1.26
60.00	21.85	1 1.33	2 1.23	3 1.33	4 1.26
61.00	21.51	1 1.33	2 1.23	3 1.33	4 1.26
62.00	21.18	1 1.33	2 1.23	3 1.33	4 1.26
63.00	20.86	1 1.33	2 1.21	3 1.31	4 1.27
64.00	20.55	1 1.35	2 1.21	3 1.28	4 1.27
65.00	20.25	1 1.35	2 1.21	3 1.28	4 1.27
66.00	19.95	1 1.29	2 1.16	3 1.21	4 1.24
67.00	19.67	1 1.29	2 1.14	3 1.20	4 1.29
68.00	19.40	1 1.27	2 1.11	3 1.18	4 1.26
69.00	19.13	1 1.24	2 1.10	3 1.17	4 1.24

SITE #2
 RECOVERY DATA
 2 OF 3

PUMP TEST RECOVERY DATA
 Union Station Locastion 2, Test 2

PAGE 3

Elapsed Recovery Time (mins.)	Elapsed Time Ratio	Pumping Well PW-2 Residual Drawdown (feet) Channel 1	Observe Well OW-1 Residual Drawdown (feet) Channel 2	Observe Well OW-2 Residual Drawdown (feet) Channel 3	Observe Well OW-3 Residual Drawdown (feet) Channel 4
70.00	18.87	1 1.21	2 1.09	3 1.16	4 1.24
71.00	18.62	1 1.21	2 1.07	3 1.14	4 1.23
72.00	18.38	1 1.21	2 1.07	3 1.14	4 1.23
73.00	18.14	1 1.21	2 1.06	3 1.13	4 1.21
74.00	17.91	1 1.18	2 1.06	3 1.11	4 1.21
75.00	17.68	1 1.16	2 1.04	3 1.10	4 1.20
76.00	17.46	1 1.16	2 1.04	3 1.10	4 1.20
77.00	17.25	1 1.21	2 1.09	3 1.13	4 1.17
78.00	17.04	1 1.21	2 1.10	3 1.14	4 1.18
79.00	16.84	1 1.24	2 1.11	3 1.14	4 1.18
80.00	16.64	1 1.24	2 1.11	3 1.14	4 1.20
81.00	16.44	1 1.21	2 1.11	3 1.14	4 1.20
82.00	16.26	1 1.21	2 1.11	3 1.14	4 1.20
83.00	16.07	1 1.24	2 1.11	3 1.14	4 1.20
84.00	15.89	1 1.21	2 1.10	3 1.14	4 1.20
85.00	15.72	1 1.21	2 1.10	3 1.13	4 1.20
86.00	15.55	1 1.21	2 1.10	3 1.13	4 1.20
87.00	15.38	1 1.21	2 1.10	3 1.13	4 1.20
88.00	15.22	1 1.21	2 1.10	3 1.11	4 1.20
89.00	15.06	1 1.24	2 1.10	3 1.13	4 1.20
90.00	14.90	1 1.24	2 1.09	3 1.11	4 1.20
91.00	14.75	1 1.24	2 1.09	3 1.11	4 1.18
92.00	14.60	1 1.21	2 1.07	3 1.10	4 1.18
93.00	14.45	1 1.21	2 1.07	3 1.10	4 1.18
94.00	14.31	1 1.21	2 1.07	3 1.08	4 1.18
95.00	14.17	1 1.21	2 1.06	3 1.08	4 1.18
96.00	14.03	1 1.21	2 1.06	3 1.08	4 1.18
97.00	13.90	1 1.21	2 1.04	3 1.07	4 1.17
98.00	13.77	1 1.18	2 1.04	3 1.07	4 1.17
99.00	13.64	1 1.18	2 1.04	3 1.07	4 1.17
100.00	13.51	1 1.18	2 1.04	3 1.05	4 1.16
101.00	13.39	1 1.16	2 0.98	3 1.01	4 1.20
102.00	13.26	1 1.12	2 0.95	3 0.98	4 1.17
103.00	13.15	1 1.10	2 0.94	3 0.96	4 1.16
105.00	12.91	1 1.12	2 0.98	3 1.01	4 1.11
110.00	12.37	1 1.12	2 1.00	3 1.01	4 1.13
115.00	11.88	1 1.10	2 0.95	3 0.96	4 1.10
120.00	11.43	1 1.06	2 0.97	3 0.96	4 1.11
125.00	11.01	1 1.06	2 0.95	3 0.95	4 1.11
130.00	10.62	1 1.01	2 0.87	3 0.87	4 1.04
135.00	10.27	1 1.01	2 0.90	3 0.90	4 1.07
140.00	9.94	1 1.04	2 0.90	3 0.90	4 1.07

SITE #2
 RECOVERY DATA
 3 OF 3

JUNE 24, 1986

MRTC PUMP TEST - UNION STATION
SITE #1, MACY AND ALAMEDA
OBSERVATION WELL #4
r = 196.2'

SE1000B
Environmental Logger
06/26 15:37
SITE #1, o.w. 4
Unit# 10624 Test# 1
INPUT 1: Level (F) TOC
Reference 0.00
Scale factor 50.13
Offset 0.00

Step# 0 06/24 10:45

Elapsed Time	Value
0.0000	PUMPING 0.00
0.0033	STARTED 0.00
0.0066	(1046) 0.00
0.0099	0.00
0.0133	0.00
0.0166	0.00
0.0200	0.00
0.0233	0.00
0.0266	0.00
0.0300	0.00
0.0333	0.00
0.0366	0.00
0.0400	340-350 0.00
0.0433	gpm 0.00
0.0466	0.00
0.0500	0.00
0.0533	0.00
0.0566	0.00
0.0600	0.00
0.0633	0.00
0.0666	0.00
0.0700	0.00
0.0733	0.00
0.0766	0.00
0.0800	0.01
0.0833	0.01
0.0866	0.01
0.0900	0.01
0.0933	0.01
0.0966	0.01
0.1000	0.01
0.1033	0.01
0.1066	0.01
0.1100	0.01
0.1133	0.01
0.1166	0.01
0.1200	0.01
0.1233	0.01
0.1266	0.01
0.1300	0.01
0.1333	0.01
0.1366	0.01
0.1400	0.01
0.1433	0.01
0.1466	0.01
0.1500	0.01
0.1533	0.01
0.1566	0.01
0.1600	0.01
0.1633	0.01
0.1666	0.01
0.1700	0.01
0.1733	0.01
0.1766	0.01
0.1800	0.01
0.1833	0.01
0.1866	0.01
0.1900	0.01
0.1933	0.01
0.1966	0.01
0.2000	0.01
0.2033	0.01
0.2066	0.01
0.2100	0.01
0.2133	0.01
0.2166	0.01
0.2200	0.01
0.2233	0.01
0.2266	0.01
0.2300	0.01
0.2333	0.01
0.2366	0.01
0.2400	0.01
0.2433	0.01
0.2466	0.01
0.2500	0.01
0.2533	0.01
0.2566	0.01
0.2600	0.01
0.2633	0.01
0.2666	0.01
0.2700	0.01
0.2733	0.01
0.2766	0.01
0.2800	0.01
0.2833	0.01
0.2866	0.01
0.2900	0.01
0.2933	0.01
0.2966	0.01
0.3000	0.01
0.3033	0.01
0.3066	0.01
0.3100	0.01
0.3133	0.01
0.3166	0.01
0.3200	0.01
0.3233	0.01
0.3266	0.01
0.3300	0.01
0.3333	0.01
0.3366	0.01
0.3400	0.01
0.3433	0.01
0.3466	0.01
0.3500	0.01
0.3533	0.01
0.3566	0.01
0.3600	0.01
0.3633	0.01
0.3666	0.01
0.3700	0.01
0.3733	0.01
0.3766	0.01
0.3800	0.01
0.3833	0.01
0.3866	0.01
0.3900	0.01
0.3933	0.01
0.3966	0.01
0.4000	0.01
0.4033	0.01
0.4066	0.01
0.4100	0.01
0.4133	0.01
0.4166	0.01
0.4200	0.01
0.4233	0.01
0.4266	0.01
0.4300	0.01
0.4333	0.01
0.4366	0.01
0.4400	0.01
0.4433	0.01
0.4466	0.01
0.4500	0.01
0.4533	0.01
0.4566	0.01
0.4600	0.01
0.4633	0.01
0.4666	0.01
0.4700	0.01
0.4733	0.01
0.4766	0.01
0.4800	0.01
0.4833	0.01
0.4866	0.01
0.4900	0.01
0.4933	0.01
0.4966	0.01
0.5000	0.01
0.5033	0.01
0.5066	0.01
0.5100	0.01
0.5133	0.01
0.5166	0.01
0.5200	0.01
0.5233	0.01
0.5266	0.01
0.5300	0.01
0.5333	0.01
0.5366	0.01
0.5400	0.01
0.5433	0.01
0.5466	0.01
0.5500	0.01
0.5533	0.01
0.5566	0.01
0.5600	0.01
0.5633	0.01
0.5666	0.01
0.5700	0.01
0.5733	0.01
0.5766	0.01
0.5800	0.01
0.5833	0.01
0.5866	0.01
0.5900	0.01
0.5933	0.01
0.5966	0.01
0.6000	0.01
0.6033	0.01
0.6066	0.01
0.6100	0.01
0.6133	0.01
0.6166	0.01
0.6200	0.01
0.6233	0.01
0.6266	0.01
0.6300	0.01
0.6333	0.01
0.6366	0.01
0.6400	0.01
0.6433	0.01
0.6466	0.01
0.6500	0.01
0.6533	0.01
0.6566	0.01
0.6600	0.01
0.6633	0.01
0.6666	0.01
0.6700	0.01
0.6733	0.01
0.6766	0.01
0.6800	0.01
0.6833	0.01
0.6866	0.01
0.6900	0.01
0.6933	0.01
0.6966	0.01
0.7000	0.01
0.7033	0.01
0.7066	0.01
0.7100	0.01
0.7133	0.01
0.7166	0.01
0.7200	0.01
0.7233	0.01
0.7266	0.01
0.7300	0.01
0.7333	0.01
0.7366	0.01
0.7400	0.01
0.7433	0.01
0.7466	0.01
0.7500	0.01
0.7533	0.01
0.7566	0.01
0.7600	0.01
0.7633	0.01
0.7666	0.01
0.7700	0.01
0.7733	0.01
0.7766	0.01
0.7800	0.01
0.7833	0.01
0.7866	0.01
0.7900	0.01
0.7933	0.01
0.7966	0.01
0.8000	0.01
0.8033	0.01
0.8066	0.01
0.8100	0.01
0.8133	0.01
0.8166	0.01
0.8200	0.01
0.8233	0.01
0.8266	0.01
0.8300	0.01
0.8333	0.01
0.8366	0.01
0.8400	0.01
0.8433	0.01
0.8466	0.01
0.8500	0.01
0.8533	0.01
0.8566	0.01
0.8600	0.01
0.8633	0.01
0.8666	0.01
0.8700	0.01
0.8733	0.01
0.8766	0.01
0.8800	0.01
0.8833	0.01
0.8866	0.01
0.8900	0.01
0.8933	0.01
0.8966	0.01
0.9000	0.01
0.9033	0.01
0.9066	0.01
0.9100	0.01
0.9133	0.01
0.9166	0.01
0.9200	0.01
0.9233	0.01
0.9266	0.01
0.9300	0.01
0.9333	0.01
0.9366	0.01
0.9400	0.01
0.9433	0.01
0.9466	0.01
0.9500	0.01
0.9533	0.01
0.9566	0.01
0.9600	0.01
0.9633	0.01
0.9666	0.01
0.9700	0.01
0.9733	0.01
0.9766	0.01
0.9800	0.01
0.9833	0.01
0.9866	0.01
0.9900	0.01
0.9933	0.01
0.9966	0.01
1.0000	0.01

1.0000	0.22
1.0933	0.25
1.1667	0.28
1.2500	0.31
1.3333	0.33
1.4136	0.36
2.5000	0.39
2.5833	0.42
2.6667	0.44
2.7500	0.47
2.8333	0.49
2.9167	0.50
2.0000	0.53
2.5000	0.63
3.0000	0.71
3.5000	0.75
4.0000	0.82
4.5000	0.85
5.0000	0.87
5.5000	0.88
6.0000	0.90
6.5000	0.90
7.0000	0.91
7.5000	0.91
8.0000	0.93
8.5000	0.93
9.0000	0.91
9.5000	0.93
10.0000	0.94
12.0	0.68
14.0	0.36
16.0	0.23
18.0	0.18
20.0	0.15
22.0	0.14
24.0	0.11
26.0	0.11
28.0	0.09
30.0	0.09
32.0	0.07
34.0	0.07
36.0	0.07
38.0	0.06
40.0	0.06
42.0	0.06
44.0	0.26
46.0	0.24
48.0	0.04
50.0	0.04

PUMPING
↓
RECOVERY
↓
RESTART STEP #1

PUMP CIRCUIT
SHUT OFF AT 10:50
PUMP ROTATING
BACKWARDS - TRIPPED
CIRCUIT

SITE #1
STAGE 1
(NOT EVALUATED)
(9-MINUTE TEST)
1 OF 1

SE10008
 Environmental Logger
 06/26 15:50
 SITE #1 - UNION STATION
 Unit# 10624 Test# 1
 OBSERVATION WELL #4
 INPUT 1: Level (F) TOC
 PUMP TEST
 Reference 0.00
 Scale factor 50.13
 Offset 0.00

Step# 1 06/24 11:35

(136)

Elapsed Time	Value
0.0000	0.04
0.0033	0.04
0.0066	0.04
0.0099	0.04
0.0133	0.04
0.0166	0.04
0.0200	0.04
0.0233	0.04
0.0266	0.06
0.0300	0.04
0.0333	0.04
0.0500	0.04
0.0666	0.04
0.0833	0.04
0.1000	0.04
0.1166	0.04
0.1333	0.06
0.1500	0.04
0.1666	0.06
0.1833	0.06
0.2000	0.06
0.2166	0.06
0.2333	0.06
0.2500	0.06
0.2666	0.06
0.2833	0.06
0.3000	0.06
0.3155	0.07
0.3333	0.07
0.4157	0.09
0.5000	0.11
0.5833	0.12
0.6667	0.14
0.7500	0.15
0.8333	0.19
0.9167	0.20
1.0000	0.23
1.0833	0.26
1.1667	0.29
1.2500	0.31
1.3333	0.34
1.4166	0.36
1.5000	0.39
1.5833	0.42
1.6667	0.44
1.7500	0.45
1.8333	0.49
1.9167	0.52
2.0000	0.53
2.0833	0.64
3.0000	0.72
3.5000	0.79
4.0000	0.85
4.5000	0.89
5.0000	0.93
5.5000	0.96
6.0000	0.99
6.5000	1.01
7.0000	1.02
7.5000	1.02
8.0000	1.04
8.5000	1.05
9.0000	1.05
9.5000	1.07

10.0	1.07
12.0	1.10
14.0	1.12
16.0	1.13
18.0	1.13
20.0	1.15
22.0	1.15
24.0	1.15
26.0	1.17
28.0	1.17
30.0	1.18
32.0	1.18
34.0	1.20
36.0	1.20
38.0	1.20
40.0	1.20
42.0	1.21
44.0	1.23
46.0	1.21
48.0	1.23
50.0	1.23
52.0	1.24
54.0	1.24
56.0	1.26
58.0	1.26
60.0	1.26
62.0	1.26
64.0	1.28
66.0	1.26
68.0	1.28
70.0	1.29
72.0	1.29
74.0	1.29
76.0	1.29
78.0	1.31
80.0	1.31
82.0	1.31
84.0	1.32
86.0	1.34
88.0	1.34
90.0	1.34
92.0	1.34
94.0	1.36
96.0	1.36
98.0	1.36
100.0	1.36
110.0	1.37
120.0	1.40
130.0	1.42
140.0	1.43
150.0	1.47
160.0	1.50
170.0	1.51
180.0	1.55
190.0	1.56
200.0	1.59
210.0	1.61
220.0	1.62
230.0	1.64
240.0	1.66
250.0	1.69
260.0	1.70
270.0	1.72
280.0	1.74
290.0	1.77
300.0	1.78
310.0	1.80
320.0	1.81
330.0	1.83
340.0	1.85
350.0	1.86
360.0	1.89
370.0	1.89
380.0	1.91
390.0	1.92
400.0	1.92
410.0	1.96
420.0	1.97
430.0	1.99
440.0	1.99
450.0	2.00

A-128

SITE #1, MACY AND ALAMEDA
 50 HOUR PUMP TEST -
 OBSERVATION WELL #4

83-1140-06 r = 196.2'
 6/24/86
 6/26/86

460.0	2.02
470.0	2.04
480.0	2.05
490.0	2.07
500.0	2.07
510.0	2.08
520.0	2.10
530.0	2.11
540.0	2.13
550.0	2.15
560.0	2.16
570.0	2.16
580.0	2.18
590.0	2.19
600.0	2.21
610.0	2.21
620.0	2.23
630.0	2.24
640.0	2.26
650.0	2.27
660.0	2.27
670.0	2.29
680.0	2.30
690.0	2.30
700.0	2.32
710.0	2.34
720.0	2.34
730.0	2.35
740.0	2.37
750.0	2.38
760.0	2.38
770.0	2.40
780.0	2.42
790.0	2.42
800.0	2.43
810.0	2.45
820.0	2.45
830.0	2.46
840.0	2.48
850.0	2.48
860.0	2.49
870.0	2.51
880.0	2.51
890.0	2.53
900.0	2.54
910.0	2.54
920.0	2.56
930.0	2.56
940.0	2.57
950.0	2.59
960.0	2.59
970.0	2.61
980.0	2.61
990.0	2.62
1000.0	2.64
1100.0	2.73
1200.0	2.83
1300.0	2.91
1400.0	2.98
1500.0	3.08
1600.0	3.14
1700.0	3.22
1800.0	3.29
1900.0	3.35
2000.0	3.41
2100.0	3.48
2200.0	3.54
2300.0	3.59
2400.0	3.65
2500.0	3.71
2600.0	3.76
2700.0	3.82
2800.0	3.89
2900.0	3.93

END

SITE #1
 STAGE 2
 OW-4 DA
 1 OF 1

83-1140-06 6/26/86
 MRTE PUMP TEST-UNION STATION
 OBSERVATION WELL #4 r = 196.2
 RECOVERY TEST

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SE10008
 Environmental Logger
 06/26 17:47
 Unit# 10624 Test# 1
 INPUT 1: Level (F) TOC
 Reference 0.00
 Scale factor 50.13
 Offset 0.00

Step# 2 06/26 13:35

Elapsed Time Value

Elapsed Time	Value
0.0000	3.98
0.0033	3.98
0.0066	3.98
0.0099	3.98
0.0133	4.00
0.0166	3.98
0.0200	3.98
0.0233	4.00
0.0266	4.00
0.0300	4.00
0.0333	4.00
0.0366	3.98
0.0400	3.98
0.0433	3.98
0.0466	3.98
0.0500	3.98
0.0533	3.98
0.0566	3.98
0.0600	3.98
0.0633	3.98
0.0666	3.98
0.0700	3.98
0.0733	3.98
0.0766	3.98
0.0800	3.98
0.0833	3.98
0.0866	3.98
0.0900	3.98
0.0933	3.98
0.0966	3.98
0.1000	3.98
0.1033	3.98
0.1066	3.98
0.1100	3.98
0.1133	3.98
0.1166	3.98
0.1200	3.98
0.1233	3.98
0.1266	3.98
0.1300	3.98
0.1333	3.98
0.1366	3.98
0.1400	3.98
0.1433	3.98
0.1466	3.98
0.1500	3.98
0.1533	3.98
0.1566	3.98
0.1600	3.98
0.1633	3.98
0.1666	3.98
0.1700	3.98
0.1733	3.98
0.1766	3.98
0.1800	3.98
0.1833	3.98
0.1866	3.98
0.1900	3.98
0.1933	3.98
0.1966	3.98
0.2000	3.98
0.2033	3.98
0.2066	3.98
0.2100	3.98
0.2133	3.98
0.2166	3.98
0.2200	3.98
0.2233	3.98
0.2266	3.98
0.2300	3.98
0.2333	3.98
0.2366	3.98
0.2400	3.98
0.2433	3.98
0.2466	3.98
0.2500	3.98
0.2533	3.98
0.2566	3.98
0.2600	3.98
0.2633	3.98
0.2666	3.98
0.2700	3.98
0.2733	3.98
0.2766	3.98
0.2800	3.98
0.2833	3.98
0.2866	3.98
0.2900	3.98
0.2933	3.98
0.2966	3.98
0.3000	3.98
0.3033	3.98
0.3066	3.98
0.3100	3.98
0.3133	3.98
0.3166	3.98
0.3200	3.98
0.3233	3.98
0.3266	3.98
0.3300	3.98
0.3333	3.98
0.3366	3.98
0.3400	3.98
0.3433	3.98
0.3466	3.98
0.3500	3.98
0.3533	3.98
0.3566	3.98
0.3600	3.98
0.3633	3.98
0.3666	3.98
0.3700	3.98
0.3733	3.98
0.3766	3.98
0.3800	3.98
0.3833	3.98
0.3866	3.98
0.3900	3.98
0.3933	3.98
0.3966	3.98
0.4000	3.98
0.4033	3.98
0.4066	3.98
0.4100	3.98
0.4133	3.98
0.4166	3.98
0.4200	3.98
0.4233	3.98
0.4266	3.98
0.4300	3.98
0.4333	3.98
0.4366	3.98
0.4400	3.98
0.4433	3.98
0.4466	3.98
0.4500	3.98
0.4533	3.98
0.4566	3.98
0.4600	3.98
0.4633	3.98
0.4666	3.98
0.4700	3.98
0.4733	3.98
0.4766	3.98
0.4800	3.98
0.4833	3.98
0.4866	3.98
0.4900	3.98
0.4933	3.98
0.4966	3.98
0.5000	3.98

Pump
 SHUTOFF
 (1336)
 RECOVERY

5.5	3.48
6.0	3.48
6.5	3.44
7.0	3.43
7.5	3.41
8.0	3.40
8.5	3.40
9.0	3.38
9.5	3.36
10.0	3.36
12.0	3.33
14.0	3.30
16.0	3.29
18.0	3.25
20.0	3.24
22.0	3.22
24.0	3.21
26.0	3.21
28.0	3.17
30.0	3.17
32.0	3.16
34.0	3.14
36.0	3.14
38.0	3.13
40.0	3.11
42.0	3.10
44.0	3.10
46.0	3.08
48.0	3.08
50.0	3.06
52.0	3.06
54.0	3.05
56.0	3.05
58.0	3.03
60.0	3.03
62.0	3.02
64.0	3.02
66.0	3.00
68.0	3.00
70.0	2.98
72.0	2.98
74.0	2.97
76.0	2.97
78.0	2.97
80.0	2.95
82.0	2.95
84.0	2.94
86.0	2.94
88.0	2.94
90.0	2.92
92.0	2.92
94.0	2.92
96.0	2.91
98.0	2.91
100.0	2.89
110.0	2.86
120.0	2.84
130.0	2.81
140.0	2.79
150.0	2.78
160.0	2.76
170.0	2.75
180.0	2.73
190.0	2.73
200.0	2.72
210.0	2.70
220.0	2.70
230.0	2.68
240.0	2.67
250.0	2.65

SITE #1
 RECOVERY DATA
 OW-4
 1 of 1

END

MRTC PUMP TEST
 UNION STATION SITE #2
 Ready 48 hr TEST
 Ready OBSERVATION WELL 5-5
 SE10008 R=199.4'
 Environmental Logger
 06/08 15:59

Unit# 20606 Test# 0

INPUT 1: Level (F)
 (ELEVATION)
 Reference 253.22
 Scale factor 50.13
 Offset 0.00

Step# 0 06/06 16:13

Elapsed Time	Value
0.0000	253.20
0.0033	253.20
0.0066	253.20
0.0099	253.20
0.0133	253.20
0.0166	253.20
0.0200	253.20
0.0233	253.20
0.0266	253.20
0.0300	253.20
0.0333	253.20
0.0500	253.20
0.0666	253.20
0.0833	253.20
0.1000	253.20
0.1166	253.20
0.1333	253.20
0.1500	253.20
0.1666	253.20
0.1833	253.20
0.2000	253.20
0.2166	253.20
0.2333	253.20
0.2500	253.20
0.2666	253.20
0.2833	253.20
0.3000	253.20
0.3166	253.20
0.3333	253.20
0.4167	253.20
0.5000	253.20
0.5833	253.20
0.6667	253.20
0.7500	253.20
0.8333	253.20
0.9167	253.20
1.0000	253.20
1.0833	253.18
1.1667	253.18
1.2500	253.18
1.3333	253.18
1.4166	253.18
1.5000	253.18
1.5833	253.17
1.6667	253.17
1.7500	253.17
1.8333	253.17
1.9167	253.17
2.0000	253.17
2.5000	253.15
3.0000	253.14
3.5000	253.14
4.0000	253.12
4.5000	253.10
5.0000	253.10
5.5000	253.09
6.0000	253.07
6.5000	253.06
7.0000	253.06
7.5000	253.04

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9.0000	253.04
8.5000	253.03
9.0000	253.03
9.5000	253.01
10.0000	253.01
12.0000	252.99
14.0000	252.98
16.0000	252.95
18.0000	252.93
20.0000	252.89
22.0000	252.88
24.0000	252.88
26.0000	252.87
28.0000	252.87
30.0000	252.85
32.0000	252.85
34.0000	252.85
36.0000	252.85
38.0000	252.85
40.0000	252.85
42.0000	252.85
44.0000	252.85
46.0000	252.85
48.0000	252.84
50.0000	252.84
52.0000	252.85
54.0000	252.84
56.0000	252.84
58.0000	252.84
60.0000	252.84
62.0000	252.84
64.0000	252.84
66.0000	252.82
68.0000	252.82
70.0000	252.82
72.0000	252.82
74.0000	252.82
76.0000	252.82
78.0000	252.82
80.0000	252.82
82.0000	252.82
84.0000	252.82
86.0000	252.82
88.0000	252.80
90.0000	252.82
92.0000	252.82
94.0000	252.80
96.0000	252.80
98.0000	252.80
100.000	252.80
110.000	252.82
120.000	252.80
130.000	252.80
140.000	252.80
150.000	252.79
160.000	252.77
170.000	252.76
180.000	252.76
190.000	252.74
200.000	252.74
210.000	252.71
220.000	252.71
230.000	252.69
240.000	252.68
250.000	252.66
260.000	252.66
270.000	252.65
280.000	252.65
290.000	252.63
300.000	252.63
310.000	252.63
320.000	252.61
330.000	252.60
340.000	252.60
350.000	252.60
360.000	252.58
370.000	252.58
380.000	252.58
390.000	252.58
400.000	252.57
410.000	252.57

420.000	252.55
430.000	252.55
440.000	252.55
450.000	252.55
460.000	252.52
470.000	252.52
480.000	252.50
490.000	252.50
500.000	252.50
510.000	252.49
520.000	252.49
530.000	252.49
540.000	252.49
550.000	252.47
560.000	252.47
570.000	252.46
580.000	252.46
590.000	252.46
600.000	252.46
610.000	252.44
620.000	252.44
630.000	252.42
640.000	252.42
650.000	252.42
660.000	252.42
670.000	252.41
680.000	252.41
690.000	252.41
700.000	252.39
710.000	252.39
720.000	252.39
730.000	252.38
740.000	252.38
750.000	252.38
760.000	252.38
770.000	252.36
780.000	252.36
790.000	252.36
800.000	252.35
810.000	252.36
820.000	252.35
830.000	252.35
840.000	252.35
850.000	252.35
860.000	252.33
870.000	252.33
880.000	252.31
890.000	252.31
900.000	252.31
910.000	252.31
920.000	252.31
930.000	252.30
940.000	252.30
950.000	252.28
960.000	252.28
970.000	252.28
980.000	252.28
990.000	252.27
1000.00	252.27
1100.00	252.22
1200.00	252.17
1300.00	252.14
1400.00	252.09
1500.00	252.08
1600.00	252.04
1700.00	252.00
1800.00	251.98
1900.00	251.93
2000.00	251.92
2100.00	251.89
2200.00	251.86
2300.00	251.84
2400.00	251.81
2500.00	251.78
2600.00	251.74
2700.00	251.73
2800.00	251.70

END

SITE #2
 STAGE 1
 DW-4 DATA

SE10008
Environmental Logger
06/09 17:34

Unit# 20606 Test# 4

INPUT 1: Level (F)

Reference 252.14
Scale factor 50.13
Offset 0.00

Step# 0 06/08 18:19

Elapsed Time	Value
0.0000	252.12
0.0033	252.12
0.0066	252.12
0.0099	252.12
0.0133	252.12
0.0166	252.12
0.0200	252.10
0.0233	252.10
0.0266	252.10
0.0300	252.10
0.0333	252.10
0.0500	252.12
0.0666	252.12
0.0833	252.12
0.1000	252.12
0.1166	252.12
0.1333	252.12
0.1500	252.12
0.1666	252.10
0.1833	252.10
0.2000	252.10
0.2166	252.10
0.2333	252.10
0.2500	252.10
0.2666	252.10
0.2833	252.10
0.3000	252.10
0.3166	252.10
0.3333	252.09
0.4167	252.09
0.5000	252.07
0.5833	252.06
0.6667	252.04
0.7500	252.02
0.8333	252.01
0.9167	251.98
1.0000	251.98
1.0833	251.96
1.1667	251.95
1.2500	251.93
1.3333	251.91
1.4166	251.90
1.5000	251.90
1.5833	251.88
1.6667	251.87
1.7500	251.87
1.8333	251.85
1.9167	251.85
2.0000	251.83
2.5000	251.79
3.0000	251.76
3.5000	251.74
4.0000	251.71
4.5000	251.69
5.0000	251.68
5.5000	251.66
6.0000	251.65
6.5000	251.63
7.0000	251.63
7.5000	251.61
8.0000	251.61
8.5000	251.60
9.0000	251.60
9.5000	251.60
10.0000	251.58

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12.0000	251.57
14.0000	251.57
16.0000	251.55
18.0000	251.55
20.0000	251.55
22.0000	251.53
24.0000	251.53
26.0000	251.52
28.0000	251.52
30.0000	251.52
32.0000	251.50
34.0000	251.52
36.0000	251.50
38.0000	251.50
40.0000	251.49
42.0000	251.49
44.0000	251.49
46.0000	251.49
48.0000	251.49
50.0000	251.49
52.0000	251.47
54.0000	251.47
56.0000	251.47
58.0000	251.47
60.0000	251.47
62.0000	251.47
64.0000	251.46
66.0000	251.46
68.0000	251.46
70.0000	251.46
72.0000	251.46
74.0000	251.46
76.0000	251.44
78.0000	251.46
80.0000	251.44
82.0000	251.44
84.0000	251.44
86.0000	251.44
88.0000	251.42
90.0000	251.42
92.0000	251.42
94.0000	251.42
96.0000	251.42
98.0000	251.42
100.000	251.42
110.000	251.42
120.000	251.41
130.000	251.39
140.000	251.38
150.000	251.36
160.000	251.34
170.000	251.33
180.000	251.31
190.000	251.30
200.000	251.30
210.000	251.27
220.000	251.28
230.000	251.28
240.000	251.27
250.000	251.27
260.000	251.25
270.000	251.23
280.000	251.23
290.000	251.22
300.000	251.22
310.000	251.20
320.000	251.20
330.000	251.20
340.000	251.19
350.000	251.19
360.000	251.17
370.000	251.17
380.000	251.15
390.000	251.15
400.000	251.14
410.000	251.14
420.000	251.14
430.000	251.12
440.000	251.12
450.000	251.11
460.000	251.11
470.000	251.11

OBSERVATION WELL 070 K=177.4
MRTZ PUMP TEST
SITE#2 - UNION STATION
2ND PHASE OF PUMP TEST
RESTART @ 1820
±450 gpm
INITIAL REFERENCE ELEVATION
INCORRECT, SOME RESONANCE
AFTER PUMP SHUTOFF.

480.000	251.09
490.000	251.09
500.000	251.08
510.000	251.08
520.000	251.08
530.000	251.06
540.000	251.06
550.000	251.04
560.000	251.04
570.000	251.04
580.000	251.03
590.000	251.03
600.000	251.03
610.000	251.01
620.000	251.01
630.000	251.00
640.000	251.00
650.000	251.00
660.000	250.98
670.000	250.98
680.000	250.98
690.000	250.96
700.000	250.96
710.000	250.96
720.000	250.96
730.000	250.95
740.000	250.95
750.000	250.93
760.000	250.93
770.000	250.93
780.000	250.92
790.000	250.92
800.000	250.92
810.000	250.90
820.000	250.90
830.000	250.89
840.000	250.87
850.000	250.85
860.000	250.89
870.000	250.87
880.000	250.85
890.000	250.85
900.000	250.85
910.000	250.84
920.000	250.84
930.000	250.84
940.000	250.82
950.000	250.82
960.000	250.82
970.000	250.82
980.000	250.81
990.000	250.70
1000.00	250.68
1100.00	192.18
1200.00	192.18

END

UNKNOWN CHANGE IN
ELEVATION DATA
SITE #2
STAGE 2
02-4 DATA

1 OF 1

SE13008
Environmental Logger
06/10 12:35

Unit# 20606 Test# 5

INPUT 1: Level (F)

Reference 192.18
Scale factor 50.13
Offset 0.00

Step# 0 06/09 15:24

Elapsed Time	Value
0.0000	192.30
0.0033	192.30
0.0066	192.29
0.0099	192.29
0.0133	192.29
0.0166	192.29
0.0200	192.29
0.0233	192.29
0.0266	192.27
0.0300	192.29
0.0333	192.29
0.0366	192.29
0.0400	192.29
0.0433	192.29
0.0466	192.29
0.0500	192.29
0.0533	192.29
0.0566	192.29
0.0600	192.29
0.0633	192.29
0.0666	192.29
0.0700	192.29
0.0733	192.29
0.0766	192.29
0.0800	192.29
0.0833	192.29
0.0866	192.29
0.0900	192.29
0.0933	192.29
0.0966	192.29
0.1000	192.29
0.1033	192.29
0.1066	192.29
0.1100	192.29
0.1133	192.30
0.1166	192.29
0.1200	192.30
0.1233	192.29
0.1266	192.29
0.1300	192.29
0.1333	192.29
0.1366	192.29
0.1400	192.29
0.1433	192.29
0.1466	192.29
0.1500	192.29
0.1533	192.29
0.1566	192.29
0.1600	192.29
0.1633	192.29
0.1666	192.29
0.1700	192.29
0.1733	192.29
0.1766	192.29
0.1800	192.29
0.1833	192.29
0.1866	192.29
0.1900	192.29
0.1933	192.29
0.1966	192.29
0.2000	192.30
0.2033	192.30
0.2066	192.30
0.2100	192.30
0.2133	192.30
0.2166	192.30
0.2200	192.30
0.2233	192.30
0.2266	192.30
0.2300	192.30
0.2333	192.30
0.2366	192.30
0.2400	192.30
0.2433	192.30
0.2466	192.30
0.2500	192.30
0.2533	192.30
0.2566	192.30
0.2600	192.30
0.2633	192.30
0.2666	192.30
0.2700	192.30
0.2733	192.30
0.2766	192.30
0.2800	192.30
0.2833	192.30
0.2866	192.30
0.2900	192.30
0.2933	192.30
0.2966	192.30
0.3000	192.30
0.3033	192.30
0.3066	192.30
0.3100	192.30
0.3133	192.30
0.3166	192.30
0.3200	192.30
0.3233	192.30
0.3266	192.30
0.3300	192.30
0.3333	192.30
0.3366	192.30
0.3400	192.30
0.3433	192.30
0.3466	192.30
0.3500	192.30
0.3533	192.30
0.3566	192.30
0.3600	192.30
0.3633	192.30
0.3666	192.30
0.3700	192.30
0.3733	192.30
0.3766	192.30
0.3800	192.30
0.3833	192.30
0.3866	192.30
0.3900	192.30
0.3933	192.30
0.3966	192.30
0.4000	192.30
0.4033	192.30
0.4066	192.30
0.4100	192.30
0.4133	192.30
0.4166	192.30
0.4200	192.30
0.4233	192.30
0.4266	192.30
0.4300	192.30
0.4333	192.30
0.4366	192.30
0.4400	192.30
0.4433	192.30
0.4466	192.30
0.4500	192.30
0.4533	192.30
0.4566	192.30
0.4600	192.30
0.4633	192.30
0.4666	192.30
0.4700	192.30
0.4733	192.30
0.4766	192.30
0.4800	192.30
0.4833	192.30
0.4866	192.30
0.4900	192.30
0.4933	192.30
0.4966	192.30
0.5000	192.30
0.5033	192.30
0.5066	192.30
0.5100	192.30
0.5133	192.30
0.5166	192.30
0.5200	192.30
0.5233	192.30
0.5266	192.30
0.5300	192.30
0.5333	192.30
0.5366	192.30
0.5400	192.30
0.5433	192.30
0.5466	192.30
0.5500	192.30
0.5533	192.30
0.5566	192.30
0.5600	192.30
0.5633	192.30
0.5666	192.30
0.5700	192.30
0.5733	192.30
0.5766	192.30
0.5800	192.30
0.5833	192.30
0.5866	192.30
0.5900	192.30
0.5933	192.30
0.5966	192.30
0.6000	192.30
0.6033	192.30
0.6066	192.30
0.6100	192.30
0.6133	192.30
0.6166	192.30
0.6200	192.30
0.6233	192.30
0.6266	192.30
0.6300	192.30
0.6333	192.30
0.6366	192.30
0.6400	192.30
0.6433	192.30
0.6466	192.30
0.6500	192.30
0.6533	192.30
0.6566	192.30
0.6600	192.30
0.6633	192.30
0.6666	192.30
0.6700	192.30
0.6733	192.30
0.6766	192.30
0.6800	192.30
0.6833	192.30
0.6866	192.30
0.6900	192.30
0.6933	192.30
0.6966	192.30
0.7000	192.30
0.7033	192.30
0.7066	192.30
0.7100	192.30
0.7133	192.30
0.7166	192.30
0.7200	192.30
0.7233	192.30
0.7266	192.30
0.7300	192.30
0.7333	192.30
0.7366	192.30
0.7400	192.30
0.7433	192.30
0.7466	192.30
0.7500	192.30
0.7533	192.30
0.7566	192.30
0.7600	192.30
0.7633	192.30
0.7666	192.30
0.7700	192.30
0.7733	192.30
0.7766	192.30
0.7800	192.30
0.7833	192.30
0.7866	192.30
0.7900	192.30
0.7933	192.30
0.7966	192.30
0.8000	192.30
0.8033	192.30
0.8066	192.30
0.8100	192.30
0.8133	192.30
0.8166	192.30
0.8200	192.30
0.8233	192.30
0.8266	192.30
0.8300	192.30
0.8333	192.30
0.8366	192.30
0.8400	192.30
0.8433	192.30
0.8466	192.30
0.8500	192.30
0.8533	192.30
0.8566	192.30
0.8600	192.30
0.8633	192.30
0.8666	192.30
0.8700	192.30
0.8733	192.30
0.8766	192.30
0.8800	192.30
0.8833	192.30
0.8866	192.30
0.8900	192.30
0.8933	192.30
0.8966	192.30
0.9000	192.30
0.9033	192.30
0.9066	192.30
0.9100	192.30
0.9133	192.30
0.9166	192.30
0.9200	192.30
0.9233	192.30
0.9266	192.30
0.9300	192.30
0.9333	192.30
0.9366	192.30
0.9400	192.30
0.9433	192.30
0.9466	192.30
0.9500	192.30
0.9533	192.30
0.9566	192.30
0.9600	192.30
0.9633	192.30
0.9666	192.30
0.9700	192.30
0.9733	192.30
0.9766	192.30
0.9800	192.30
0.9833	192.30
0.9866	192.30
0.9900	192.30
0.9933	192.30
0.9966	192.30
1.0000	192.30

MRTC PUMP TEST A-132

UNION STATION SITE #2

RECOVERY TEST

OBSERVATION WELL 5-5

DISTANCE FROM PUMP WELL: 199.4'

INITIAL REFERENCE ELEVATION INCORRECT.

12.0000	192.73
14.0000	192.74
16.0000	192.76
18.0000	192.78
20.0000	192.79
22.0000	192.81
24.0000	192.81
26.0000	192.82
28.0000	192.82
30.0000	192.84
32.0000	192.84
34.0000	192.86
36.0000	192.87
38.0000	192.87
40.0000	192.87
42.0000	192.89
44.0000	192.89
46.0000	192.90
48.0000	192.90
50.0000	192.92
52.0000	192.92
54.0000	192.92
56.0000	192.93
58.0000	192.93
60.0000	192.95
62.0000	192.95
64.0000	192.95
66.0000	192.95
68.0000	192.97
70.0000	192.97
72.0000	192.97
74.0000	192.98
76.0000	192.98
78.0000	192.98
80.0000	192.98
82.0000	193.00
84.0000	193.00
86.0000	193.00
88.0000	193.01
90.0000	193.01
92.0000	193.01
94.0000	193.01
96.0000	193.03
98.0000	193.03
100.000	193.03
110.000	193.08
120.000	193.08
130.000	193.09
140.000	193.11
150.000	193.11
160.000	193.11
170.000	193.12

END

SITE #2
RECOVERY DATA
OW-4
1 OF 1

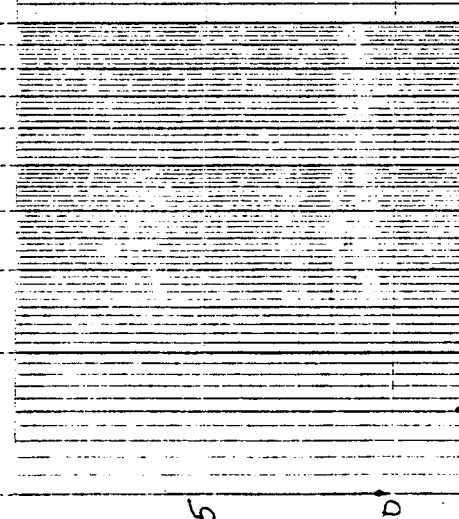
ELAPSED TIME (MINUTES)

SITE #1, STAGE 2, PUMP WELL

Q = 362 gpm
 $C = 0.91$
 $T = \frac{264 \cdot Q}{\Delta S}$

SEMI-LOG PUMP TEST PLOT
 Q = PUMPING RATE IN GPM
 T = COEFFICIENT OF TRANSMISSIVITY (gpd/ft)
 ΔS = DRAWDOWN CHANGES PER LOG CYCLE
 $T(1-u) =$ TRANSMISSIVITY VALUES OF EACH STRAIGHT LINE
 PLOT

1.0
2
3
4
5
6
7
8
9
10



$\Delta S_1 = (16.35 - 12.0) = 4.35$

$T_1 = \frac{264(362)}{4.35}$

$T_1 = 21969 \text{ gpd/ft}$

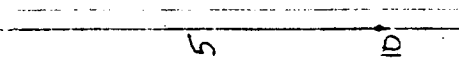
$u = \frac{0.25}{4.74}$

$T = \frac{(0.91)(0.10)}{(4)(21969)(0.01)}$

$L = 9.2 \times 10^5 \text{ ft}$

L = MINIMUM VALID DISTANCE IN FEET TO PUMP WELL
 C = STORAGE COEFFICIENT
 T = TRANSMISSIVITY (gpd/ft)
 u = WEL FUNCTION, THIS EQUATION ASSUMPTION

1000



$\Delta S_2 = (17.2 - 15.8) = 1.40$

$T_2 = \frac{264(362)}{1.40}$

$T_2 = 68262 \text{ gpd/ft}$

$T_3 = \frac{264(362)}{3.4}$

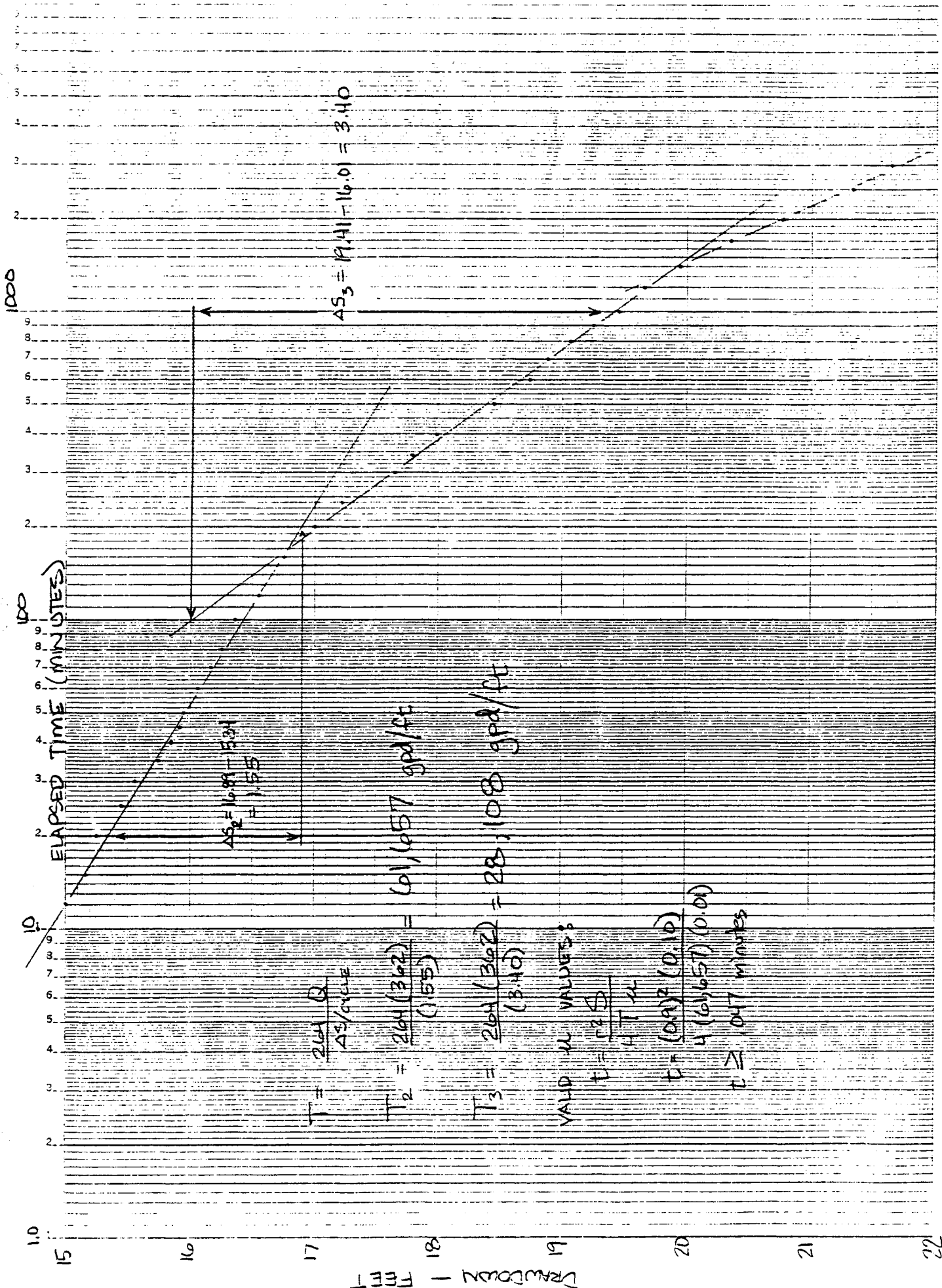
$T_3 = 28108 \text{ gpd/ft}$

$\Delta S_3 = (21.8 - 18.4) = 3.4$

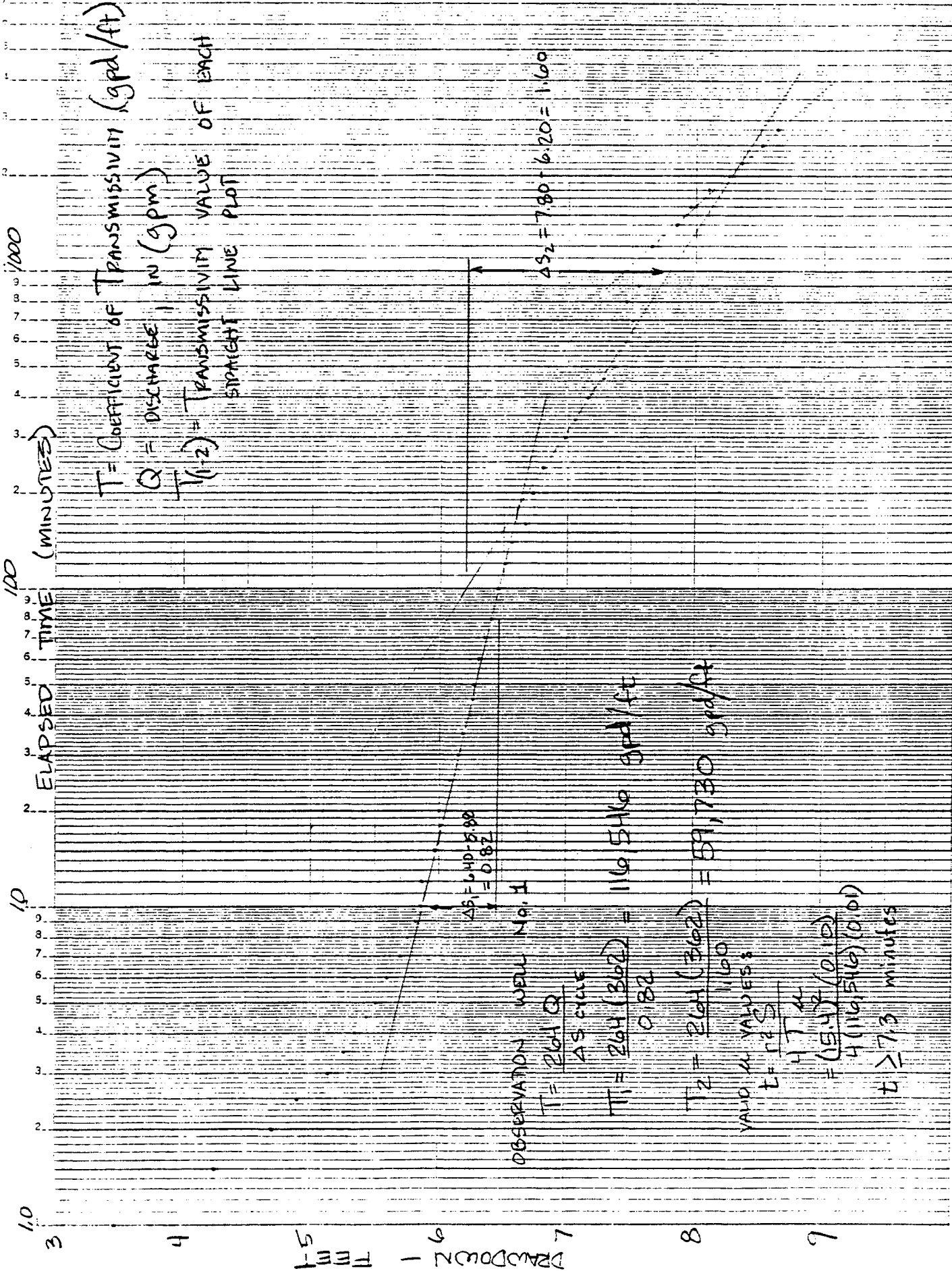
$T_4 = \frac{264(362)}{6.1}$

$T_4 = 15666 \text{ gpd/ft}$

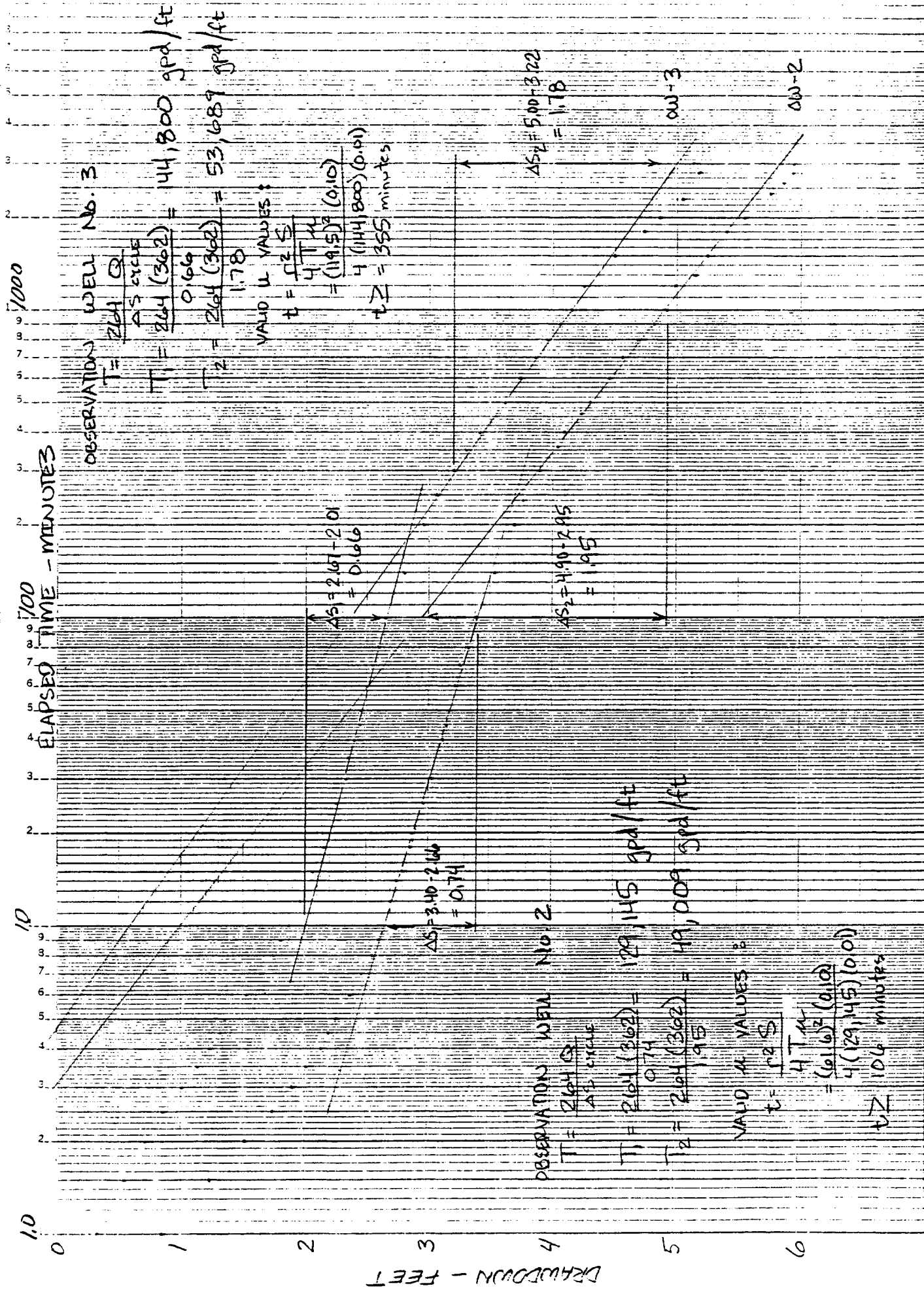
SITE #1, STAGE 2, PUMP WELL - SEMI LOG



SITE #1, STAGE 2, PUMP WELL - SEMI LOG (LARGER ORANDOWN SCALE)



SITE #1, STAGE 2, OBSERVATION WELL #1 - SEMI LOG



OBSERVATION WELLS No. 3

$T = \frac{264 \cdot Q}{\Delta S \cdot r^2}$

$T_1 = \frac{264 (362)}{0.66} = 144,800 \text{ gpd/ft}$

$T_2 = \frac{264 (362)}{1.78} = 53,689 \text{ gpd/ft}$

VALID U VALUES:

$u = \frac{r^2 S}{4 T t}$
 $= \frac{(119.5)^2 (0.01)}{4 (144,800) (0.01)}$
 $u \approx 355 \text{ minutes}$

OBSERVATION WELLS No. 2

$T = \frac{264 \cdot Q}{\Delta S \cdot r^2}$

$T_1 = \frac{264 (362)}{0.74} = 129,145 \text{ gpd/ft}$

$T_2 = \frac{264 (362)}{1.95} = 49,009 \text{ gpd/ft}$

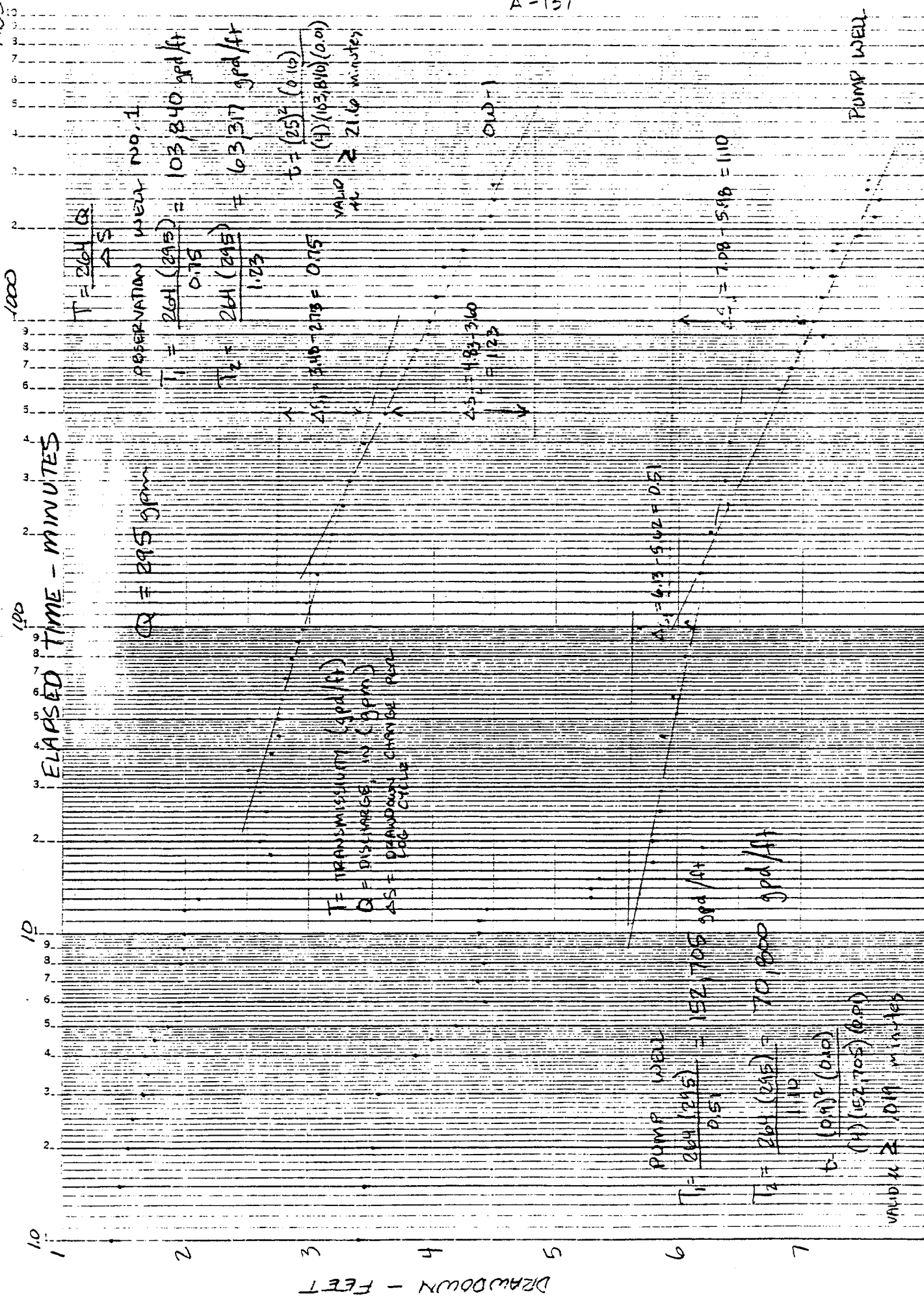
VALID U VALUES:

$u = \frac{r^2 S}{4 T t}$
 $= \frac{(61.6)^2 (0.01)}{4 (129,145) (0.01)}$
 $u \approx 106 \text{ minutes}$

SITE #1, STAGE 2, OBSERVATION WELLS 2 AND 3 - SEMI LOG

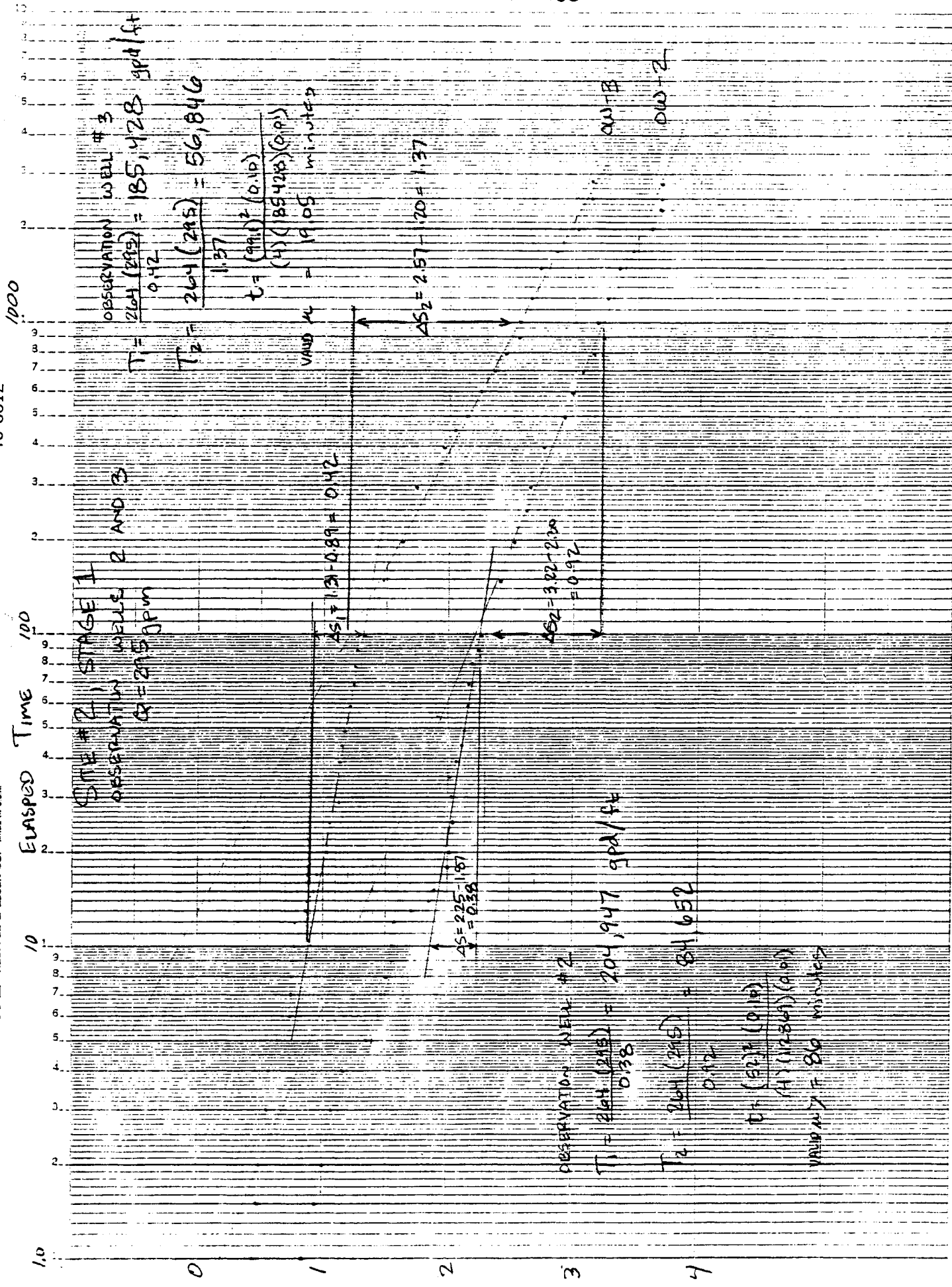
9/30/86
MBS

A-137

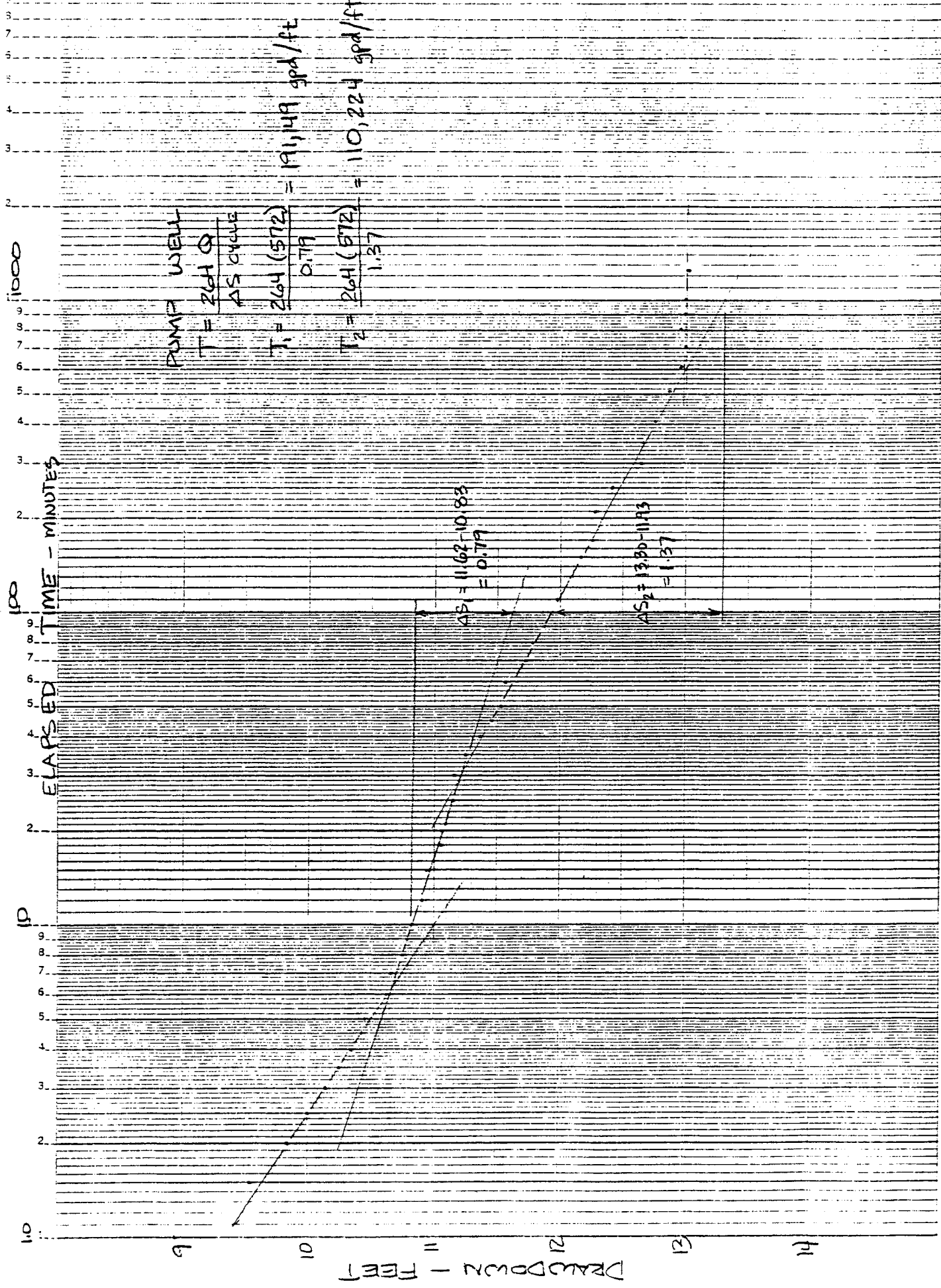


SITE #2, STAGE 1, PUMP WELL AND OBSERVATION WELL No.1 - SEMI LOGS

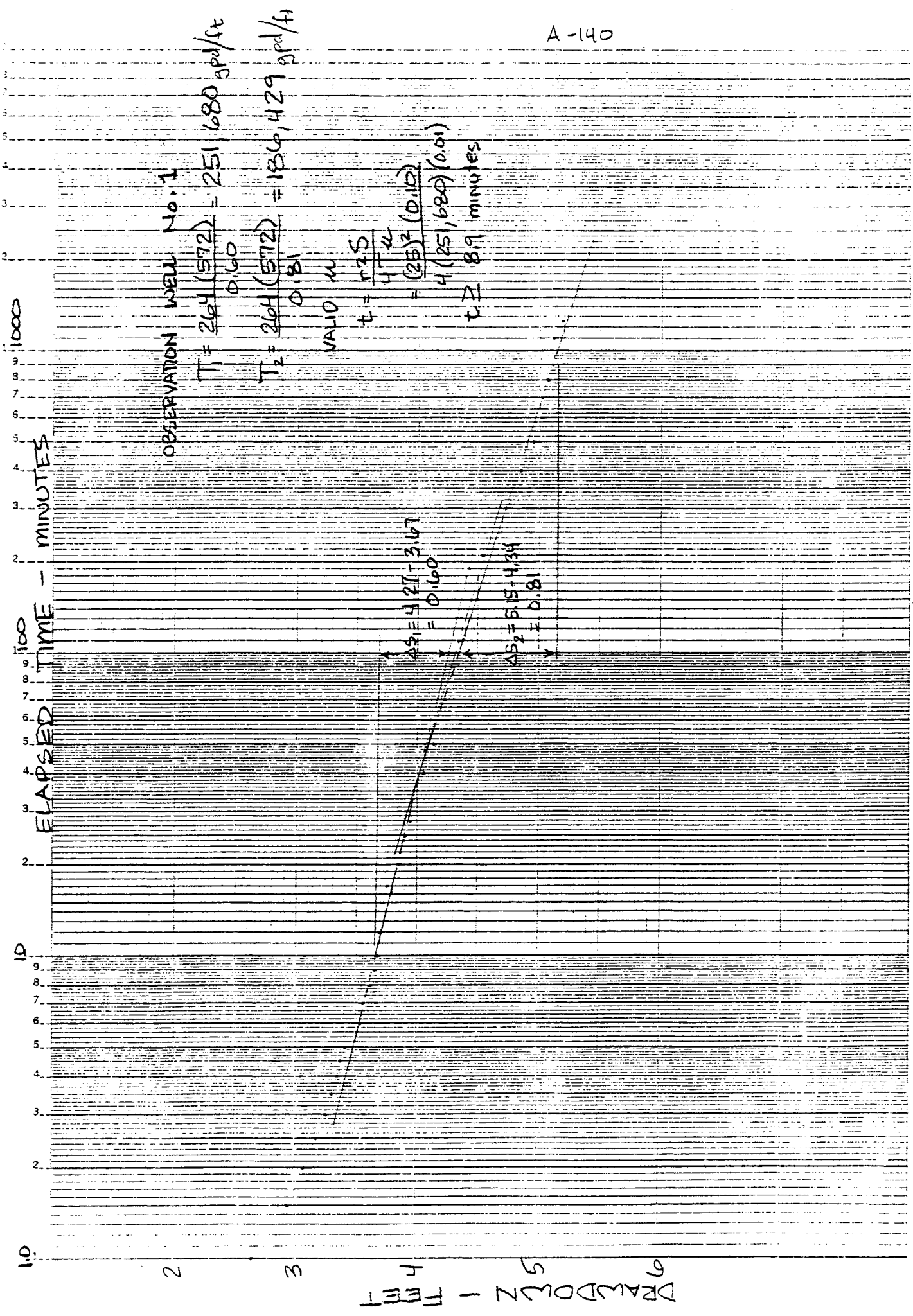
PUMP WELL



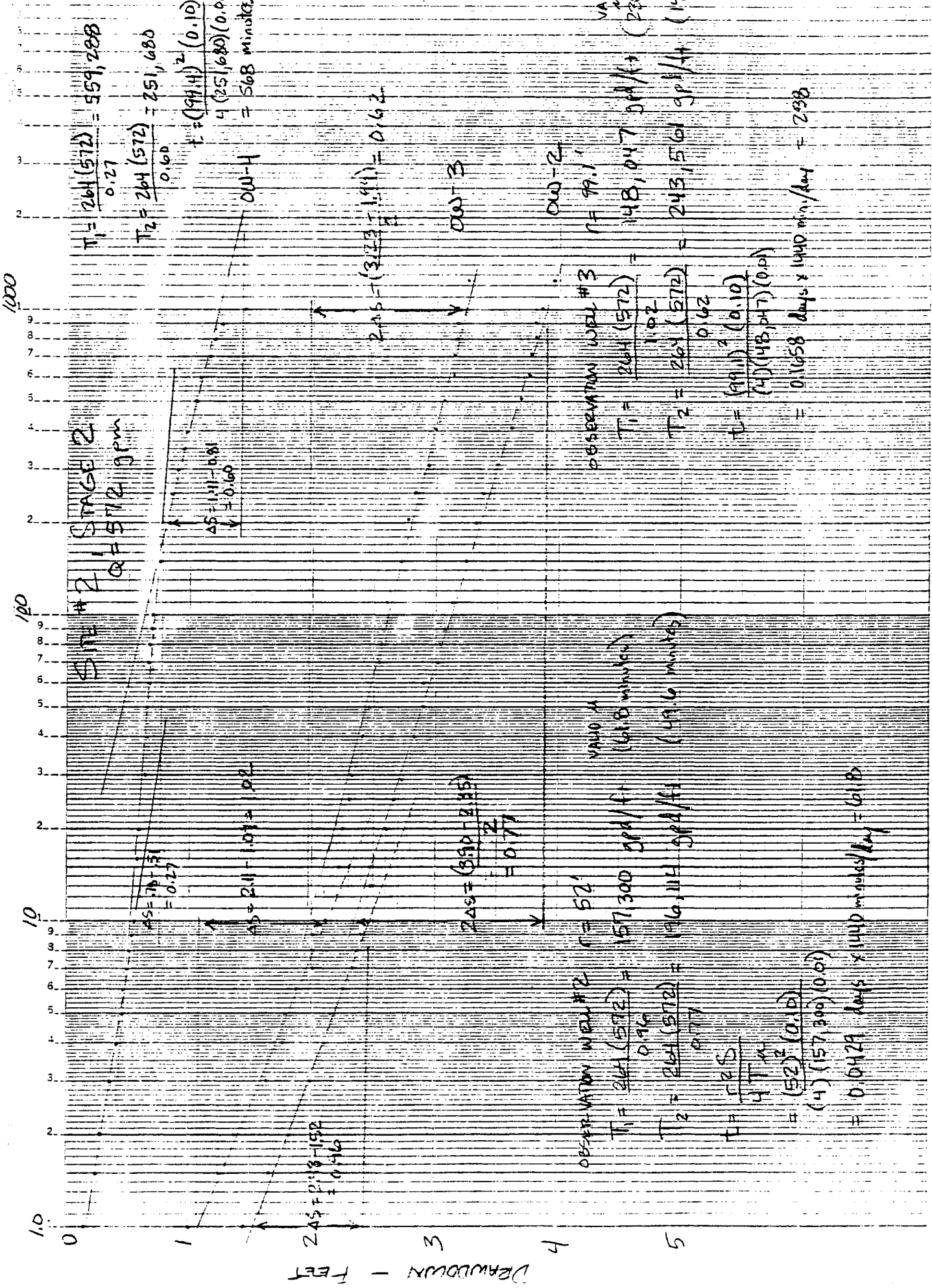
SITE #2, STAGE 1, OBSERVATION WELLS 2 AND 3 - SEMI LOG



SITE #2, STAGE 2, PUMP WELL - SEMI LOGS



SITE # 2, STAGE 2, OBSERVATION WELL No. 1 - SEMI LOG



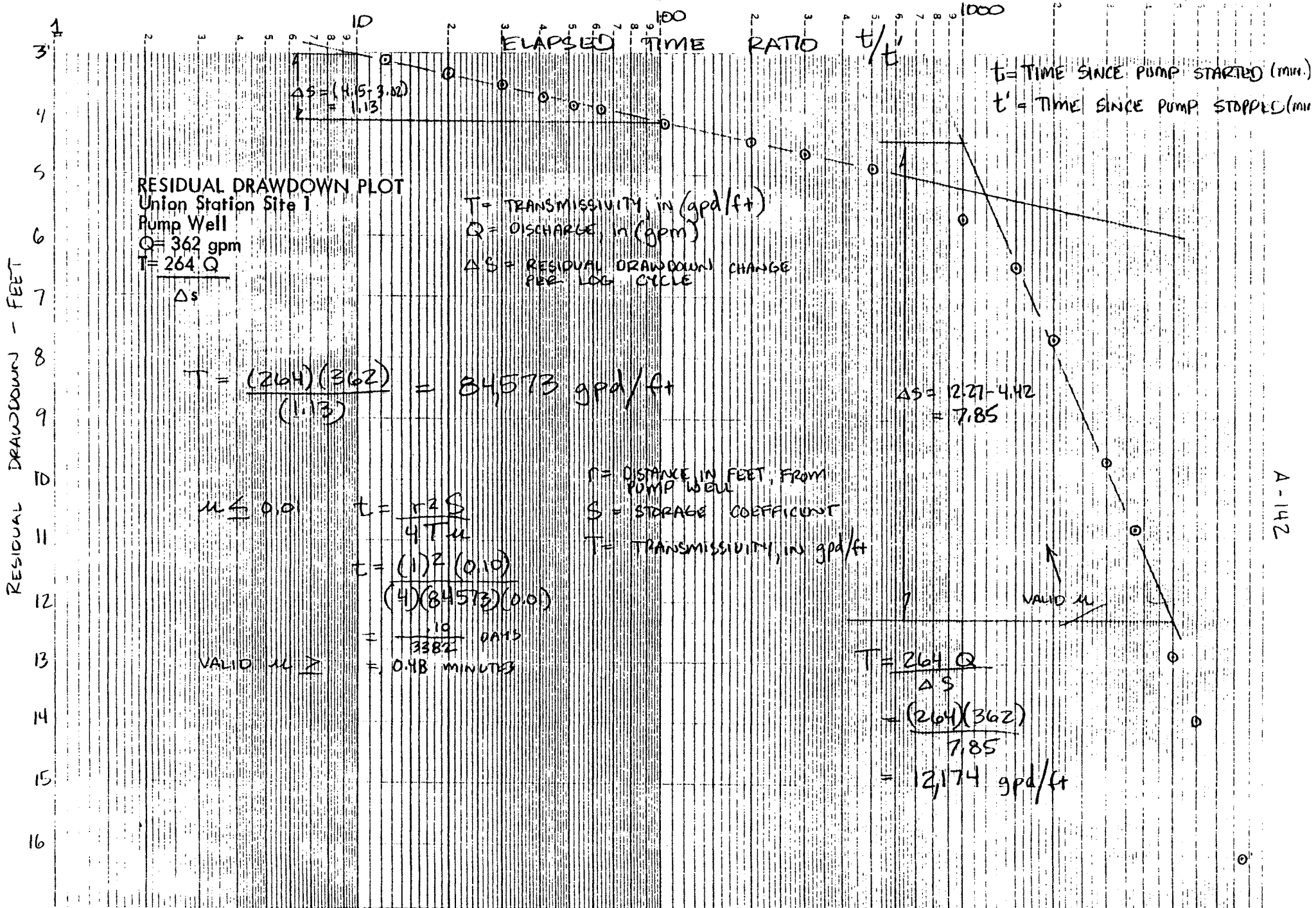
$T_1 = \frac{264(572)}{0.27} = 559,288$
 $T_2 = \frac{264(572)}{0.60} = 251,680$
 $t = \frac{(99.1)^2 (0.10)}{4(25,680)(0.01)} = 568 \text{ minutes}$

$2.05 = \frac{(3.23 - 1.41)}{2} = 0.62$

OBSERVATION WELL #3
 $T_1 = \frac{264(572)}{1.07} = 148,047 \text{ gpd/ft}$
 $T_2 = \frac{264(572)}{0.62} = 243,561 \text{ gpd/ft}$
 $t = \frac{(99.1)^2 (0.10)}{4(148,047)(0.01)} = 0.1658 \text{ days} \times 1440 \text{ min./day} = 238$

OBSERVATION WELL #2 (Q = 572)
 $T_1 = \frac{264(572)}{0.27} = 557,300 \text{ gpd/ft}$ (61.8 minutes)
 $T_2 = \frac{264(572)}{0.77} = 196,111 \text{ gpd/ft}$ (19.6 minutes)
 $t = \frac{(52)^2 (0.10)}{4(557,300)(0.01)} = 0.0429 \text{ days} \times 1440 \text{ min./day} = 61.8$

SITE #2, STAGE 2, OBSERVATION WELLS 2, 3, AND 4 - SEMI LOG



RESIDUAL DRAWDOWN PLOT

Union Station Site 1

Pump Well

Q = 362 gpm

T = 264 Q

Δs

T = TRANSMISSIVITY, in (gpd/ft)

Q = DISCHARGE, in (gpm)

ΔS = RESIDUAL DRAWDOWN CHANGE PER LOG CYCLE

t = TIME SINCE PUMP STARTED (min.)

t' = TIME SINCE PUMP STOPPED (min.)

$$T = \frac{(264)(362)}{(1.13)} = 84,573 \text{ gpd/ft}$$

$\mu \leq 0.01$

$$t = \frac{r^2 S}{4 T \mu}$$

$$t = \frac{(1)^2 (0.10)}{(4)(84573)(0.01)}$$

$$= \frac{.10}{3382} \text{ DAYS} = 0.48 \text{ MINUTES}$$

VALID $\mu >$

r = DISTANCE IN FEET, FROM PUMP WELL

S = STORAGE COEFFICIENT

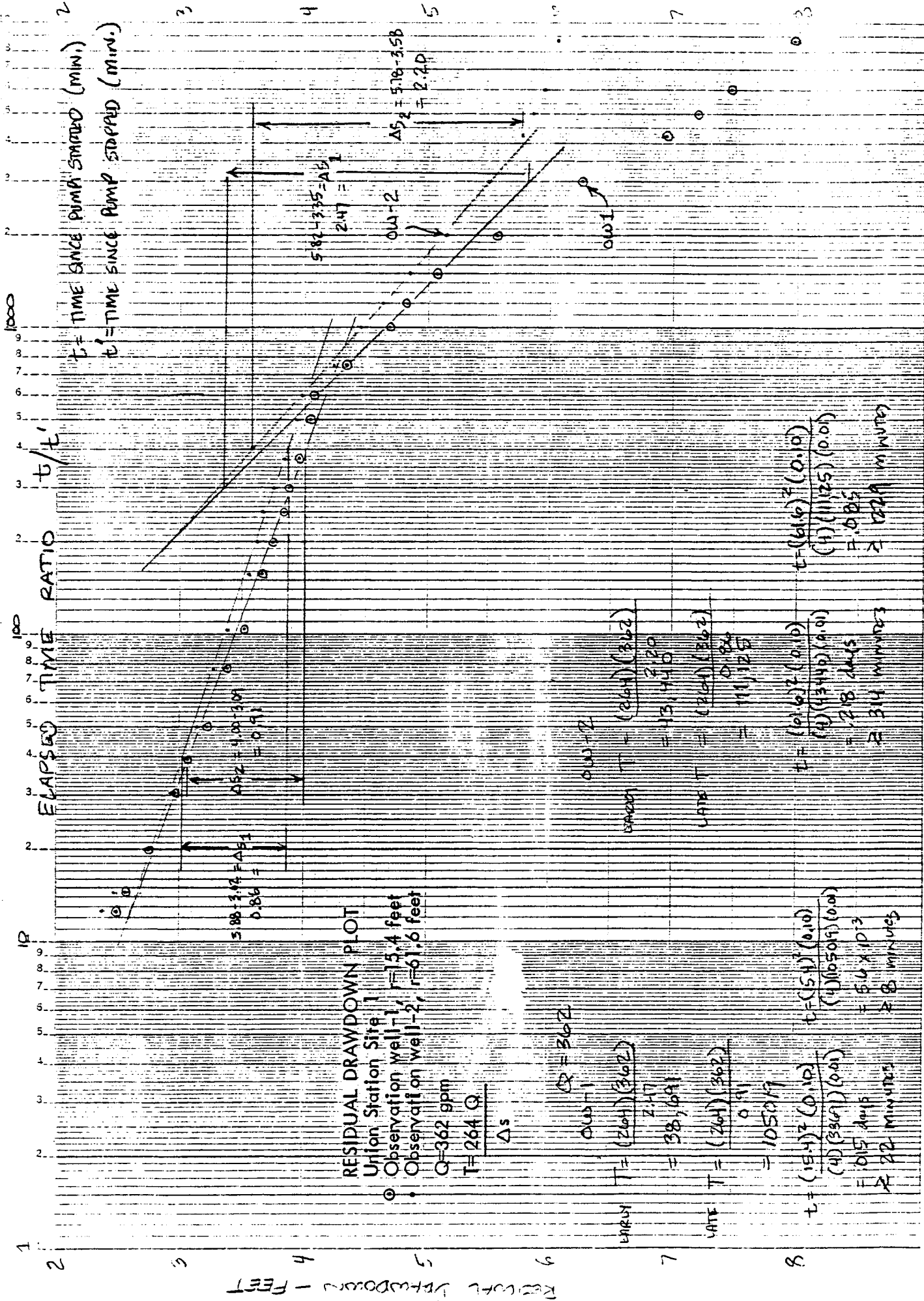
T = TRANSMISSIVITY, in gpd/ft

$$\Delta S = 12.27 - 4.42 = 7.85$$

$$T = \frac{264 Q}{\Delta S} = \frac{(264)(362)}{7.85} = 12,174 \text{ gpd/ft}$$

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RATIO t/t'



RESIDUAL DRAWDOWN PLOT

Union Station Site
 Observation well-1, $r=15.4$ feet
 Observation well-2, $r=61.6$ feet
 $Q=362$ gpm
 $T=264 Q$

Δs

$S=362$

WELL 1
 $T = \frac{(264)(362)}{2.17}$
 $= 38,691$

WELL 2
 $T = \frac{(264)(362)}{0.91}$
 $= 105,217$

$t = \frac{(15.4)^2 (0.10)}{(4)(38691)(0.01)}$
 $= 0.15 \text{ days}$
 $\approx 22 \text{ MINUTES}$

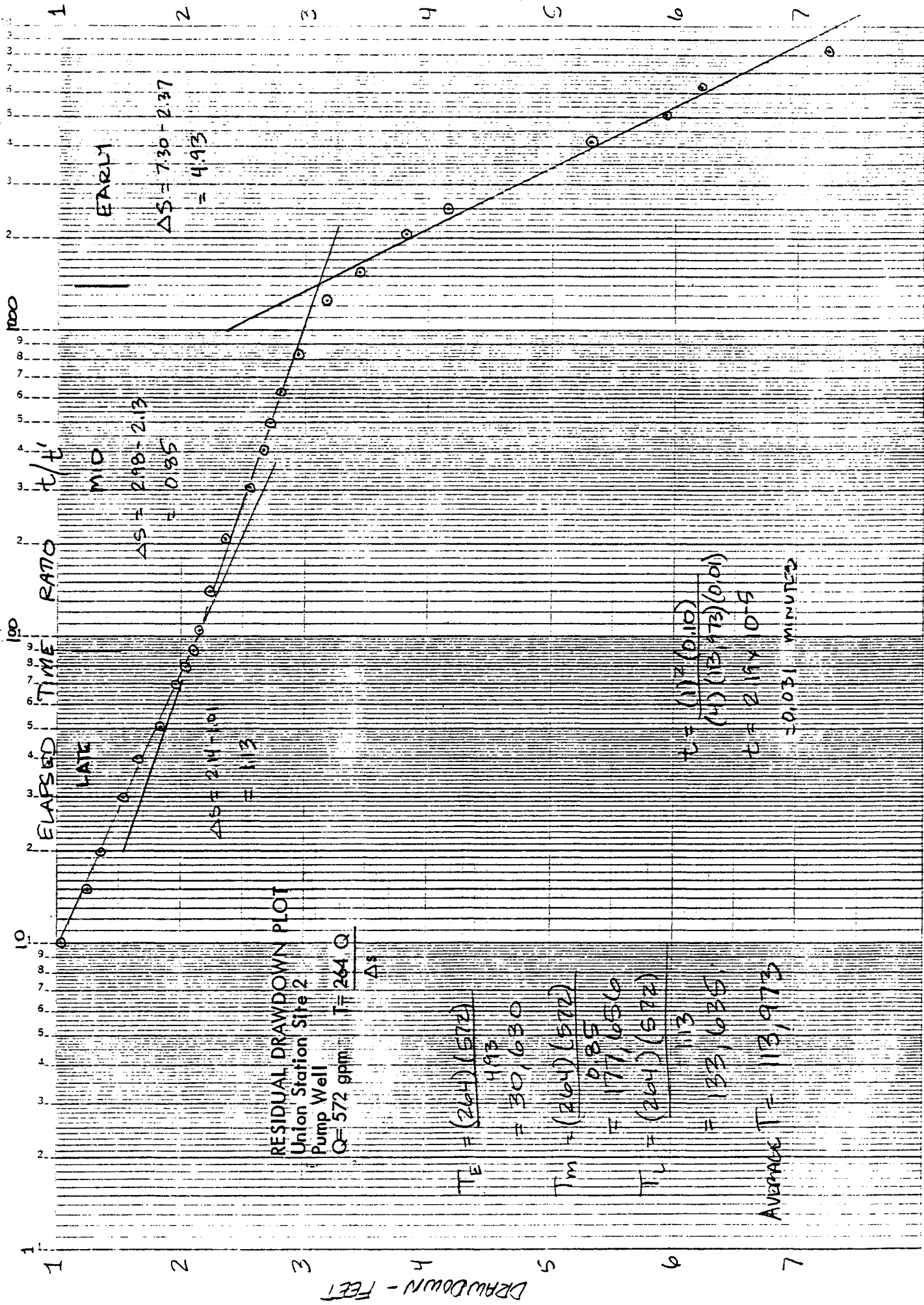
WELL 1
 $T = \frac{(264)(362)}{2.17}$
 $= 38,691$

WELL 2
 $T = \frac{(264)(362)}{0.91}$
 $= 111,255$

$t = \frac{(61.6)^2 (0.10)}{(4)(111255)(0.01)}$
 $= 2.025$
 $\approx 314 \text{ MINUTES}$

RATIO t/t'

A-144



RESIDUAL DRAWDOWN PLOT

Union Station Site 2

Pump Well

Q = 572 gpm TF = 264 Q

AS

$T_E = \frac{(264)(572)}{493}$

$= 30,680$

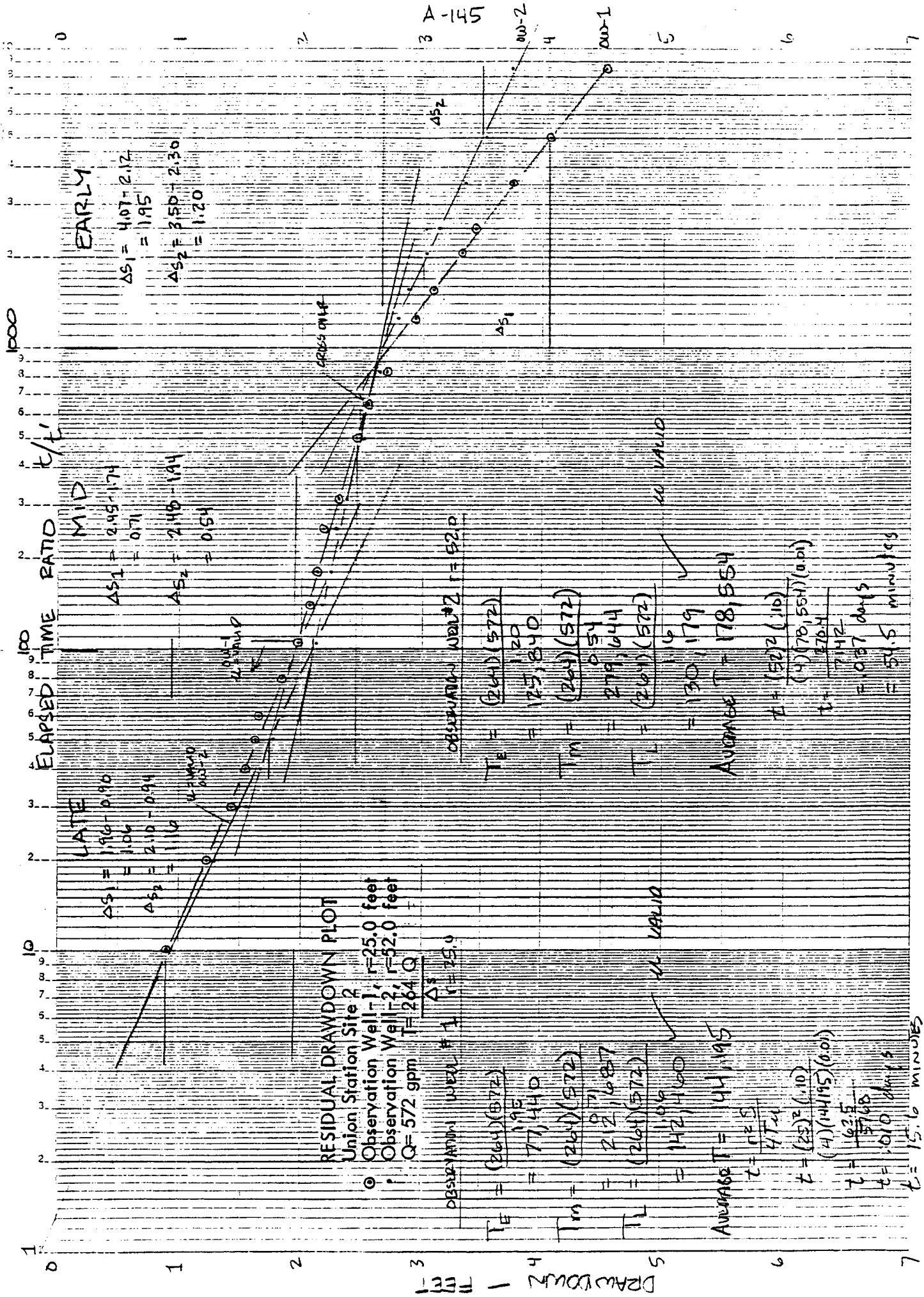
$T_M = \frac{(264)(572)}{0.85}$

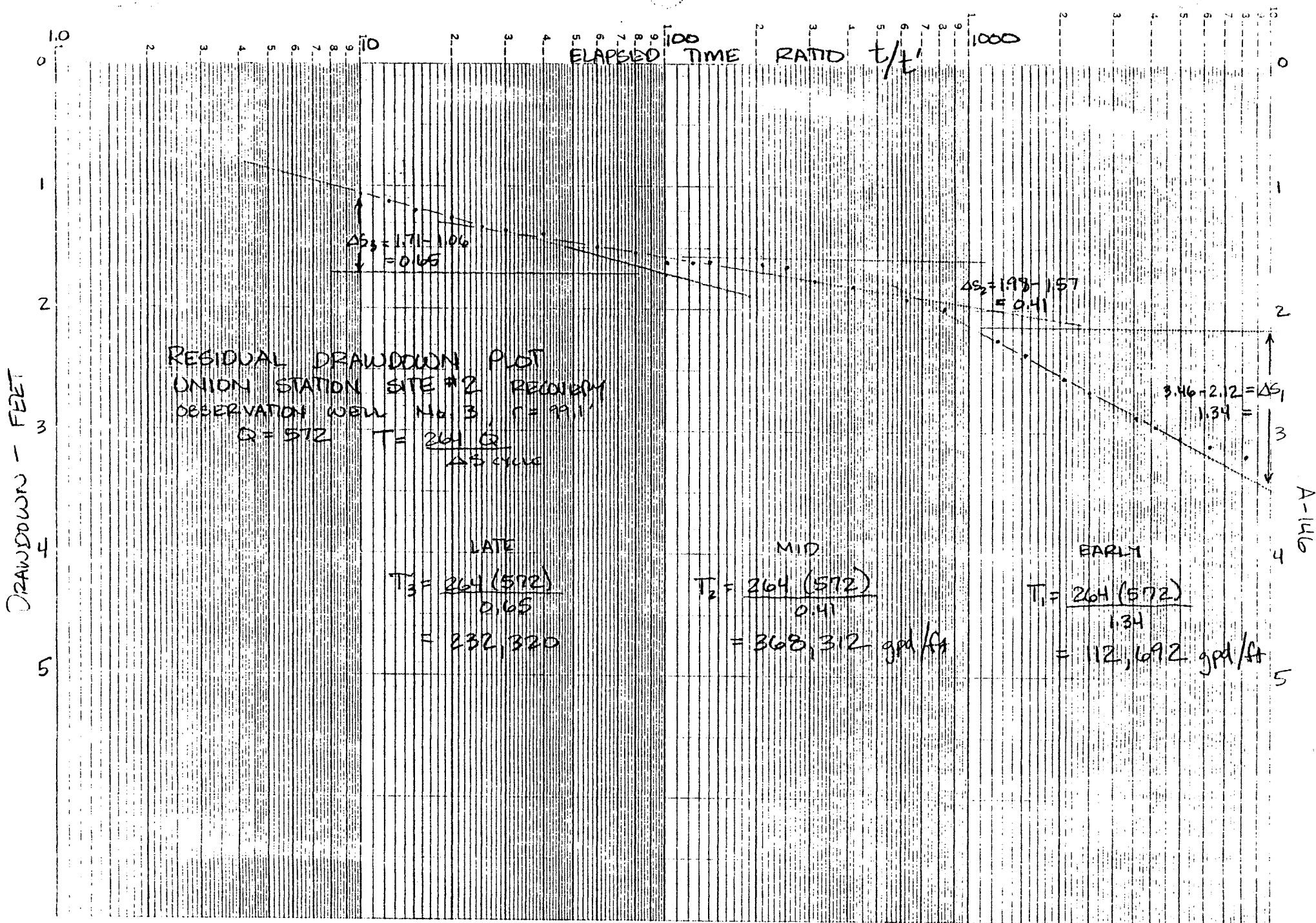
$= 177,656$

$T_L = \frac{(264)(572)}{113}$

$= 133,635$

AVERAGE $T_F = 113,973$





Appendix B

APPENDIX B
FIELD EXPLORATION

B.1 GENERAL

Field exploration data presented in this report for the Union Station Pump Tests includes information from borings drilled during the (1983) Design Unit A-135 Geotechnical Investigation and additional well borings drilled for this investigation. Four existing groundwater observation wells (Site #1: OW-1, OW-2, OW-3 and Site #2: OW-4), drilled during the 1983 investigation, were "air-lifted" to clean and develop the wells for re-use during the subject tests. Two pump wells (Site #1 and Site #2) and four additional groundwater observation wells (Site #1: OW-4 and Site #2: OW-1, OW-2, OW-3) were drilled for this investigation. Locations of these well borings are shown on Figure 2, Site #1 - Well Location Map, and Figure 3, Site #2 - Well Location Map.

B.2 OBSERVATION WELL LOGS

The observation wells were drilled by Pitcher Drilling Company of East Palo Alto, California using a Failing 1500 rotary wash drill rig. These wells were logged continuously by a geologist during drilling operations. The subsurface soils were classified by visual examination in the field in accordance with the Unified Soil Classification System. Relatively undisturbed samples of the subsurface soils and bedrock were obtained at regular intervals in the borings using a drive sampler. Copies of the observation well boring logs are presented following the text of this appendix. Boring logs for Site #1, observation wells 2 and 3, drilled during the 1983 investigation, were not available from the 1983 report. A general description of these two observation wells is presented in well construction and development section.

B.3 PUMP WELL LOGS

The pump wells were drilled by Stang Hydronics, Inc. located in Orange, California. The Site #1 Pump Well was drilled with a Gus Pech 24-inch bucket auger drill rig. The well boring was kept full of water during drilling to minimize caving. Subsurface soils excavated during the drilling operation

were continuously logged by a geologist. These soils were classified by visual examination in the field in accordance with the Unified Soil Classification System.

The Site #2 pump well was drilled with an Ingersol Rand Model TH60 direct rotary drill rig. This rotary wash well boring was advanced using a combination of 10-inch, 12-inch and modified 24-inch tri-cone drill bits. The well boring was started with a 10-inch diameter pilot hole which was reamed out to a 24-inch diameter boring using repeated passes from a 12-inch and modified 24-inch tri-cone drill bit. Rotary wash cuttings and drill rig response were continuously logged by a geologist during the drilling operation.

Copies of the pump well boring logs are presented following the text of this appendix.

B.4 SAMPLING AND LOGGING PROCEDURES

Logging and sampling were performed in the field by the geologist. The following describes sampling equipment and procedures and notations used on the lithologic logs to indicate drilling and sampling modes.

B.4.1 Sampling

In the overburden at about 10-foot intervals, the Converse ring sampler was driven using a down-hole 450-pound slip-jar hammer. The Converse sampler was followed with the standard split spoon sample (SPT) driven with a 140-pound hammer with a 30 inch stroke. Where the Puente Formation was encountered, the borings were sampled using a Pitcher-Barrel and Converse ring sampler at 20-foot intervals.

The most common cause for loss of samples or altering the sample interval was when gravels were encountered at the desired sampling depth. Standard penetration blow count information can often be misleading in this type of formation, and it is difficult to recover an undisturbed sample. Therefore at some locations borings were advanced until drill response and cutting suggested a change in formation.

The following symbols were used on the logs to indicate the type of sample and the drilling mode:

<u>Log Symbol</u>	<u>Sample Type</u>	<u>Type of Sampler</u>
<u>B</u>	<u>Bag</u>	<u>-</u>
<u>J</u>	<u>Jar</u>	<u>Split Spoon</u>
<u>C</u>	<u>Can</u>	<u>Converse Ring</u>
<u>S</u>	<u>Shelby Tube</u>	<u>Pitcher Barrel</u>
<u>Box</u>	<u>Box</u>	<u>Pitcher Barrel, Core Barrel</u>

<u>Log Symbol</u>	<u>Drilling Mode</u>
<u>AD</u>	<u>Auger Drill</u>
<u>RD</u>	<u>Rotary Drill</u>
<u>PB</u>	<u>Pitcher Barrel Sampling</u>
<u>SS</u>	<u>Split Spoon</u>
<u>DR</u>	<u>Converse Drive Sample</u>
<u>C</u>	<u>Coring</u>

B.4.2 Field Classification of Soils

All soil types were classified in the field by the site geologist using the "Unified Soil Classification System". Based on the characteristics of the soil, this system indicates the behavior of the soil as an engineering construction material.* Although particle size distribution estimates were based on volume rather than weight, the field estimates should fall within an acceptable range of accuracy.

Table A-1 shows the correlation of standard penetration information and the physical description of the consistency of clays (hand-specimen) and the compactness of sands used by the field geologists for describing the materials encountered.

TABLE A-1 Correlation of N-Values and Consistency/Compactness of Soil Obtained in the Field

N-Values (blows/foot)	Hand-Specimen (clay only)	Consistency (clay or silt)	Compactness (sand only)	N-Values (blows/foot)
0 - 2	Will squeeze between fingers when hand is closed	Very soft	Very loose	0 - 4
2 - 4	Easily molded by fingers	Soft	Loose	4 - 10
4 - 8	Molded by strong pressure of fingers	Firm	---	---
8 - 16	Dented by strong pressure of fingers	Stiff	Medium dense	10 - 30
16 - 32	Dented only slightly by finger pressure	Very stiff	Dense	30 - 50
32+	Dented only slightly by pencil point	Hard	Very dense	50+

B.4.3 Field Description of the Formations

The description of the formations is subdivided in two parts: lithology and physical condition. The lithologic description consists of:

- ° rock name;
- ° color of wet core (from GSA rock color chart);
- ° mineralogy, textural and structural features; and
- ° any other distinctive features which aid in correlating or interpreting the geology.

The physical condition describes the physical characteristics of the rock believed important for engineering design consideration. The form for the description is as follows:

Physical condition: _____ fractured, minimum _____,
 maximum _____, mostly _____; _____ hardness;
 _____ strength; _____ weathered.

* For a more complete discussion of the Unified Soil Classification System, refer to Corps of Engineers, Technical Memorandum No. 3-357, March 1953, or Department of the Interior, Bureau of Reclamation, Earth Manual, 1963.

PUMP WELL AND OBSERVATION WELL BORING LOGS
UNION STATION SITE #1 - MACY AND ALAMEDA STREETS

Converse Consultants



Boring Log PT-1

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SC RTD 83-1101-11 DATE DRILLED 3/15, 16, 17, 18/83 HOLE NO. PT-1
 LOCATION 194' E/O ALAMEDA 5/0 MACY AT N edge of Union Stn Pad L1 GROUND ELEV. 279.1
 DRILLING CONTRACTOR Roscoe Moss LOGGED BY DAN Gillette DEPTH TO GROUND WATER 20.0
 TYPE OF RIG Cable Tool HOLE DIAMETER 14-15 INCH HAMMER WEIGHT AND FALL NA 3/11/83
 SURFACE CONDITIONS Asphalt Parking Lot TOTAL DEPTH 82.5 NO. CORE BOXES NA

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0	AF	0.0-1.5 ARTIFICIAL FILL						ASPHALT PAVING Top 3"
2	SP	1.5-60.0 SAND AND GRAVEL						
4		MODERATE REDDISH BROWN (10R 4/6); contains						
6		50-75% SAND						
8								
10.0								
12								
14								
16								
18								
20.0								
22								
24								
26								
28								
30.0								
32								
34								
36								
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								
72								
74								
76								
78								
80								
82.5								

PUMP TEST HOLE
NO SAMPLES REQUIRED
RD ↓

3/2/83

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (ft)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
15.0	SP	1.5-60.0 SAND AND GRAVEL			RD ↓			
20.0								
25.0								
30.0								
35.0								
40.0								
45.0								
50.0								
55.0								
60.0		60.0-80.0 SAND AND BOULDERS light gray (N 7); contains 40-80% SAND AND Granitic Boulders						
65.0								
70.0								
75.0								
80.0								
80.0	TP	80.0-82.0 SILTSTONE AND CLAYSTONE OLIVE BLACK (SY 2/1)						
82.5		END BORING 82.5						

3/1

3/1
3/1

5/1

SUMMARY BORING NO. PT-1

PROJECT 83-1101-11 SC RTD STATION HOLE YES DATE DRILLED 3/15, 16, 17, 18/83

OVERBURDEN DEPTH (FT.) 0.0 TO 80.0.

BEDROCK DEPTH (FT.) 80.0 TO 82.5 (T.D.).

WATER PRESS. TEST No; INTERVAL(S) — TO —, — TO —.

GROUND WATER DEPTH (FT.) 20.6 DATE 3/15/83; 19.7 DATE 3/21/83. (Rainfall 3/17, 3/20 USE 20.0 AS MEAN)

GAS No; DEPTH FIRST NOTICED —, DATE —.

E-LOG No.

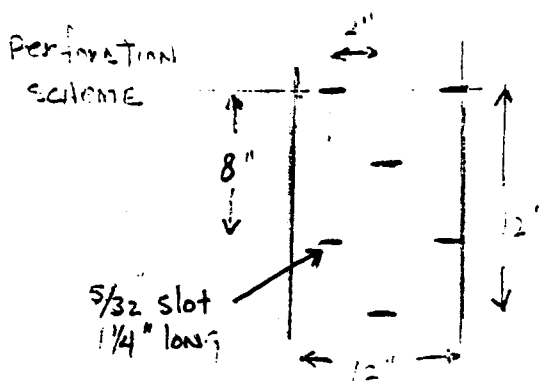
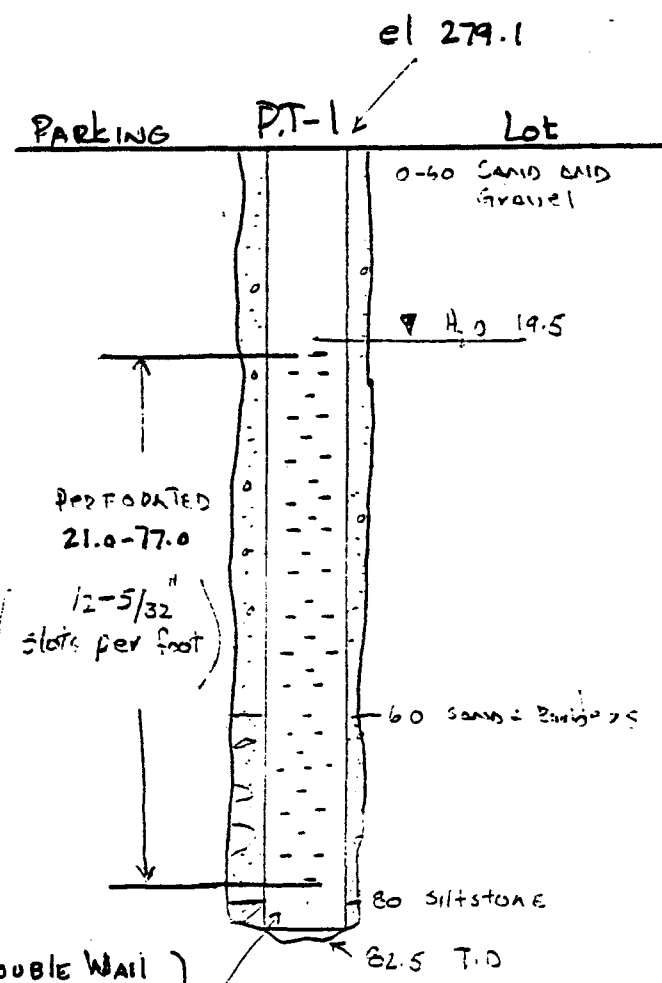
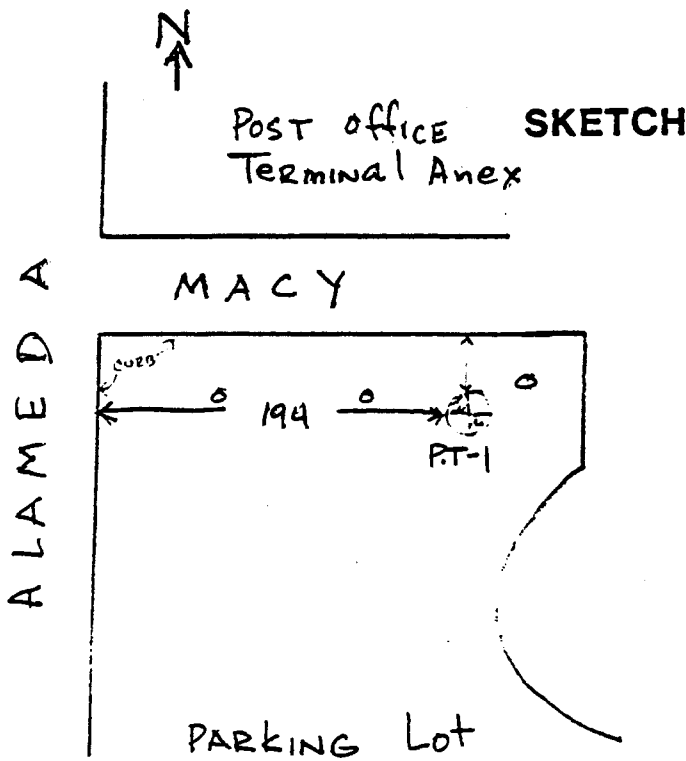
DOWN-HOLE SURVEY No.

CROSS-HOLE SURVEY No.

PVC CASING (I.D.): 4" No TO —; 3" No TO —; 2" No TO —.

Steel CASING - See Boring

GROUND ELEVATION REF. —



Double Wall Steel CASING
O.D.-12 1/2"
I.D.-12"

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.



Converse Consultants, Inc.
Earth Sciences Associates
Geo/Resource Consultants

BORING LOG SITE # 1
 PUMP WELL

Proj: 83-1140-06 Date Drilled 6/18-20/86 Ground Elev. 279
 Drill Rig GUS PULP 4 SLOPE KELLY Logged By MBS Total Depth 88'
 Hole Diameter 24" BUCKET Hammer Weight & Fall (NO SAMPLING PERFORMED)

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
0	////	0.0-0.3 ASPHALTIC PAVEMENT	(NO SAMPLING)			0700
0-2	ML	0.3-6.0 SANDY SILT w/ DEBR (FILL)	(0-20-80)		24" BUCKET AUGER	FILL RED BRICK LAYER @ 2'
2-6		SILT WITH FINE SAND, SOME CLAY BINDER, MOIST, LOOSE - MEDIUM DENSE, MISC. DEBR AND RUBBLE DECREASING WITH DEPTH, OLIVE BROWN COLOR			AD ↓	
6-16	SW	6.0-70.0 GRAVELLY SAND	(35-65-0)			6' ADDED DRILLING FLUID (SUPERCOL (20%) AND WATER MIX) BUILT SOIL BERM TO CONTAIN FLUIDS AT SURFACE
6-12		FINE TO COARSE SAND WITH GRAVELS, OCCASSIONAL COBBLES TO 5", CLASTS SUBROUNDED TO ROUNDED, RIVER DEPOSITS				DRILLING FLUID IN BORING WASHING OUT MANY OF THE FINES IN EACH BUCKET
12-16		OCCASSIONAL DRILL RIG CHATTER FROM COBBLES AND GRAVELS				
16-20	SW (GW)	OCCASSIONAL COBBLES TO 14" SUBROUNDED TO ROUNDED PREDOMINANTLY GRAVELLY SAND				

Project 83-1140-06

Date Drilled 6-18-86

Hole No. PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20		GRAVELLY SAND WITH OCCASSIONAL COBBLES - CONTINUED	✓		AD	
22		INTERBEDDED LENSES OF COARSE GRAVEL AND SMALL COBBLES ALTERNATING WITH LENSES OF SANDS AND GRAVELLY SANDS			↓	H ₂ S ODOR
24						↓
26						
28		28' COBBLES WITH POSSIBLE SMALL BOULDERS, DIFFICULT DRILLING, DRILL RIG CHATTER, COBBLES TO 14"				(0900) PLACED NEW TEETH ON 24" BUCKET
30						
32		INTERBEDDED THIN LAYERS OF CLAY AND SILT, OLIVE GRAY TO GRAY, PREDOMINANTLY SAND AND GRAVELLY SANDS WITH COBBLES, AVERAGE COBBLE SIZE 3-6", OCCASSIONAL COBBLES TO 14"	(40-60)			
34						
36						
38						
40		OCCASSIONAL CLAYEY GRAVEL LAYERS VARIABLE THICKNESS, 1-2', OLIVE GRAY COLOR WITH H ₂ S ODOR				
42						
44						

Project 83-1140-06

Date Drilled 6-18-86

SITE #1
Hole No. PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	SW	<u>GRAVELLY SANDS - CONTINUED</u> FINE TO COARSE SAND WITH GRAVEL, OCCASSIONAL COBBLES FROM 6"-14", SUBROUNDED TO ROUNDED.	∅		AD ↓	(1000)
46						
48		INTERBEDDED THIN LENSES OF CLAY AND SILTY CLAY - VARIABLE, PREDOMINANTLY GRAVELLY SANDS				
50						
52						
54						(1100)
56						HYDRAULIC LEAK DEVELOPING ON DRILL RIG RING GEAR
58						
60		<u>GRAVELLY SANDS - CONTINUED,</u> OCCASSIONAL SMALL COBBLES				
62						
64						
66						(1200)
68						Sheet <u>3</u> of <u>4</u>

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68		<u>GRAVELLY SANDS - CONTINUOUS</u> INCREASING FINES			AD ↓	
70	SC CL	70.0 - 74.0 <u>GRAVELLY SAND w/ CLAY</u> MIXTURE OF SAND AND GRAVEL WITH A CLAY / SILTY CLAY BINDER, GRAY, DENSE, H ₂ S ODOOR IN FINER MATERIALS, OCCASSIONAL COBBLES, CLASTS SUBANGULAR TO SUBROUNDED	(35-4025)			ADDED ±20lbs OF SUPERCOL TO DRILLING FLUID IN BORING. (1320)
72						
74	GW	74.0 - 80.0 <u>COBBLES WITH SANDY GRAVEL</u> SURROUNDED TO ROUNDED COBBLES TO 12", COBBLES GENERALLY 4"-8", SOME SANDY GRAVEL CONSISTING OF MEDIUM TO COARSE SANDS AND GRAVELS, RIVER DEPOSITS, H ₂ S ODOOR GRADATIONAL CONTACT				PLACED NEW TEETH (2ND SET) ON 24" (1400) BUCKET 6-18-86 74'- SHUTDOWN AT 1430, NEED SPECIAL BUCKETS TO REMOVE COBBLES, SECURED SITE 6-20-86 ATTEMPTED TO BREAK THROUGH ROCK IN BOTTOM OF BORING APPEARS TO BE LARGE COBBLE OR BOULDER, USING CHOPPING BUCKET AND LARGE SINGLE TOOTH WITH NO SUCCESS 6-21-86 USING CORING BUCKET TO ADVANCE THROUGH ROCK, HOLE REMAINED OPEN PAST TWO DAYS WITH A MINIMUM OF DRILLING FLUID
76						
78						
80		80.0 - 88' <u>BEDROCK</u> <u>CLAYSTONE / SILTSTONE</u> <u>PUNTE FORMATION</u> OLIVE GRAY SILTSTONE AND CLAYSTONE, MEDIUM PLASTICITY, AQUICLUDE MATERIAL				EASY DRILLING (0900) THROUGH SILTSTONE / CLAYSTONE (0930)
82						
84						
86						
88		END OF BORING 88' USED 1 BAG SUPERCOL (50lbs) FOR BORING INSTALLED PUMP WELL CASINGS CONSISTING OF 12" AND 2" MACHINE SLOTTED PVC CASINGS FROM APPROX 7' TO 87' 0-7' NON SLOTTED CASING, ENDS CAPPED, WELL CENTRALIZERS AT 7', 40', 87', BACKFILLED AROUND SLOTTED CASING WITH (SW) SAND CONSISTING OF IMPORTED DESIGN FILTER MIX FROM 5'-88', MONITORED BACKFILLING WITH TAPE SOUNDINGS				
90						
92						Sheet <u>4</u> of <u>4</u>



THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - UNION STATION DATE DRILLED 2/4/83 HOLE NO. 5-1 (1983)
 LOCATION NORTHEAST CORNER OF PUBLIC PARKING LOT GROUND ELEV. 279.1'
 DRILLING CONTRACTOR CONVERSE - LAS VEGAS LOGGED BY B. INGRAM DEPTH TO GROUND WATER 20.3
 TYPE OF RIG _____ HOLE DIAMETER 4 1/4" HAMMER WEIGHT AND FALL 320# 36" 2-8-83
 SURFACE CONDITIONS A.C. PARKING AREA TOTAL DEPTH 85.0 NO. CORE BOXES _____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0	SM	0.0 - 0.4' ASPHALT PAVEMENT			RD			SET UP 7:00 AM BEGIN DRILLING 7:30 AM WEATHER: CLEAR, WARM
0.4		0.4 - 2.0 FILL - SILTY SAND MOTTLED BRN, MOIST, DENSE VARIABLE COMPOSITION	1-1 12K		CCI DR			
2.0	SM/ML	YOUNG ALLUVIUM 2.0 - 4.0 SILTY SAND/SANDY SILT			RD			SLIGHTLY POROUS
4.0	SM	RED-BRN., MOIST, M. DENSE V. FINE SAND - 50-60% SILT - 40-50%						
4.0		4.0 - 8.0 SILTY SAND	1-2 6K		CCI DR			
6.0		GRAY-BRN., MOIST, M. DENSE FINE SAND WITH 20% SILT AND TRACE GRAVEL TO 1"			RD			
8.0	SW	8.0 - 70.0 GRAVELLY SAND						
10.0				5"	100 SPT			
				REFUSAL	RD			
12.0								
14.0								
16.0								
18.0								
20.0								

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	8.0-70.0 <u>GRAVELLY SAND</u> (CONTINUED)	50K		CCI DR			DELICATE SAMPLE, DIFFICULTY EXTRUDING - SAMPLE DESTROYED
22.0					RD			
24.0								
26.0								
28.0								
30.0			1-3 45K		CCI DR			POOR RECOVERY, DELICATE SAMPLE 3 RINGS ONLY
32.0					RD			
34.0		INTERMITTENT LENSES OF INCREASED GRAVEL CONTENT						
36.0								
38.0								
40.0			1-4 55K		CCI DR			SULPHUR ODOR IN SAMPLE
42.0					RD			POOR RECOVERY, 2 RINGS ONLY
44.0								SHEET <u>2</u> OF <u>5</u>

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (blows)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	8.0 - 70.0 <u>GRAVELLY SAND</u> (CONTINUED)			RD			SULPHUR ODOR POOR SAMPLE RECOVERY - 2 RINGS ONLY
46.0			1-5 57K	CCI DR				
48.0				RD				
50.0			80K	CCI DR				
52.0				RD				
54.0								
56.0			1-6 100K - 10"	CCI DR				
58.0				RD				
60.0								
62.0								
64.0								
66.0								
66.0			1-7 100K - 10"	CCI DR				SULPHUR ODOR POOR RECOVERY 4 RINGS ONLY
68.0				RD				

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (blows)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SW	8.0-70.0 <u>GRAVELLY SAND</u> (CONTINUED)			RD			
70.0	B	70.0-79.5 <u>BOULDERS</u> GRANITIC-TYPE CUTTINGS						
72.0								
74.0								
76.0			100K - 0" REFUSAL					ATTEMPTED TO SAMPLE - COULD NOT DRIVE SAMPLER TOO HARD TO SAMPLE
78.0								
80.0	CL/ SC	<u>PUENTE FORMATION</u> 79.5-85.0 <u>SANDY CLAYSTONE</u> <u>AND CLAYEY SANDSTONE</u>	1-8 50K		CCI DR			
82.0		OLIVE-GRAY COLOR, MOIST, FRESH THINLY LAMINATED, BEDDING PLANNES DIP ~ 50° (SAMPLES NOT ORIENTED).			RD			
84.0		FRIABLE. STRENGTH, FRIABLE TO LOW HARDNESS. TENDS TO FRACTURE ALONG LAMINATIONS	1-9 40K		CCI DR			
		END BORING 85.0 FT PIEZOMETER SET TO 85.0' PERFORATED INTERVAL: 45'-85'						

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BORING LOG SITE #1
 O.W.-4

Proj: 83-1140-06 MRTL PUMP TEST UNION STATION AREA Date Drilled 3/1-3/86 Ground Elev. 281'
 Drill Rig FAILING 1500 ROTARY WASH Logged By EMIR UTUH Total Depth 24'
 Hole Diameter 4 7/8" Hammer Weight & Fall 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0		0-0.5' ASPHALTIC PAVEMENT AND BASE			C	
0.5	ML	0.5'-5' <u>SANDY SILT</u> BROWN, MOIST, VERY FINE SAND AND SILT			AD	
5	SP	5'-6' <u>GRAVELLY SAND</u> , BROWN				
6	GP	6'-13' <u>SANDY GRAVEL</u> LIGHT BROWN AND GRAY, MEDIUM TO COARSE SAND, POORLY GRADED, COBBLES TO 4", SUBROUNDED, MOIST, LOOSE TO MEDIUM DENSE, TRACE FINES			RD	INSTALLED CASING MIXED REVERT
10			C-1		DR	
12					RD	
13	SP	13'-15' <u>SAND</u> YELLOWISH BROWN, GRANITIC FRAGMENTS, MEDIUM TO COARSE, TRACE FINE GRAVEL				
15	GP	15'-20' <u>SAND AND GRAVEL</u> YELLOWISH BROWN, MEDIUM TO COARSE SAND, COARSE GRAVEL AND SMALL COBBLES, SAND LENSES, TRACE SILT AND CLAY, POORLY GRADED WITH TRACE FINES			DR	
16	SP		C-2			
18					RD	
20		▲ APPROXIMATE GROUNDWATER LEVEL: 20.0'				

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20	GM	20'-22' <u>SANDY GRAVEL</u> DARK GRAY, SILT, COARSE GRAVEL TO 3"			RD	
			C-3		DR	3/28/86
22	SM	22'-30' <u>SILTY SAND</u> DARK GRAY TO GREENISH GRAY, COARSE SAND			RD	3/3/86 CAVING TO 17.5' REDRILLED BORINGS
24						
26		COARSE GRAVEL, ANGULAR, MEDIUM SAND, LENSES OF SANDY SILT AND CLAY	C-4		DR	
28						
30	SP	30'-34' <u>SAND</u> GRAY, MEDIUM TO COARSE SAND, POORLY GRADED, LITTLE GRAVEL, TRACE SILT.			RD	HYDROGEN SULFIDE ODOR ↓
32			C-5		DR	
34	GP	34-35.6 <u>SANDY GRAVEL</u>			RD	DRILL RIG CHATTER
36	SP	35.6-40 <u>SAND</u> GRAY, MEDIUM TO COARSE SAND, GRAVEL TO 1.5", TRACE SILT, H ₂ S ODOR			DR	
38	SP GP				RD	DRILL RIG CHATTER
40	SP	40-45.5 <u>SAND</u> GRAY, MEDIUM TO COARSE SAND			DR	SAMPLES NOT RECOVERED
42	SM SP	SAND SILT LENSE WITH CLAY BINDER			DR	
			C-7			
44					RD	Sheet <u>2</u> of <u>4</u>

Project 83-1140-06 MRTC PUMP TEST

Date Drilled 3/3/86

Hole No. Site #1 O.W. - 4

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	SP	40'-45.5' <u>SAND</u> - CONTINUED				HYDROGEN SULPHIDE ODOR - CONTINUED ↓ DRILL RIG CHATTER
46	GM GP	45.5'-47' <u>SANDY GRAVEL</u> WITH SILT, SUBROUND GRAVEL TO 1/2", GREEN CLAYEY SILT			RD	
48	SP	47-49' <u>SAND</u> GRAY, MEDIUM TO COARSE				
			C-8		DR	
50	GP SP GP	49'-51' <u>SANDY GRAVEL</u> TRACE FINES OCCASSIONAL SAND LENSES				DRILL RIG CHATTER
52	GM SM	51'-52.8' <u>SILTY SAND AND GRAVEL</u>			RD	
54	SW	52.8'-57' <u>SAND</u> GRAY, MODERATELY TO POORLY GRADED, MEDIUM TO COARSE SAND, TRACE SILT	C-9		DR	
56					RD	
58	GP	57'-58' <u>SANDY GRAVEL</u>				DRILL RIG CHATTER
60	SW SM	58'-60' <u>SILTY SAND</u> GRAY, FINE TO MEDIUM SAND MODERATELY GRADED, TRACE SILT	C-10		DR	H ₂ S ODOR
62	SM	60'-67.4' <u>SILTY SAND</u> GREENISH-GRAY VERY FINE SAND, TRACE CLAY, POORLY GRADED, DELAYING PLANT MATERIAL			RD	
64			C-11		DR	
66					RD	
68	GM GP	LENSE OF SILTY GRAVEL WITH CLAY 67.4-70.0 <u>SANDY GRAVEL</u>				DRILL RIG CHATTER Sheet <u>3</u> of <u>4</u>

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS	
68	GP	67.4-70' <u>SANDY GRAVEL</u> GRAY, COARSE, TRACE FINES			RD		
70	SW	70-72' <u>GRAVELLY SAND</u> GRAY, FINE TO COARSE SAND, SOME SILT, GRAVELS TO 3" MODERATELY WELL GRADED, COBBLES	C-12		DR	SMALL COBBLE IN SAMPLER TIP	
72	GP	72-78' <u>SANDY GRAVEL</u> GRAY, COARSE, COBBLES AND BOULDERS, TRACE FINES			RD	DRILL RIG CHATTER	
78	SM	78-79' <u>SANDY SILT</u> BROWNISH GREEN, POORLY GRADED, TRANSITION ZONE					
80	TP	79-84' <u>BEDROCK - PUENTE FORMATION</u> SILTSTONE / CLAYSTONE OLIVE GRAY, STIFF, TRACE VERY FINE SAND					
84		<p>END OF BORING 84'</p> <ul style="list-style-type: none"> - INSTALLED PIEZOMETER 0'-10' NON SLOTTED 2" PVC CASING 10'-79' MACHINE SLOTTED 2" CASING, 0.20" SLOTS, END CAPPED - FLUSHED CASING AND BORING WITH CLEAN WATER (± 1000 GALLONS) - BACKFILLED BORING WITH #3 MONTEREY SAND, 12-100# SACS - SEALED TOP 5' WITH CONCRETE GROUT AND BENTONITE, INSTALLED 2.5' CASING AND WELL COVER. 					
86							
88							
90							
92							

PUMP WELL AND OBSERVATION WELL BORING LOGS
UNION STATION SITE #2 - RAMIREZ AND VIGNES STREETS

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.



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Geo/Resource Consultants

SITE #2

BORING LOG PUMP WELL

83-1140-06
 MRTL PUMP TEST
 Proj: UNION STATION AREA Date Drilled 3/3-6/86 Ground Elev. 279.5
 Drill Rig INGERSOLL RAND TH60 Logged By MARK SCHLUTER Total Depth _____
 Hole Diameter 10" REAMED TO 24" Hammer Weight & Fall (NO SAMPLING PERFORMED)

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
0		0.0 - 9.0 <u>FILL</u> GRAVELLY SAND, SILT, AND SANDY SILT, TRACE AMOUNT OF DEBRIS AND RUBBLE INCLUDING FRAGMENTS OF CONCRETE, BRICK, METAL	(NO SAMPLING)			STARTED DRILLING AT (0945) 3-3-86 3/3/86 AIR-LIFTED CUTTING WITH DRILL RIG COMPRESSOR FROM 0-10' 3/3/86 (1240) STARTED REAMING BORING WITH MODIFIED 24" DRILL BIT AIR ROTARY 3/4/86 (0730) DRILLED OUT HOLE WITH 12" TRI-CONE BIT TO CLEAN OUT FALLEN GRAVELS AND COBBLES FROM 24" REAMING DRILLED TO 110' WITH 12" BIT. (1100)
9.0		9.0 - 85' <u>GRAVELLY SAND</u> MEDIUM TO COARSE SAND, SOME GRAVELS, TRACE SILT BORING LOGGED BASED ON ROTARY WASH CUTTING, GRAVELS AND COBBLES BROKEN UP DURING DRILLING.				3/3/86 DRILLED TO 10', SET UP FOR 10" ROTARY WASH DRILLING 3-3-86 ATTACHED 10" TRI-CONE BIT TO 10' LONG REAMING SECTION AND STARTED ROTARY WASH DRILLING OF PILOT HOLE. RD DRILLED 10" PILOT HOLE TO 100' 3-3-86 ADDED SUPERCOLD GUAR GUM TO DRILLING FLUID.
16		16' - DRILL RIG CHATTER GRAVELS AND COBBLES PROGRESS SLOWED				3/3/86 (1340) AT 16" WITH 24" MODIFIED DRILL BIT

83-1140-06
MRTC PUMP TEST

SITE #2

Project UNION STATION AREA

Date Drilled 3/3-6/86

Hole No. PUMP WELL

DEPTH USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS 16"	DRILL MODE	REMARKS
20	9.0 - 85' <u>GRAVELLY SANDS</u> - CONTINUED -	(NO SAMPLING)		RD ↓	3/3/86 (1030) AT 20' WITH 10" TRI-CONE BIT.
22					
24					
26	25' - DRILL RIG CHATTER - 10" BIT COBBLES AND GRAVELS				3/3/86 (1040) AT 25' WITH 10" TRI-CONE BIT
28					3/3/86 (1510) AT 28' WITH MODIFIED 24" BIT, GRAVELS AND COBBLES FALLING INTO PILOT HOLE, PULLED 24" MODIFIED BIT OUT OF HOLE AND ATTACHED 12" TRI-CONE BIT TO CLEAN OUT PILOT HOLE
30					
32					
34					
36					
38					
40					
42					
44					

83-1140-06
MRTL PUMP TEST
Project UNION STATION AREA

Date Drilled 3/3-6/86

Site #2
Hole No. PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68		9.0-85' <u>GRAVELLY SANDS</u> - CONTINUED -	(NO SAMPLING)			
70					RD ↓	3/4/86 (1630) AT 70' WITH MODIFIED DRILL BIT, WELDED WINGS WORN DOWN TO NUBS (14") PULLED RODS AND BIT TO ATTACH SECOND MODIFIED DRILL BIT ON 3/5/86 A.M. (SEE 3/5/86 AT 60')
72						
74						
76						
78						
80						3/3/86 (1145) AT 80' WITH PILOT HOLE USING 10" TRI-CONE BIT.
82						3/5/86 (1400) AT 80' WITH 2ND 24" MODIFIED DRILL BIT, PROGRESSES SLOW, GRAVELS AND COBBLES ACCUMULATING IN PILOT BORING
84						
86		85'-110' <u>BEDROCK</u> <u>PUNTE FORMATION</u> SILTSTONE / CLAYSTONE OLIVE GRAY COLOR				
88						3/5/86 (1450) AT 88' WITH WORN 20" MODIFIED BIT, DRILLING MUCH EASIER IN BEDROCK, STILL SOME DRILL RIG CHATTER FROM GRAVELS AND COBBLES THAT FELL INTO PILOT BORING
90						
92						

83-1140-06
MRTL PUMP TEST
UNION STATION AREA

Date Drilled 3/3-6/86

SITE #2
Hole No. PUMP WELL

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
92		<p>85'-110' <u>BEDROCK</u> <u>PUENTE FORMATION</u> SILTSTONE / CLAYSTONE - CONTINUED -</p>	(NO SAMPLING)		<p>RD ↓</p>	
94						
96						
98						
100						
102						-3/3/86 (1220) COMPLETED 10" PILOT HOLE TO 100', REMOVED DRILL RODS AND BIT AND STARTED REAMING 24" HOLE, USING 14.75' TR4-CONE BIT MODIFIED WITH WELLOW WINGS TO 24"
104						
106						
108						
110		<p>END OF BORING 110'</p> <p>4/5/86 (1500) FLUSHED BORING WITH DRILLING FLUID TO REMOVE CUTTINGS</p> <p>(1535) - ADDED FRESH WATER TO THIN DOWN SUPERCOL GUAR GUM DRILLING FLUID.</p> <p>- CONTINUED TO FLUSH BORING WITH CLEAN WATER FROM WATER TROUGH</p> <p>- BOTTOM OF BORING SOUNDED @ 87' WITH TAP (SOFT BOTTOM)</p> <p>(1605) INSTALLED 12" AND 2" MACHINE SLOTTED CASING INTO BORING</p> <p>0-7' NON SLOTTED</p> <p>7'-87' MACHINE SLOTTED</p> <p>BACKFILLED AROUND CASING WITH FILTER MIXED SAND, REPEATEDLY SOUNDED DEPTH TO SAND DURING BACKFILL</p>				<p>3/4/86 (1100) COMPLETED PILOT HOLE CLEAN-OUT WITH 12" BIT TO 110', PULLED OUT AND ATTACHED 24" MODIFIED BIT</p> <p>3/5/86 (1500) AT 110' WITH WORN 20" MODIFIED BIT, HEAVY DRILL RIG CHATTER - GRAVELS, COBBLES ACCUMULATED IN PILOT HOLE, LAST 20' - EASIER DRILLING IN BEDROCK</p>
112						
114						
116		<p>4/6/86 (0800) STARTED "AIR-LIFT" DEVELOPMENT OF PUMP WELL</p>				

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.




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SITE #2
BORING LOG OW-1

83-1140-06
 MRTC PUMP TEST
 Proj: UNION STATION AREA Date Drilled 2/24-25/86 Ground Elev. 279'
 Drill Rig FAILING 1500 ROTARY WASH Logged By EMIR UTUSH Total Depth 94'
 Hole Diameter 4 7/8" Hammer Weight & Fall 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0	FILL (AF)	0-2' GRAVELY SAND - (FILL)			AD/C	FILL
2	FILL (AF)	2-7' SILT - (FILL), DARK BROWN GRADING INTO OLIVE GREEN, LITTLE FINE-TO-MEDIUM GRAVEL AND SAND				PIECE OF METAL AT 3.5'
4						
6						
8	SM/ML	7-9' SANDY SILT, LIGHT OLIVE BROWN, SOME GRAVEL AND FINE SAND. GRADATIONAL FILL CONTACT.				3" SMALL COBBLE
10	SP/GP	9'-28' GRAVELY SAND/SANDY GRAVEL ANGULAR TO SUBROUNDED GRAVEL WITH MEDIUM TO COARSE SAND. TRACE FINES	C-1		DR	
12	SP/GP	COARSE SAND AND GRAVEL			RD	SET 12.5' OF CASING ADDED 1/2 BAG OF JOHNSON REVERT STRONG DRILL RIG CHATTER AT 11'
14						
16	SP/GP	MEDIUM TO COARSE SAND LENSE				DRILL RIG CHATTER STOPPED FROM 16'-17'
18						
20						

Sheet 1 of 5

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS 16"	DRILL MODE	REMARKS	
20	GP	<u>SANDY GRAVEL (CONTINUED)</u> WHITE AND GRAY COBBLES WITH COARSE SAND, TRACE SILT AND CLAY  GROUND WATER AT 25.7' LEVEL MEASURED @ 1100 A.M. ON 3/3/86	C-2		DR	SOFT ZONE @ 22'	
22					RD		
24				C-3			DR
26	GP SP						RD
28	SM ML	28'-30' FINE SAND AND SILT TRACE CLAY, SLIGHTLY DAMP, DARK GREEN, TRACE ORGANICS	C-4		DR	VARIABLE DRILL RIG CHATTER ↓	
30	GP	30'-31' SANDY GRAVEL			RD		
32	ML AND GP	31'-36' SILT AND SANDY GRAVEL INTERBEDDED LENSES OF SILT AND SANDY GRAVEL, SILT - DARK GREEN, TRACE CLAY	C-5		DR	2" COBBLE FRAGMENT IN DRIVE SAMPLE	
34		SANDY GRAVEL - COARSE GRAVEL AND SAND, LITTLE FINES IN SANDS, SILT SEAMS			RD		
36	GP	36'-39.5' SANDY GRAVEL SAND AND GRAVEL WITH COBBLES AND BOULDERS			DR	STRONG DRILL RIG CHATTER AT 36' VERY STRONG DRILL RIG CHATTER AT 37' - BOULDER?	
38			NO RECOVERY		DR		
40	ML	39.5'-40.5' SILT (?) SOFT ZONE			RD	VERY STRONG DRILL RIG CHATTER 39.5'	
42	GP	40.5'-43.5' SANDY GRAVEL SAND AND GRAVEL WITH COBBLES AND BOULDERS				INCREASING RESISTANCE GASTEL METER READING -NO COMBUSTIBLE GAS AT SURFACE ABOVE DRILLING FLUID	
44	GP	43.5'-45.5' SANDY GRAVEL	C-7		DR	Sheet <u>2</u> of <u>5</u>	

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	GP	<u>SANDY GRAVEL - CONTINUED</u> MOTTLED WHITE AND GRAY, CLASTS SUBANGULAR TO SUBROUNDED, TRACE SILT WITH CLAY			DR	STRONG DRILL RIG CHATTER AT 45'
46	SP	<u>45.5'-49.5' GRAVELLY SAND</u> LIGHT GRAY AND WHITE, COARSE SAND, TRACE SILT, SOME GRAVEL			RD	
50	SP	<u>49.5'-52.5' SAND</u> GRAY, LITTLE GRAVEL, TRACE SILT, MEDIUM TO COARSE SAND	C-8		DR	VARIABLE DRILL RIG CHATTER AT: 52.5', 53.5', 54'
52					RD	
54	SP	<u>52.5'-57.5' SAND</u> SAND WITH INTERBEDDED SANDY GRAVEL LENSES MEDIUM TO COARSE SAND, CLASTS SUBANGULAR TO SUB-ROUNDED				
56	GP		C-9		DR	DRILL RIG CHATTER AT 57.5' AND 60'
58	GP	<u>57.5'-61.5' GRAVEL</u> GRAVELS WITH SOME MEDIUM TO COARSE SAND			RD	
60		GRADATIONAL CONTACT				DRILL RIG CHATTER AT 61'
62	SM/ML	<u>61.5'-69.5' SAND AND SILT</u> DARK GREEN, FINE SAND AND SILT, TRACE CLAY, TRACE SMALL GRAVEL, H ₂ S ODOR IN SAMPLE	C-10		DR	LOST DRILLING FLUID CIRCULATION
64					RD	SMELL OF HYDROGEN SULPHIDE IN SAMPLE CAVING - BORING CAVED TO 7'
66						
68						

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	SP ML	SAND AND SILT - CONTINUED			RD	
70	GP	69.5'-71' <u>SAND</u> GRAY, MEDIUM COARSE, TRACE SMALL GRAVEL	C-11		DR	
72	GP	71'-76.5' <u>SANDY GRAVEL</u>			RD	DRILL RIG CHATTER AT 71'
74		(SP) SAND LENSE AT 74'				DECREASED DRILL RIG CHATTER AT 74' AND 75.5'
76		(SP) SAND LENSE AT 76'				
78	SP	76.5'-77.5' <u>GRAVELLY SAND</u>				DRILL RIG CHATTER AT 77.5'
80	GP	77.5'-80.5' <u>SANDY GRAVEL</u>				
82	GM GP	80.5'-84.5' <u>SANDY GRAVEL</u> FINE TO COARSE SAND, SUBGRADED FINE TO MEDIUM GRAVEL, TRACE BLuish GRAY SILT AND CLAY	C-12		DR	2-24-86 2-25-86
84		GRADATIONAL CONTACT			RD	
86	Sp	84.5'-94.0' <u>BEDROCK-SILTSTONE/CLAYSTONE</u> PUENTE FORMATION, OLIVE GREEN, SOFT, MOIST, INTERBEDDED FINE SAND LAYERS				
88		VERY FINE SAND INTERBEDS THINLY BEDDED TO LAMINATED DIPPING AT APPROX. 40°	NO RECOVERY		DR	
90		STIFF TO VERY STIFF			RD	
92			C-14		DR	ADDED 1 GAL (25#) OF REVERT Sheet <u>4</u> of <u>5</u>

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
92	Tp	<p><u>BEDROCK - SILTSTONE / CLAYSTONE</u> <u>CONTINUED</u> PUENTE FORMATION</p>			RD	
94						
96		<p>END OF BORING 94.0'</p>				
98		<p>- FLUSHED BORING</p>				
100		<p>- INSTALLED PIEZOMETER</p>				
102		<p>0'-10' NON SLOTTED 2" CASING</p>				
104		<p>10'-89' MACHINE SLOTTED 2" CASING,</p>				
106		<p>0.20" SLOTS, END CAPPED</p>				
108		<p>BACKFILLED BORING WITH #3</p>				
110		<p>MONTEREY SAND, 6-100# SACS</p>				
112		<p>- FLUSHED PIEZOMETER WITH FRESH</p>				
114		<p>WATER.</p>				
116		<p>- INSTALLED WELL COVER AND</p>				
		<p>SEALED TOP 4.5' WITH CONCRETE</p>				
		<p>GROUT AND BENTONITE.</p>				

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SITE #2

BORING LOG O.W.-2

Proj: 83-1140-06 MRTC PUMP TEST UNION STATION AREA Date Drilled 2/25-27/86 Ground Elev. 280'
 Drill Rig FAILING 1500 ROTARY WASH Logged By EMIR UTUSH Total Depth 84'
 Hole Diameter 4 7/8" Hammer Weight & Fall 250* @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0	FILL (AF)	0-4' SAND AND GRAVEL - (FILL) WITH DARK BROWN SILT			AD/C	FILL
2						
4	FILL (AF)	4-7' SILT - (FILL) BROWN, DRY, LOOSE				PIECES OF METAL, NAILS, GLASS AND SLAG-LIKE MATERIAL AT 4'
6		SIGHTLY DAMP LITTLE CLAY BINDER AT 7'				LARGE BENT METAL SPIKE AT 5'
8	ML	7-8' SILT - BROWN, SLIGHTLY DAMP, TRACE CLAY, SOFT				
8	SP	8-10' SAND - LIGHT BROWN, DAMP, LOOSE TO MEDIUM DENSE, LITTLE FINE GRAVEL, POORLY GRADED	C-1		DR	SET 11.5' OF CASING ADDED JOHNSON REVERT
10						
10	GP	10-16' SANDY GRAVEL BROWN TO LIGHT GRAY. GRAVEL - COARSE, SUB-ROUNDED SAND - POORLY GRADED WITH LITTLE SILT			RD	
12						
14						
16			C-2		DR	POOR RECOVERY
16	SP	16'-20.5' GRAVELLY SAND LIGHT BROWN TO SPECKLED YELLOW/GREY, WET, MEDIUM DENSE, POORLY GRADED MEDIUM TO COARSE SAND, MEDIUM GRAVEL TO 3/4", TRACE SILT			RD	
18						
20						

Project 83-1140-06
MRTC PUMP TEST

Date Drilled

2/25/86

Hole No. 0.W.-2 SITE #2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS (6")	DRILL MODE	REMARKS
20	SP	GRAVELLY SAND				
	GP	20.5'-24' SANDY GRAVEL				DRILL RIG CHATTER AT 20.5'
	GM	LIGHT BROWN WITH GRAY AND YELLOW, MEDIUM TO COARSE GRAVEL, POORLY GRADED SAND, LITTLE SILT			RD	
22	ML	25' THIN CLAY SILT SEAM, SOME SAND				
	GP					
24	SM	24'-26.8' SILTY SAND				
		BROWN, MEDIUM DENSE, WET, SOME GRAVEL, TRACE CLAY	C-3		DR	GROUNDWATER AT 25.9'
26	SP	26.8'-30.2' SAND				LEVEL MEASURED @ 1158 A.M. ON 3/3/86
		GRAY, MEDIUM TO COARSE SAND, SOME GRAVEL, TRACE SILT, POORLY GRADED				CAVING FROM 26' TO 31'
28						
30		SLEIGHT INCREASE IN SILT			RD	
	GP	30.2'-30.7' GRAVEL				INCREASED DRILL RIG CHATTER
32	GM	30.7'-37'				SMOOTH
34		SANDY GRAVEL				
		WITH SILT, GRAY, LOOSE TO MEDIUM DENSE	C-4		DR	
	GP					DRILL RIG CHATTER AT 35'
36	GM					
38	GP	37'-45' SANDY GRAVEL				
		COARSE SAND AND GRAVEL COBBLE AND BOULDER ZONES			RD	STRONG DRILL CHATTER AT 38'
40						
		LENSES OF COBBLES AND BOULDERS - VARIABLE -				STRONG, DRILL CHATTER AT 41'
42						
						STRONG DRILL CHATTER AT 42'
44						

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	GP	<u>SANDY GRAVEL</u>			RD	SLIGHT H ₂ S ODOR
45-46	SP	<u>GRAVELLY SAND</u>			RD	
46	GP	46-51.4 <u>GRAVEL</u> GRAY, WITH SAND AND SOME SILT, COARSE GRAVEL TO COBBLE SIZE CLASTS, COARSE SAND	C-5		DR	CAVING TO 44' STRONG DRILL RIG CHATTER, ADDED ADDITIONAL REVERT TO DRILLING FLUID, BOULDERS AND COBBLES BLOCKING BORING. 2-25-86 2-26-86
48	GP/SP				RD	
50		<u>SANDY GRAVEL</u> COARSE SAND, TRACE FINES			RD	
52	SP	51.4-56' <u>GRAVELLY SAND</u> GRAY, COARSE SAND, POORLY GRADED, LITTLE SILT			DR	CAVING TO 31', BORING BLOCKED, REPOSITIONED BORING ADJACENT TO CAVED HOLE, DROVE CASING TO 32' RESUMED DRILLING ADDED REVERT TO DRILLING FLUID.
54		H ₂ S ODOR IN SAMPLE				
56	SP	56-58' <u>SAND</u> GRAY, MEDIUM DENSE, FINE TO MEDIUM SAND, TRACE SILT H ₂ S ODOR IN SAMPLE	C-6		DR	
58	GP	58-61' <u>SANDY GRAVEL</u> GRAY				
60					RD	
62	SM/ML	61-70' <u>SAND AND SILT</u> DARK GREEN TO GRAY, LOOSE TO MEDIUM DENSE, SOME CLAY AND GRAVEL, VERY FINE SAND, TRACE ORGANICS (PLANT ROOTLETS)				
64					DR	
66			C-7		RD	
68						

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	ML	<u>SAND AND SILT</u> - CONTINUED -				
70	SP	70'-71' <u>SAND</u> MEDIUM COARSE, LITTLE GRAVEL			RD	
72	GP	71'-72' <u>SANDY GRAVEL</u> COARSE SAND AND GRAVEL, COBBLES AND BOULDERS				STRONG DRILL RIG CHATTER
74						
76			X		DR	NO RECOVERY
78					RD	STRONG DRILL RIG CHATTER
80						LOST DRILLING FLUID CIRCULATION MIXED IN ADDITIONAL REVERT
82	GM GP	81'-82' <u>SANDY GRAVEL</u> WITH SILT, LUMPS OF DARK GRAY/GREEN SILT WITH CLAY BINDER				CAVING UP TO 32' ADDING ADDITIONAL REVERT
84	GP	82'-84' <u>SANDY GRAVEL</u> COARSE SAND AND GRAVEL, LITTLE FINES				82' LOSING FLUID ADDED TOTAL 3 SACS OF REVERT, DRILLED TO 84' AND INSTALLED 2" CASING
86		END OF BORING 84.0 (BORING CLOSE TO BEDROCK)				
88		- INSTALLED PIEZOMETER 0-12' NON SLOTTED 2" CASING 12'-81' MACHINE SLOTTED 2" CASING 0.20" SLOTS, END CAPPED				
90		- FLUSHED BORING AND CASING WITH CLEAN WATER (±400 GALLONS), CONTINUED TO FLUSH, WATER NOT RETURNING TO SURFACE - LOST TO FORMATION, PUMPED DOWN ADDITIONAL WATER AND 1 GALLON OF BLEACH (±800 GALLONS)				
92		- BACKFILLED BORING WITH #3 MONTEREY SAND; 8 - 100# SACS - INSTALLED WELL COVER AND SEALED TOP 5' WITH CONCRETE GROUT AND BETONITE.				

THIS BORING LOG IS BASED ON FIELD CLASSIFICATION AND VISUAL SOIL DESCRIPTION, BUT IS MODIFIED TO INCLUDE RESULTS OF LABORATORY CLASSIFICATION TESTS WHERE AVAILABLE. THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME. CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.



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SITE #2
 O.W. -3

BORING LOG

83-114D-06
 MRTL PUMP TEST
 Proj: UNION STATION AREA Date Drilled 2/28-3/1/86 Ground Elev. 280'
 Drill Rig FAILING 1500 ROTARY WASH Logged By EMIR UTUSH Total Depth 85'
 Hole Diameter 4 7/8" Hammer Weight & Fall 250# @ 30"

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
0	FILL (AF)	0.0'-8' <u>SILTY SAND</u> BROWN, DRY, LOOSE, BROKEN BRICK FRAGMENTS, TOP 6" ASPHALT AND BASE SUBGRADE			AD	CORED THROUGH ASPHALT PAVEMENT FILL
8	ML	8'-11' <u>SANDY SILT</u> SILT WITH VERY FINE SAND, BROWN, LOOSE, TRACE CLAY, POSSIBLE FILL?	C-1		DR	SET CASING AND ADDED REVERT TO DRIVING FLUID
11	GP	11'-17' <u>SANDY GRAVEL</u> LIGHT GRAY TO LIGHT BROWN, GRANITIC CLASTS, POORLY GRADED, CLASTS SUBANGULAR TO SUBROUND			RD	
17	SP	17-18.4 <u>SAND</u> GRAY TO LIGHT BROWN, LOOSE, WITH SILT AND GRAVEL	C-2		DR	DRILL RIG CHATTER AT 19'
18.4	GP	INCREASING GRAVELS			RD	
18.4-23	GM	<u>SILTY GRAVEL</u>				Sheet <u>1</u> of <u>4</u>

Project 83-1140-06
MRTZ PUMP TEST

Date Drilled 2/28/86

Hole No. 0.W.-3 SITE # 2

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	BLOWS 16"	DRILL MODE	REMARKS
20	GM	18.4'-23' <u>SILTY SAND AND GRAVEL</u> SILT WITH COARSE SAND AND GRAVEL, LUMPS OF GRAY/GREEN CLAY	C-3		RD	
22	SM				DR	
22					RD	DRILL RIG CHATTER @ 22'
24	GP	23'-26' <u>SANDY GRAVEL</u> SAND AND GRAVEL, POORLY GRADED, COARSE, TRACE SILT	C-4		DR	
26	SP	26'-29' <u>GRAVELLY SAND</u> COARSE, POORLY GRADED, LITTLE SILT			RD	<u>GROUNDWATER</u> ▲ AT 26.8' — LEVEL MEASURED AT 1050 A.M. ON 3/3/86
28						
30	GP	29'-30.6' <u>SANDY GRAVEL</u> COARSE GRAVEL, SUBANGULAR TO SUBROUNDED				DRILL RIG CHATTER AT 29'
30.6	GM	30.6'-31' <u>SILTY GRAVEL WITH TRACE CLAY</u>				
32	SP	31'-33.5' <u>SAND</u> GRAY, MODERATELY GRADED, MEDIUM TO COARSE SAND, SOME FINE SAND, TRACE SILT	C-5		DR	
34	GM	33.5'-43.0' <u>SANDY GRAVEL</u> WHITE TO GRAY WITH CLAYEY SILT INCLUSIONS, SOME SILT, POORLY GRADED COARSE SAND			RD	ADDING ADDITIONAL REVERT TO THICKEN FLUID. ROCK FRAGMENTS AND GRAVELS ACCUMULATING IN BOTTOM OF BORING, ATTEMPTING TO FLUSH WITH THICKENED FLUID DRILL RIG CHATTER
36						
38						
40		GRAY, COARSE GRAVEL TO 3", COARSE SAND WITH SILT, DENSE	C-6		DR	
42					RD	
44	GP	43'-47' <u>SANDY GRAVEL</u> SOME SILT, COARSE GRAVEL				DRILL RIG CHATTER AT 43'

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
44	GP	43'-47' <u>SANDY GRAVEL</u> SOME SILT, COARSE GRAVEL				DRILL RIG CHATTER
46					RD	
48	GM	47'-49' <u>SANDY GRAVEL</u> WITH SILT, GREEN CLAYED SILT				
50	SP SM	49'-52' <u>SAND</u> GRAY, DENSE, SOME SILT AND GRAVEL, COARSE TO MEDIUM COARSE SAND, POORLY GRADED.	C-7		DR	
52	GP SP	52'-61' <u>SANDY GRAVEL</u> MIXTURE OF SAND AND GRAVEL, TRACES FINES, OCCASSIONAL LENSES OF GRAVELS AND COBBLES			RD	OCCASSIONAL DRILL RIG CHATTER 54' - STRONG DRILL RIG CHATTER VARIABLE DRILL RIG CHATTER ↓
54						
56						
62	SP	61'-64' <u>SAND</u> GRAY, MEDIUM COARSE SAND, SOME GRAVEL, TRACE FINES	C-8		DR	LOOSE SAMPLE
64	GP	OCCASSIONAL GRAVEL/COBBLE LENSES			RD	
66	SM ML	64'-69' <u>SAND AND SILT</u> DARK GRAYISH GREEN, FINE SAND AND SILT, POORLY GRADED, TRACE ORGANICS (PLANT ROOTS), TRACE GRAVEL.	C-9		DR	
68					RD	

DEPTH	USCS	MATERIAL CLASSIFICATION	SAMPLE	RUN NO.	DRILL MODE	REMARKS
68	SM ML	64'-69' <u>SAND AND SILT</u> DARK GREEN TO GRAY, FINE SAND, LITTLE GRAVEL				
70	GP	69'-71' <u>SANDY GRAVEL</u>			RD	DRILL RIG CHATTER
72	SP	71'-74' <u>SAND</u> GRAY, COARSE SAND LITTLE GRAVEL				
74	GP	74'-84' <u>GRAVEL</u> COARSE GRAVEL TO 2", WITH MEDIUM TO COARSE SAND, TRACE SILT, GRAY COLOR	C-10		DR	DRILL RIG CHATTER ↓
76						STARTED LOSING DRILLING FLUID TO FORMATION, MIXING IN ADDITIONAL REVERT
78					RD	2/28/86 3/1/86
80		<u>SANDY GRAVEL</u> SUBROUNDED TO WELL ROUNDED PEBBLES				CAVING TO 72', MIXED ADDITIONAL REVERT, BOTTOM OF BORING CAVING
82						
84	TP P	84'-85' <u>BEDROCK - PUENTE FORMATION</u> OLIVE GRAY SILTSTONE/CLAYSTONE				DRILLED TO 85' AND INSTALLED CASING
86		<u>END OF BORING 85'</u> -INSTALLED PIEZOMETER 0-10' NON SLOTTED 2" PVC CASING 10'-78.5' MACHINE SLOTTED 2" CASING 0.20" SLOTS, END CAPPED				
88		-FLUSHED CASING AND BORING WITH CLEAN WATER (±1800 GALLONS WITH ±650 GALLONS RETURNING) RETURN FLUID REDUCED AS BORING WAS FLUSHED. ADDED 1/2 QUART BLEACH.				
90		-BACKFILLED BORING WITH #3 MONTEREY SAND -INSTALLED WELL COVER AND CASING TOP 2.5', SEALED TOP 5' WITH CONCRETE GROUT AND BENTONITE				
92						Sheet <u>4</u> of <u>4</u>

Converse Consultants



Boring Log 5-5 (1983)

THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - Union Sta. DATE DRILLED 2/1/83 HOLE NO. 5-5
 LOCATION LOADING DOCK AT INT. VIGNES & RAILWAY STS GROUND ELEV. 280.8'
 DRILLING CONTRACTOR CONVERSE - Las Vegas LOGGED BY B. INGRAM DEPTH TO GROUND WATER 27.9
 TYPE OF RIG _____ HOLE DIAMETER 4 3/4" HAMMER WEIGHT AND FALL 320# 36" (2-8-2-)
 SURFACE CONDITIONS A.C. PARKING AREA TOTAL DEPTH 100.0 NO. CORE BOXES _____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0 - 0.3 - ASPHALT PAVEMENT			RD			SET UP 2:45 PM 1/31 BEGIN DRILLING 7:15 AM 2/1/83 WEATHER: CLEAR, WARM
0.3	ML & SM	0.3 - 5.5 - FILL - SANDY SILT & SILTY SAND		16	S			
2.0		MOTTLED & INTERMIXED MOIST, STIFF / M. DENSE W/ BRICK DEBRIS		25	P			
4.0				57	T			
5.0			5-1		RD			DRILLED TO 5' WITH 7" BIT FOR PIEZO INSTALLATION. 4 3/4" BIT BELOW
6.0	SM	YOUNG ALLUVIUM	3K		CCI DR			
5.5		5.5 - 11.0 - SILTY SAND			RD			CONTACT CONTAINED WITHIN SAMPLE
8.0		GRAY-BRN, MOIST, MED. DENSE FINE TO V. FINE SAND - 76% 30% SILT						
10.0				10	S			
11.0	SP	11.0 - 14.0 - SAND		12	P			
12.0		GRAY-BRN, MOIST, M. DENSE TO DENSE POORLY GRADED FINE SAND W/ TRACE SILT		25	T			
14.0	SW	14.0 - 62.0 GRAVELLY SAND			RD			GRAVELLY - DISTURBED SAMPLE
16.0		BROWN, DENSE WELL GRADED - MED TO COARSE CLEAN SAND - 70% GRAVEL TO 2" - 30% SUBANGULAR TO SUBROUND GRAINS, GRANITIC COMP.	5-2 50K		CCI DR			
18.0					RD			
28.0								

PROJECT SCRTD - UNION STA. DATE DRILLED 2/1/83 HOLE NO. 5-5(1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	14.0 - 22.0 <u>GRAVELLY SAND</u> (CONTINUED)	5"	100	SPT			
				REFCAL	RD			
22.0								
24.0								
26.0		25.5 - 26.0 - LENSE OF FINE SAND IN SAMPLE	5-3 36K		CCI DR			
28.0					RD			
30.0		30.0 COLOR CHANGE TO DR. GRAY INCREASED MAFIC CONTENT: GRANITIC/DIORITIC COMP.	3"	75 100	SPT			SLIGHT GAS ODOR
32.0				REFCAL	RD			
34.0								
36.0			5-4 40K		CCI DR			SLIGHT GAS ODOR GRAVELLY SAMPLE - ONLY 5 GOOD RINGS
38.0					RD			
40.0			J-1	25	S			
				75	P			
			2"	100	T			
42.0			REFCAL	RD				
44.0								

PROJECT SCRTD - UNION STA. DATE DRILLED 2/1/83 HOLE NO. 5-5 (1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0		14.0 - 62.0 <u>GRAVELLY SAND</u>			RD			
46.0		(CONTINUED)						
48.0								
50.0								
52.0			75K		CCI DR			SULPHUR ODOR POOR SAMPLE RECOVERY - REMAINING SAMPLE DESTROYED IN HANDLING
54.0					RD			
56.0		GRAD. DECREASING GRAVEL CONTENT ↓						
58.0								
60.0			5-5 50K		CCI DR			SLIGHT SULPHUR ODOR
62.0	SP	62.0 - 78.0 <u>SAND</u>			RD			
64.0		DARK GRAY, DENSE POORLY GRADED UNIFORM FINE TO VERY FINE GRAINED MICACEOUS						
66.0								
68.0								

PROJECT SCRTD - UNION STA. DATE DRILLED 2/1/83 HOLE NO. 5-5 (1983)

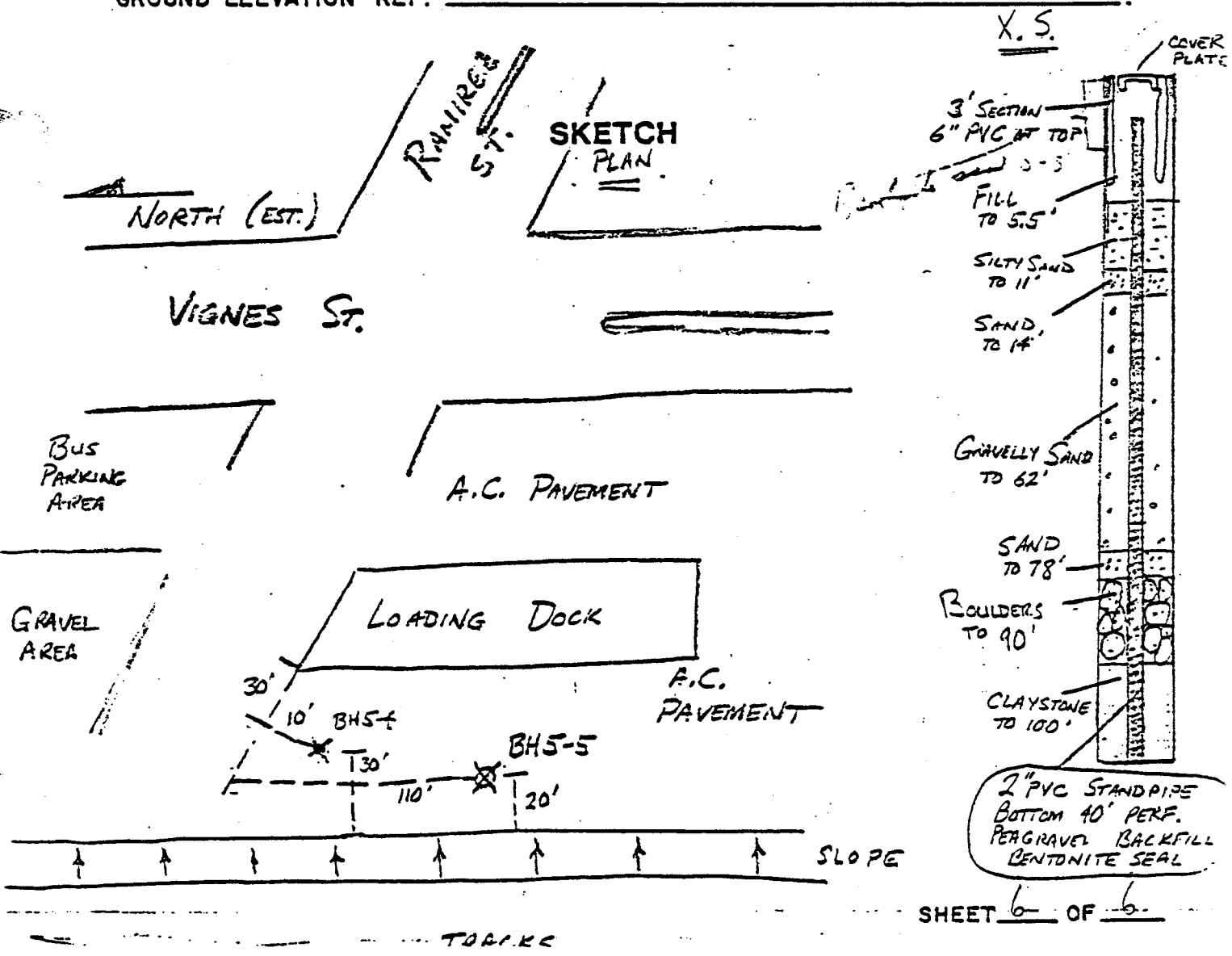
DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
66.0	SP	62.0-78.0 <u>SAND</u>			RD			
		(CONTINUED)						
70.0			5-6		CCI DR			STRONGER SULPHUR ODOUR
			5DK		RD			POOR SAMPLE RECOVERY: 4 1/2 RINGS ONLY
72.0								
74.0								
76.0								
78.0		78.0-90.0 <u>BOULDERS</u>						78.0 - CHANGE IN DRILLING CONDITIONS - V. HARD DRILLING, FULL WT. OF RIG (10TON) ON BIT. TOO HARD TO SAMPLE TO 90.0' NO SAMPLE RECOVERY
		CUTTINGS: MED. TO COARSE SUBANGULAR GRAINS GRANITIC COMPOSITION						
80.0			60K-1"		CCI DR			
			REFUSAL		RD			
82.0								
84.0								
86.0			100K-0"		RD			ATTEMPTED TO SAMPLE - UNSUCCESSFUL
			REFUSAL					
88.0			J-2					JTR SAMPLE OF CUTTINGS TAKEN
			CUTTINGS					
90.0	CL	<u>PUENTE FORMATION</u> 90.0-100.0 <u>CLAYSTONE</u>						EASY DRILLING FROM 90.0' CLAYSTONE CUTTINGS OBTAINED
92.0		(SEE NEXT PAGE)						SHEET <u>4</u> OF <u>6</u>

PROJECT SCRTD - UNION STA DATE DRILLED 2/1/83 HOLE NO. 5-5 (1983)

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
92.0	CL	90.0-100.0 <u>CLAYSTONE</u> (CONTINUED) OLIVE-GRAY COLOR, MOIST. PLASTIC TO FRAGILE STRENGTH, SOFT FRAGILE HARDNESS, THINLY LAMINATED W/ SILTY CLAYSTONE - 20% SANDSTONE BLEBS. TENDS TO FRACTURE ALONG LAMINATIONS	5-7 SBK		RD			
94.0								
96.0								
98.0								
100.0								
		END BORING 100.0 FT PIEZOMETER SET TO 100' PERFORMED IN LOWEST 40'						

SUMMARY BORING NO. 5-5 (1983)

PROJECT SCRTD STATION HOLE UNION STA. DATE DRILLED 2/1/83
 OVERBURDEN DEPTH (FT.) 0.0 TO 90.0
 BEDROCK DEPTH (FT.) 90.0 TO 100.0 (T.D.)
 WATER PRESS. TEST No; INTERVAL(S) — TO —, — TO —
 GROUND WATER DEPTH (FT.) 28.0 DATE 2/3/83; 27.9 DATE 2/8/83
 GAS YES; DEPTH FIRST NOTICED 30', DATE —. (SULPHUR ODOR)
 E-LOG No
 DOWN-HOLE SURVEY No
 CROSS-HOLE SURVEY No
 PVC CASING (I.D.): 4" — TO —; 3" — TO —; 2" 0.4 TO 100.0
 GROUND ELEVATION REF. —



2" PVC STANDPIPE
 BOTTOM 40' PERF.
 PERGRAVEL BACKFILL
 BENTONITE SEAL

1983 UNION STATION BORING LOGS

DESIGN UNIT A135

BORING LOGS FOR HOLE NUMBERS 5-2, 5-3 and 5-4



THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - UNION STATION DATE DRILLED 2/3/83 HOLE NO. 5-2
 LOCATION BETWEEN TRACKS & RAILROAD BUILDING GROUND ELEV. 292.7'
 DRILLING CONTRACTOR CONVERSE-LAS VEGAS LOGGED BY B. INGRAM DEPTH TO GROUND WATER _____
 TYPE OF RIG _____ HOLE DIAMETER 4 3/4" HAMMER WEIGHT AND FALL 320#, 36"
 SURFACE CONDITIONS A.S. / CONCRETE PAVED AREA TOTAL DEPTH 85.0' NO. CORE BOXES _____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0-0.4' CONCRETE SLAB			RD			SET UP 7:00 AM BEGIN DRILLING 7:30 AM WEATHER: OVERCAST, COOL
		0.4-0.8' BASE COURSE						
0.8	ML & CL	0.8-14.0' FILL - CLAYEY SILT AND SILTY CLAY	2-1		CCD			TRIED TO SAMPLE WITH SPT - COULD NOT DRIVE,
2.0		MOTTLED BRN & GREEN-GRAY, MOIST, STIFF, W/ TRACE GRAVEL AND 10% FINE SAND	8K		RD			
4.0								
6.0								
8.0								
10.0								
12.0				8 11 24	S P T			
13.0		13.0' - ROCK OR CONCRETE ENCOUNTERED			RD			
14.0	SM	14.0-19.0' YOUNG ALLUVIUM SILTY SAND						
16.0		GRAY-BRN, MOIST, MED. DENSE FINE TO V. FINE SAND W/ 20% SILT		6 7 14	S P T			
18.0					RD			
19.0	SW	19.0-72.0' GRAVELLY SAND (SEE NEXT PAGE)						

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (ft)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	17.0 - 22.0 GRAVELLY SAND	2-2		CCT DR			DISTURBED SAMPLE - 4 RINGS ONLY
		(CONTINUED)	25K		RD			
22.0		GRAY, DENSE WELL GRADED - MED. TO COARSE SAND, GRAVEL TO 2", PERCENTAGES VARYING WITH DEPTH GRANITIC COMPOSITION						
24.0								
26.0								
28.0								
30.0								
32.0								
34.0								
36.0								
38.0								
40.0								
42.0								
44.0								

70 S
100 P
5th REFUSAL RD

RUSTY STAINED GRAINS
IN SAMPLE -
OXYDIZING ENVIRONMENT

INCREASING CONTENT
OF FINE & V. FINE
GRAINED SAND ↓

50K

No SAMPLE RECOVERY

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	19.0 - 72.0 <u>GRAVELLY SAND</u>			KD			SLIGHT SULPHUR ODOR, GRAY SAMPLE - REDUCING ENVIRONMENT POOR SAMPLE RECOVERY - - 4 DISTURBED RINGS ONLY
46.0		(CONTINUED) COLOR CHANGE OBSERVED - TO DK. GRAY	2-3 75K		CCI DR RD			
48.0								
50.0								
52.0								
54.0								
56.0			80K		CCI DR RD		No SAMPLE RECOVERY	
58.0								
60.0			75K		CCI DR RD		No SAMPLE RECOVERY	
62.0		GRAVEL CONTENT DECREASES W/ DEPTH ↓						
64.0								
66.0			5-5" 100 REFUSAL	SPT	RD			
68.0								

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	BT (ft)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SW	19.0-72.0 <u>GRAVELLY SAND</u>			RD			
70.0		(CONTINUED) DECREASING GRAVEL CONTENT	2-4 60K		CCI DR			SLIGHT SULPHUR ODOR
72.0	SP	72.0-83.0 <u>SAND</u>			RD			EASIER DRILLING
74.0		DARK GRAY, DENSE, POORLY GRADED PREDOM. MED. GRAINED TRACE GRAVEL TO 2"						
76.0			5"	100	SPT RD			SULPHUR ODOR
78.0		SAND BECOMES MORE FINE-GRAINED						
80.0		FINE TO V. FINE GRAINED	2-5 50K		CCI DR			SULPHUR ODOR DISTURBED SAMPLE ONLY 5 RINGS
82.0		THIN LENSES OF SILTY SAND			RD			
84.0		83.0-84.0 <u>BOULDERS</u> GRANITIC-TYPE CUTTINGS	50K-0"		CCI			HARD DRILLING TRIED TO SAMPLE - COULD NOT DRIVE SAMPER
		PERICAL						
		END BORING 84.0 FT						

SUMMARY BORING NO. 5-2

PROJECT SCRTD STATION HOLE UNION STATION DATE DRILLED 2/3/83

OVERBURDEN DEPTH (FT.) 0.0 TO 84.0 (T.D.)

BEDROCK DEPTH (FT.) TO (T.D.)

WATER PRESS. TEST No; INTERVAL(S) TO , TO

GROUND WATER DEPTH (FT.) DATE ; DATE
ROTARY WASH BORING - COULD NOT DETERMINE

GAS Yes; DEPTH FIRST NOTICED 45', DATE 2/3/83 - SULPHUR ODOR

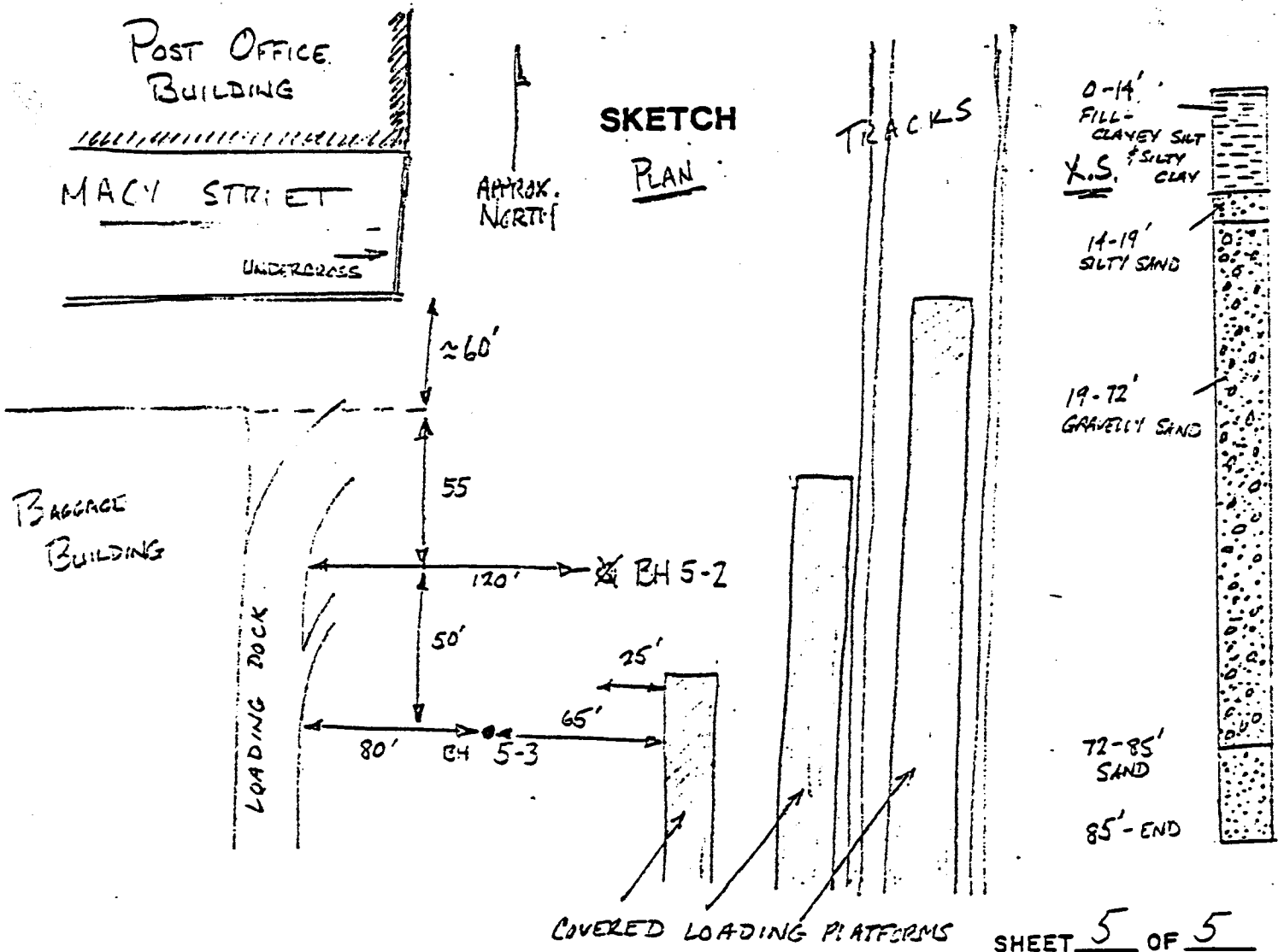
E-LOG No

DOWN-HOLE SURVEY No

CROSS-HOLE SURVEY No

PVC CASING (I.D.): 4" NONE TO ; 3" TO ; 2" TO

GROUND ELEVATION REF.





THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD - UNION STATION DATE DRILLED 2/2/83 HOLE NO. 5-3
 LOCATION BETWEEN TRACKS & BAGGAGE BLDG. GROUND ELEV. 292.8'
 DRILLING CONTRACTOR CONVERSE - LAS VEGAS LOGGED BY B. INGRAM DEPTH TO GROUND WATER _____
 TYPE OF RIG _____ HOLE DIAMETER 4 3/4" HAMMER WEIGHT AND FALL 320#, 36"
 SURFACE CONDITIONS A.C. PAVED AREA TOTAL DEPTH 80.0' NO. CORE BOXES _____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0		0.0 - 0.8' ASHALT PAVEMENT			RD			SET UP 7:00 AM
0.8	GW	0.8 - 4.6' <u>FILL - GRAVEL</u>			CC: DR			BEGIN DRILLING 7:30 AM
2.0		WELL GRADED GRAVEL TO 2 1/2", COMPOSITION VARIABLE SUBANGULAR TO SUBROUNDED	20K		RD			WEATHER: COOL, RAINING
4.0								NO SAMPLE RECOVERY
4.6	ML	4.6 - 14.0 <u>CLAYEY SILT</u>			CC: DR			LOST CIRCULATION OF DRILLING FLUID
6.0		GREEN-GRAY, MOIST, STIFF CONSISTENCY VARIABLE SAND CONTENT (LOCALLY 3-30%)	3-1 15K		RD			
8.0								
10.0		TO VERY STIFF CONSISTENCY						
12.0				15 25 45	S P T			
14.0					RD			
14.0	SM	<u>YOUNG ALLUVIUM</u>						
14.0		14.0 - 19.0 <u>SILTY SAND</u>						
16.0		GRAY-BROWN, MOIST, MED. DENSE. FINE TO V. FINE SAND WITH 20% SILT			S P T			
18.0					RD			
19.0	SW	19.0 - 74.0 <u>GRAVELLY SAND</u>						
20.0		(SEE NEXT PAGE)						

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (blows)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
20.0	SW	19.0 - 74.0 <u>GRAVELLY SAND</u> (CONTINUED)	37K		CCT DR			No SAMPLE RECOVERY
22.0		BROWN, VERY DENSE, WELL GRADED - MED. TO COARSE SAND (70%), GRAVEL TO 3" (30%) SUBANGULAR TO SUBROUNDED GRAINS; GRANITE COMP.			RD			
24.0		ALTERNATING SAND & GRAVEL STRATA						24-28' INTERMITTENT RIG CHATTER
26.0								
28.0								
30.0								
32.0			ROK-9"		CCT DR			POOR SAMPLE RECOVERY LARGE GRAVEL - SAMPLE DESTROYED BY HANDLING
34.0					RD			
36.0								
38.0								
40.0		CHANGE OF SAMPLE COLOR TO DARK GRAY	5TK		CCT DR			SULPHUR ODOR LARGE GRAVEL IN SAMPLE - SAMPLE DESTROYED BY HANDLING
42.0					RD			RIG CHATTER AT 43'
44.0								SHEET <u>2</u> OF <u>5</u>

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (K)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	19.0-74.0 <u>GRAVELLY SAND</u> (CONTINUED)			RD			
46.0								
48.0								
50.0			3-2 41K		CCI DR			SULPHUR ODOR IN SAMPLE
52.0		ALTERNATING SAND AND GRAVEL STRATA			RD			53' INTERMITTENT RIG CHATTER TO 58'
54.0								
56.0								
58.0								
60.0			82K		CCI DR			SLIGHT SULPHUR ODOR IN SAMPLE
62.0					RD			POOR RECOVERY - SAMPLE DESTROYED BY HANDLING
64.0		LESS GRAVEL, LENSES FURTHER APART						
66.0								
68.0								

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (blows)	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SW	19.0-74.0 <u>GRAVELLY SAND</u> (CONTINUED)			RD			
70.0					CCI DR			
72.0					RD			
74.0	SP	74.0-80.0 <u>SAND</u> DARK GRAY, MED. DENSE TO DENSE; POORLY GRADED, UNIFORM FINE TO V. FINE GRAINED, MICACLOUS SILTY SAND LENSES						74' EASIER DRILLING
76.0								
78.0								
80.0					CCI DR			
		END BORING 80.0 FT						

SUMMARY BORING NO. 5-3

PROJECT SCRTD STATION HOLE UNION STATION DATE DRILLED 2/2/83

OVERBURDEN DEPTH (FT.) 0.0 TO 80.0 (T.D.)

BEDROCK DEPTH (FT.) TO (~~7.0~~)

WATER PRESS. TEST No; INTERVAL(S) TO , TO .

GROUND WATER DEPTH (FT.) DATE ; DATE .
ROTARY WASH BORING - COULD NOT DETERMINE

GAS Yes; DEPTH FIRST NOTICED 40', DATE 2/2/83 - SULPHUR ODOR

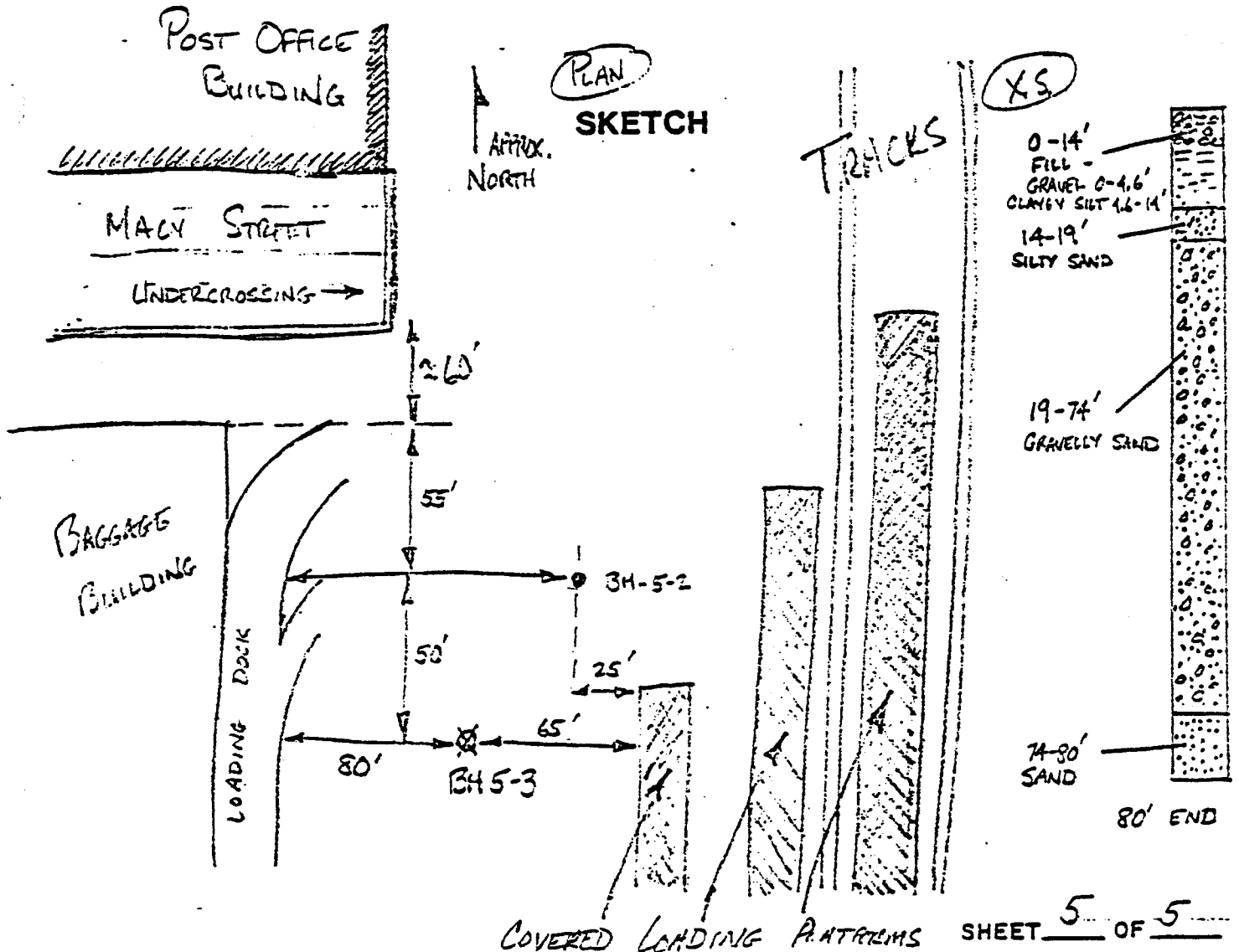
E-LOG No

DOWN-HOLE SURVEY No

CROSS-HOLE SURVEY No

PVC CASING (I.D.): 4" TO ^{NONE}; 3" TO ; 2" TO

GROUND ELEVATION REF.





THIS LOG IS APPLICABLE ONLY AT THIS LOCATION AND TIME.
 CONDITIONS MAY DIFFER AT OTHER LOCATIONS OR TIME.

PROJECT SCRTD DATE DRILLED 1/31/83 HOLE NO. 5-4
 LOCATION LOADING DOCK INT. VIGNES & RAMIREZ STREETS GROUND ELEV. 287.6'
 DRILLING CONTRACTOR CONVERSE - LAS VEGAS LOGGED BY B. INGRAM DEPTH TO GROUND WATER _____
 TYPE OF RIG _____ HOLE DIAMETER 4 3/4" HAMMER WEIGHT AND FALL 320 #, 36"
 SURFACE CONDITIONS A.P. PARKING AREA TOTAL DEPTH 80.0' NO. CORE BOXES _____

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6')	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
0.0	ML	0.0-0.3 ASPHALT PAVEMENT			RD			BEGIN DRILLING 8:15AM WEATHER: CLEAR, WARM
		0.3-3.5 FILL - SANDY SILT						
2.0		DARK BRN, MOIST, STIFF SILT - 50%, FINE TO MED. SAND 40%, 10% GRAVEL & BRCK CHNKS	4-1 16K		CCI DR RD			
4.0		3.5-4.0 CONCRETE BLOCK						
6.0	SM	4.0-7.0 YOUNG ALLUVIUM - SILTY SAND						
		GRAY-BRN, MOIST, DENSE FINE TO VERY FINE - 70%, SILT - 30%	J-1	30 18 24	S P T			
8.0	SP	7.0-13.0 SAND			RD			
		GRAY, MOIST, DENSE. CLEAN, UNIFORM FINE SAND						
10.0			14-2 17K		CCI DR RD			
12.0		BECOMES COARSER: TO MED. GRAINED						
16.0			J-2	5 4 11	S P T			
18.0	SW	18.0-28.0 GRAVELLY SAND			RD			
		BRN / GRAY FINE MOIST, DENSE MED. TO COARSE CLEAN SAND - 60%, GRAVEL TO 2" - 40%. SUBROUNDED TO SUBANGULAR GRAINS. GRANITIC / CRYSTALLINE COMPOSITION						
20.0								

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CONC REC. %	REMARKS
20.0	SW	18.0-28.0 <u>GRAVELLY SAND</u> (CONTINUED)	4-3 75K		CCI DR			HIGHLY DISTURBED SAMPLE DUE TO LG. GRAVEL PIECES IN SAMPLE BARREL
22.0					RD			
24.0								
26.0				52 REFUSAL	SPT RD			
28.0	SP/CL	28.0-41.0' <u>SAND/SILTY CLAY</u> GRAY, MOIST, DENSE CLEAN SAND; INTERBEDS OF DARK GRAY, STIFF, MOIST SILTY CLAY TO 31.5'	4-4 55K		CCI DR			
30.0					RD			
32.0	SP	31.5' <u>END CLAY INTERBEDS</u>						
34.0								
36.0			J-3	57 55 70	S P T			
38.0					RD			
40.0			40K 0" REFUSAL					No SAMPLE RECOVERY
42.0	SW	41.0-68.0 <u>GRAVELLY SAND</u> DARK GRAY, VERY DENSE SUBROUNDED GRAINS, WELLGRADED V.FINE TO COARSE SAND - 75% GRAVEL TO 1" - 25% HIGHLY MICACEOUS - DIORITIC COMPOSITION						
44.0								

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
44.0	SW	41.0-68.0 <u>GRAVELLY SAND</u> (CONTINUED)			RD			
46.0				75 78 5'-100	SPT			
48.0					RD			
50.0			4-5 70K		CCI DR			4 RINGS ONLY
52.0		50.5' CLAY INTERBEDS DECREASING GRAVEL (70 ≈ 15%)			RD			SULPHUREOUS ODOR IN SAMPLE
54.0								
56.0			3'-100 REPRISAL		SPT RD			SULPHUREOUS ODOR
58.0								
60.0			1-6 15'-9"		CCI DR			SULPHUR HYDROTHERMAL ODOR
62.0					RD			
64.0								
66.0				105 1'-50	SPT RD			SULPHUR ODOR
68.0								

PROJECT SCRTD-UNION STA. DATE DRILLED 1/31/83 HOLE NO. 5-4

DEPTH	CLASS.	FIELD DESCRIPTION	SAMPLE	SPT (6")	DRILL MODE	RUN NO.	CORE REC. %	REMARKS
68.0	SP	68.0-75.0 SAND			KV			SULPHUR/HYDROTHERMAL ODOR IN SAMPLE
70.0		GRAY, DENSE UNIFORM MICACEOUS FINE TO VERY FINE GRAINED	4-7 25K		CCI DR			
72.0					RD			
74.0								
76.0	SW	75.0-80.0 GRAVELLY SAND						STOP DRILLING 2:30 PM
78.0		20% GRAVEL TO 1 1/2" GRAY, DENSE TO V. DENSE						
80.0			4-8 75K		CCI DR			
		END BORING 80.0 FT						

SUMMARY BORING NO. 5-4

PROJECT 83-1101-41 STATION HOLE UNION STA. DATE DRILLED 1/31/83

OVERBURDEN DEPTH (FT.) 0.0 TO 80.0 (T.D.)

BEDROCK DEPTH (FT.) NOT ENCOUNTERED TO (T.D.)

WATER PRESS. TEST No; INTERVAL(S) — TO —, — TO —

GROUND WATER DEPTH (FT.) ROTARY WASH - COULD NOT DETERMINE DATE —; — DATE —

GAS Yes; DEPTH FIRST NOTICED 50', DATE 1/31 - SULFURIUM ODOUR

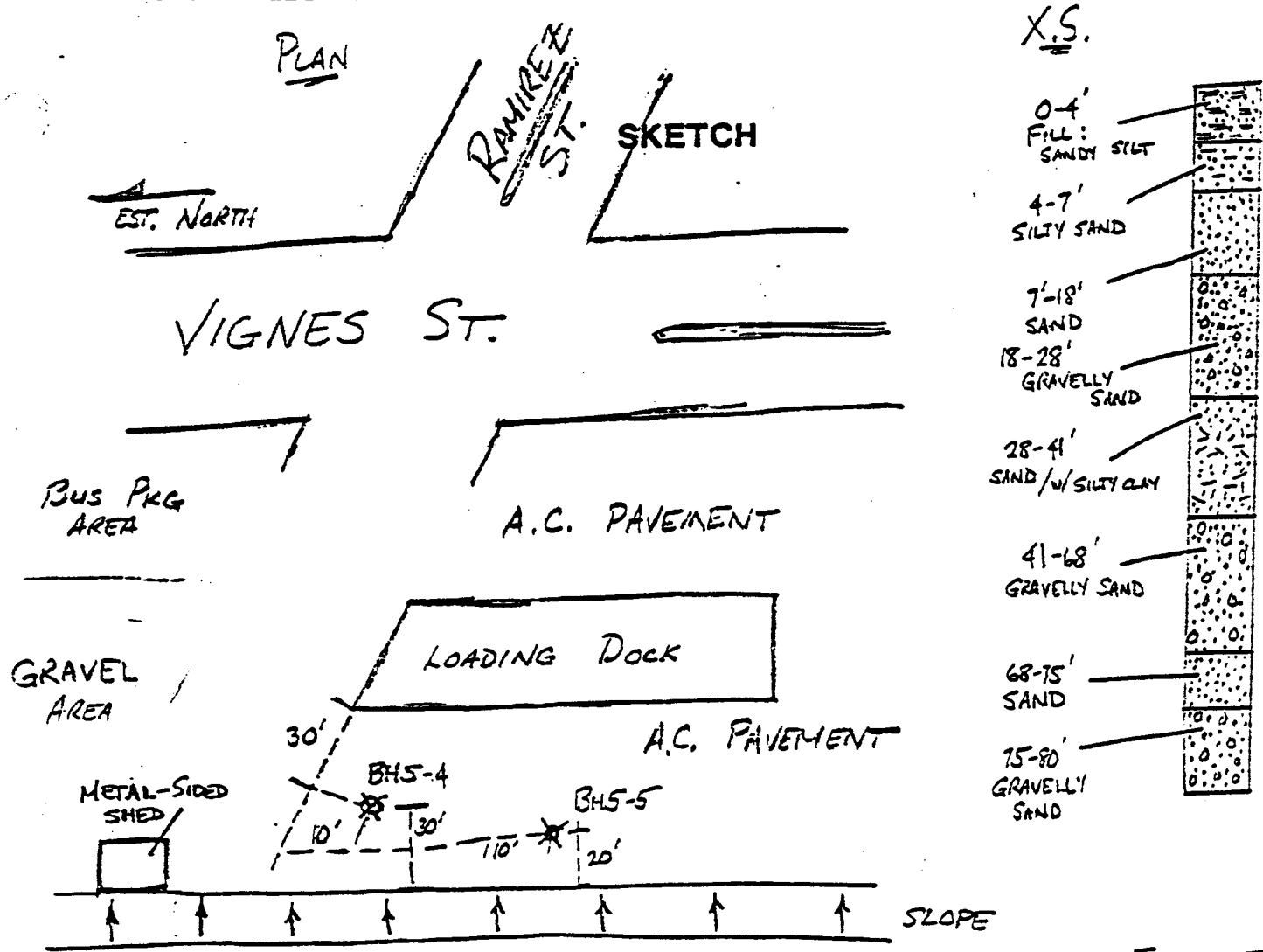
E-LOG No

DOWN-HOLE SURVEY No

CROSS-HOLE SURVEY No

PVC CASING (I.D.): 4" (NONE) TO —; 3" — TO —; 2" — TO —

GROUND ELEVATION REF. —



Appendix C

APPENDIX C

GROUNDWATER QUALITY REPORT OF ANALYTICAL RESULTS

C.1 GENERAL

Appendix C presents the results of laboratory tests performed on groundwater samples obtained from pump test wells located at Site #1 - Union Station Parking Lot (southeast corner of Macy and Alameda Streets) and Site #2 - Union Station Passenger Terminal (northwest corner of Vignes and Ramirez Streets). The location of these pump test wells are shown on Figure 2 - Site #1 Well Location Map and Figure 3 - Site #2 Well Location Map.

A detailed chemical analyses was performed at each site on groundwater samples collected from developed wells before the pump tests started and on groundwater discharge samples collected after at least 48 hours of pumping operation. Discharge samples collected after 48 hours of pumping operation including two groups, those sampled from the discharge line before treatment ("untreated") and those sampled after injection and chemical treatment with hydrogen peroxide ("treated"). Laboratory testing and analysis of these samples was conducted at Brown and Caldwell Analytical Laboratories located in Pasadena, California. Copies of the reports of Analytical Results are presented following the text of this appendix.

Laboratory results of groundwater samples collected at the proposed Union Station Subway Terminal site provided the following water quality information:

- Determined the existing groundwater quality at each pump test site prior to pump test operations.
- Provided the required design information necessary to implement a temporary groundwater treatment system for the pump tests acceptable to the City of Los Angeles Bureau of Sanitation and the California Regional Water Quality Control Board, Los Angeles Region.
- Monitored changes in groundwater quality after 48 hours of pumping from those levels measured prior to start of pump test operations at each site.

- Measured the effectiveness and influence of hydrogen peroxide treatment of groundwater discharge from the pump test.
- Provided invaluable water quality information for the future design, permitting and installation of construction dewatering systems in the Union Station area.

In addition, we have included available water quality information on tests performed by the City of Los Angeles, Department of General Services and Field Measurements of groundwater quality conducted during the Site #2 pump test by Converse Consultants (Table C-1).

C.2 DISCUSSIONS

Monitoring instrumentation and pump equipment exposed to the groundwater in the Union Station area suffered corrosive damage during the relatively short pump test periods. The hydrogen sulfide within the groundwater formed a weak acid which etched or discolored the surfaces of exposed equipment. Materials or equipment exposed to these groundwater conditions for even short periods of time may require protection in order to prevent damage.

Laboratory analysis of "treated" and "untreated" discharge samples were performed to verify the accuracy of field monitoring and quantify the effectiveness and influence of hydrogen peroxide treatment of hydrogen sulfide in the groundwater discharge. Results of these tests indicated variations in the hydrogen sulfide concentration of "treated" effluent.

Laboratory results of the "treated" Site #1 samples indicated that the hydrogen sulfide concentrations in the raw groundwater were reduced by hydrogen peroxide treatment; however, the hydrogen sulfide concentration in the "treated" effluent was not reduced to the required ZERO mg/l. Variations can be expected due to the complexity of the chemical reactions and conditions involved. A lower sulfate in the treated water could be due to biological activity under anoxic conditions. This activity could convert sulfates to hydrogen sulfide and nitrates to nitrogen which would be analyzed as a decrease in sulfate, increase in hydrogen sulfide and a decrease in nitrates.

Laboratory Results of the "treated" Site #2 samples indicated that hydrogen sulfide concentrations in the raw groundwater were reduced to ZERO mg/l by hydrogen peroxide treatment. During the Site #2 sampling period, the amount of hydrogen peroxide used to treat the discharge was slightly greater than that used during the Site #1 sampling period, and the concentration of hydrogen sulfide in the raw Site #2 groundwater was lower to begin with. Hydrogen peroxide reaction with hydrogen sulfide can produce either elemental sulfur (colloidal) or dissolved sulfate, depending on the dose of hydrogen peroxide used. The high sulfate in the treated water sample could be due to a higher hydrogen peroxide dose.

Based on review of the laboratory sample analysis, the temporary treatment system used during the pump test did perform satisfactorily. Additional design refinement and evaluation will be necessary for longer term/higher volume treatment systems which may be used for construction dewatering. The effectiveness of these long-term treatment programs will be verifiable with quantitative laboratory analysis during actual system operation.

Any treatment or disposal system used for the project will require permit application and written concurrence of the California Regional Water Quality Control Board, Los Angeles Region.

TABLE C-1
 FIELD MEASUREMENTS*
 UNION STATION SITE #2 PUMP TEST
 UNTREATED GROUNDWATER DISCHARGE

<u>Date</u>	<u>Time (24-hour)</u>	<u>Temperature of Sample** (Degrees Centigrade)</u>	<u>Salinity</u>	<u>Conductivity (μ MHOS)</u>	
6/6/86	17:05	24	1.8	2,800	
	18:00	23	1.8	2,850	
	18:26	22	1.9	2,820	
	20:09	19	1.9	2,780	
	22:07	19	1.9	2,800	
6/7/86	00:03	18.2	2.0	2,780	
	02:03	19.1	1.9	2,790	
	04:10	19.8	1.9	2,790	
	06:02	19.9	1.9	2,790	
	07:25	21	1.9	2,790	
	09:00	22	1.9	2,790	
	09:40	22	1.9	2,790	
	10:12	22	1.9	2,820	
	11:12	22	1.9	2,820	
	12:12	23	1.9	2,880	
	14:30	23	1.9	3,000	
	16:04	23	1.9	2,980	
	17:16	23	1.9	2,920	
	18:16	22	1.9	2,880	
	20:18	19	1.9	2,820	
22:17	19	1.9	2,770		
6/8/86	00:11	19.5	1.9	2,800	
	02:17	19.1	2.0	2,810	
	04:17	19.1	2.0	2,920	
	06:08	20.0	2.0	2,900	
	07:18	22	2.0	2,980	
	09:15	22.5	2.0	2,980	
	10:15	23	2.0	2,980	
	12:15	23	2.0	3,080	
	15:15	23	2.0	3,020	
	22:44	20	1.9	2,860	
	6/9/86	00:24	19.1	2.0	2,870
		03:24	19.9	2.0	2,820
05:23		20.1	2.0	2,880	
09:52		23	2.0	3,080	
10:24		24	2.0	3,000	
10:28		24	2.0	3,040	
13:24		24	2.0	3,100	
15:05		24	2.0	3,100	

*Field measurements performed with the following instrument: Yellow Springs Instrument Company YSI Model 33, S-C-T Meter, Serial No. 13708.

**The influence of surface temperatures on the instruments lead encapsulated sensor produced variations in the temperature readings of samples tested.

GROUNDWATER QUALITY
REPORTS OF ANALYTICAL RESULTS
UNION STATION SITE #1 - MACY AND ALAMEDA STREETS

SUMMARY OF REPORTS

1. Brown and Caldwell Report of Analytical Results, Log No. P86-04-496, Dated April 24, 1986. (Analytical Results of Groundwater Sampled Prior to Site #1 Pump Test Operations.)
2. Department of General Services, Wastewater Test Report, Lab No. F8130-32203, dated April 24, 1986. (Analytical Results of Groundwater Sampled Prior to Site #1 Pump Test Operations.)
3. Brown and Caldwell Report of Analytical Results, Log No. 86-06-520 dated June 26, 1986. (Analytical Results of "UNTREATED" Groundwater Discharge Sampled After 48 Hours of Pumping Operation.)
4. Brown and Caldwell Report of Analytical Results, Log No. 86-06-520 dated June 26, 1986. (Analytical Results of "TREATED" Groundwater Discharge Sampled After 48 Hours of Pumping Operation.)



MAY 14 1986

LOG NO: P86-04-496

Received: 24 APR 86

Reported: 13 MAY 86

RECEIVED

Mark Schluter
 Converse Consultants
 126 W. Del Mar Avenue
 Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WATER SAMPLES	DATE SAMPLED
04-496-1	Site #1 (UNTREATED*)	24 APR 86
PARAMETER	04-496-1	
Total Coliform, MPN/0.1L	<2.2	
Aquatic Bioassay, LC-50, Percent	NONE	
Arsenic, mg/L	<0.0075	
Barium, mg/L	0.23	
Cadmium, mg/L	<0.009	
Chromium, mg/L	<0.03	
Lead, mg/L	<0.012	
Mercury, mg/L	<0.0005	
Selenium, mg/L	<0.0056	
Silver, mg/L	<0.02	
Dissolved Digestion, Date	04/28/86	
Fluoride, mg/L	0.43	
Non-filterable Residue (TSS), mg/L	160	
Volatile Suspended Solids, mg/L	28	
Filterable Residue (TDS), mg/L	1400	
Hardness, Total (as CaCO3), mg/L	660	
Biochemical Oxygen Demand, mg/L	90	
Sulfide, mg/L	27	
Sulfate, mg/L	130	
Salinity, mg/L	490	
Oil and Grease, mg/L	35	
Chloride, mg/L	160	
Nitrate (as NO3), mg/L	<4	

*Analytical Results of Groundwater Sampled Prior to Site #1 Pump test operations

LOG NO: P86-04-496

Received: 24 APR 86


Reported: 13 MAY 86

Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

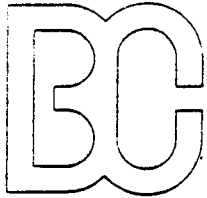
REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WATER SAMPLES	DATE SAMPLED
04-496-1	Site #1 (UNTREATED*)	24 APR 86
PARAMETER	04-496-1	
Phenolics, mg/L	<0.02	
Color, APHA U	5	
Floatable Oil and Grease, mg/L	<5	
Alkalinity		
Carbonate Alk (as CaCO3), mg/L	0	
Bicarb Alk (as CaCO3), mg/L	630	
Hydroxide Alk (as CaCO3), mg/L	0	
Total Alkalinity (as CaCO3), mg/L	630	


Edward Wilson, Laboratory Director

* Analytical results of groundwater sampled prior to Site #1 pump test operations.

TOXICITY BIOASSAY



BROWN AND CALDWELL

CONSULTING ENGINEERS

ANALYTICAL SERVICES DIVISION

373 SOUTH FAIR OAKS AVE.
PASADENA, CA 91105
PHONE (818) 795-7553

Log No. P86-04-496

Date Sampled 04-24-86
Date Received 04-24-86
Date Reported 05-13-86

Project No. 83-1140-06 MRTC Pump

Report To: Converse Consultants
126 West Del Mar Avenue
Pasadena, California 91105

Attention: Mark Schluter

Edward Caldwell
Laboratory Director

cc.

Sample Description Site #1 (UNTREATED*)
Test Organism Gasterosteus aculeatus Source San Mateo
Dilution Water Fresh Source Emeryville Temperature Range 15.0 - 17.5 °C
dechlorinated Tap Water

Aeration: Air Oxygen None

Bioassay Conditions	Time, hrs	Control		Dilution													
		No.	%	10%		18%		32%		56%		100%		No.	%	No.	%
Organisms Surviving	Start	10	100	10	100	10	100	10	100	10	100	10	100	10	100		
	24	10	100	10	100	10	100	10	100	10	100	10	100	10	100		
	48	10	100	10	100	10	100	10	100	10	100	10	100	10	100		
	72	10	100	10	100	10	100	10	100	10	100	10	100	10	100		
	96	10	100	10	100	10	100	10	100	10	100	10	100	10	100		
Dissolved Oxygen, mg/l	Start	10.0		10.0		8.0		6.5		6.0		6.0					
	24	9.7		8.8		8.9		8.8		8.7		8.8					
	48	10.0		9.2		9.0		8.9		9.3		9.5					
	72	9.3		7.7		7.6		7.9		8.0		8.3					
	96	8.9		7.7		7.5		8.1		7.8		8.3					
pH	Start	8.0		7.8		7.4		6.7		6.6		6.5					
	24	8.1		7.5		7.5		7.4		7.7		7.7					
	48	7.6		7.3		7.2		7.2		7.4		7.5					
	72	7.7		7.4		7.4		7.4		7.4		7.4					
	96	7.8		7.7		7.6		7.6		7.5		7.4					

RESULTS 96 hr TL_m* none Toxicity Units <0.59 Percent survival in undiluted sample 100

*In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample no TL_m value is established.

*Analytical results of groundwater sampled prior to Site #1 pump test operations.

Analyst C. Cox

Lah

DEPARTMENT OF GENERAL SERVICES

STANDARDS

WASTEWATER TEST REPORT



MAY - 9 1986

LAB. No. ^F 8130 - 32203

Rec'd: 4-24-86

Rpt'd: 5-6-86

Director
Bureau of Sanitation
Attn: Chief Industrial Waste Inspector

RECEIVED

ONE sample of water collected from CONVERSE CONSULTANTS,
METRO RAIL PROJECT WAS
tested for the Bureau of Sanitation.

Tests were made in accordance with the Standard Methods for the Examination of Water, and Wastewater.

Sampled by: F. BAJINTING

IDENTIFICATION OF SAMPLES

Sample No. Location

TEST WELL, SITE #1 AT MACY & ALAMEDA ST.

TEST DATA

Sample No.

Permit No. NONE (W-450659)

pH 9.1

Suspended solids, mg/l.

Total 160

Volatile

Fixed

Dissolved solids, mg/l. 1,320

CONDUCTANCE MICROMHOS /CM 1,434

Grease, mg/l.

SULFIDES, DISSOLVED, MG/L 45
Hexavalent Chromium, mg/l.

SULFIDES, TOTAL, MG/L 60
Free Cyanides, mg/l.

Total Cyanides, mg/l.

Settleable solids, ml/l

[Signature]
Unit Head
General Services/Standards



LOG NO: P86-06-520

Received: 26 JUN 86

Reported: 16 JUL 86

Mark Schluter
 Converse Consultants
 126 W. Del Mar Avenue
 Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , GROUND WATER SAMPLES	DATE SAMPLED	
06-520-1	Site #1 Untreated	26 JUN 86	
06-520-2	Site #1 Treated	26 JUN 86	
PARAMETER		06-520-1	06-520-2
Bioassay, LC 50		NONE	NONE
Nitrate Nitrogen			
Nitrate (as NO ₃), mg/L		5.6	1.9
Nitrate (as N), mg/L		1.3	0.4
Phenolics, mg/L		<0.05	<0.05
Sulfide, mg/L		43	21
Biochemical Oxygen Demand, mg/L		44	46
Color, APHA U		<5	<5
Salinity, mg/L		1300	1300
Filterable Residue (TDS), mg/L		1900	2000
Floatable Oil and Grease, mg/L		<5	13
Non-filterable Residue (TSS), mg/L		15	21
Oil and Grease, mg/L		<5	17
Volatile Suspended Solids, mg/L		5	4
Alkalinity			
Carbonate Alk (as CaCO ₃), mg/L		580	590
Total Alkalinity (as CaCO ₃), mg/L		580	590
Other Alkalinity,		<10	<10
Chloride, mg/L		540	735
Fluoride, mg/L		0.4	0.4
Hardness, Total (as CaCO ₃), mg/L		650	620
Sulfate, mg/L		220	62

LOG NO: P86-06-520

Received: 26 JUN 86

Reported: 16 JUL 86

Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

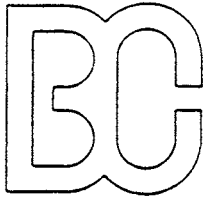
Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , GROUND WATER SAMPLES	DATE SAMPLED	
06-520-1	Site #1 Untreated	26 JUN 86	
06-520-2	Site #1 Treated	26 JUN 86	
PARAMETER		06-520-1	06-520-2
Arsenic, mg/L		<0.012	<0.012
Barium, mg/L		0.32	0.32
Cadmium, mg/L		<0.02	<0.02
Chromium, mg/L		<0.03	<0.03
Iron, mg/L		<0.2	<0.2
Lead, mg/L		<0.018	<0.018
Manganese, mg/L		0.12	0.12
Mercury, mg/L		<0.0005	<0.0005
Selenium, mg/L		<0.021	<0.021
Silver, mg/L		<0.02	<0.02
Dissolved Digestion, Date		06/27/86	06/27/86
Total Coliform, MPN/0.1L		>16	>16



Edward Wilson, Laboratory Director



BROWN AND CALDWELL

CONSULTING ENGINEERS
ANALYTICAL SERVICES DIVISION
 1255 POWELL STREET
 EMERYVILLE, CA 94608
 PHONE (415) 428-2300

Log No. E86-06-547-1

Date Sampled 6/26/86
 Date Received 6/27/86
 Date Reported 7/08/86

Report To: Mr. Mark Schluter
 Converse Consultants
 126 West Del Mar Avenue
 Pasadena, California 91105

Linda Brack Fox
 Laboratory Director

cc.

Sample Description Site #1; Untreated, P86-06-520-1
 Test Organism Gasterosteus aculeatus, threespine stickleback Source San Mateo
 Dilution Water Fresh Source Emeryville Dechlorinated Tap Water Temperature Range 13.5-16.0 °C
 Aeration: Air X Oxygen None

Bioassay Conditions	Time, hrs	Control		Dilution													
				10%		18%		32%		56%		100%					
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Survival	Start	10	100	10	100	10	100	10	100	10	100	10	100				
	24	10	100	9	90	9	90	9	90	8	80	10	100				
	48	10	100	9	90	9	90	8	80	8	80	10	100				
	72	10	100	9	90	9	90	8	80	8	80	10	100				
	96	10	100	9	90	9	90	8	80	8	80	10	100				
Dissolved Oxygen, mg/l	Start	9.0		8.6		7.8		6.5		6.3		6.0					
	24	7.0		7.8		8.2		6.5		8.4		6.8					
	48	6.5		6.1		7.7		6.3		8.2		7.8					
	72	7.3		7.0		7.6		7.4		7.9		7.5					
	96	7.3		7.3		7.5		7.7		7.7		7.6					
pH	Start	8.8		8.6		8.2		7.7		7.7		7.7					
	24	6.5		7.2		7.7		7.7		8.4		8.3					
	48	6.5		6.9		7.7		7.6		8.2		8.1					
	72	7.1		7.3		7.7		7.7		7.9		7.9					
	96	7.2		7.4		7.6		7.6		7.7		7.8					

RESULTS 96 hr TL_m* none Toxicity Units <0.59 Percent survival in undiluted sample 100

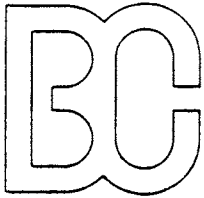
Weight of fish, g: Max. 0.63, Min. 0.44, Mean 0.52
 Length of fish, cm: Max. 3.8, Min. 3.1, Mean 3.4
*In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample no TL_m value is established.



JUL 14 1986

RECEIVED

Analyst C. Cox



BROWN AND CALDWELL

CONSULTING ENGINEERS
ANALYTICAL SERVICES DIVISION
 1255 POWELL STREET
 EMERYVILLE, CA 94608
 PHONE (415) 428-2300

Log No. E86-06-547-2

Date Sampled 6/26/86
 Date Received 6/27/86
 Date Reported 7/09/86

Report To:

Mr. Mark Schluter
 Converse Consultants

Ainda Brack Fox
 Laboratory Director

cc.

Sample Description Site #1; Treated, P86-06-520-2
 Test Organism Gasterosteus aculeatus, threespine Stickleback Source San Mateo
 Dilution Water Fresh Source Emeryville Temperature Range 13.5-16.5 °C
Dechlorinated Tap Water
 Aeration: Air X Oxygen . None

Bioassay Conditions	Time, hrs	Control		Dilution													
				10%		18%		32%		56%		100%					
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Surviving	Start	10	100	10	100	10	100	10	100	10	100	10	100				
	24	10	100	10	100	10	100	10	100	10	100	10	100				
	48	10	100	10	100	10	100	10	100	10	100	10	100				
	72	10	100	10	100	10	100	10	100	10	100	10	100				
	96	10	100	10	100	10	100	10	100	10	100	10	100				
Dissolved Oxygen, mg/l	Start	9.0		8.9		8.8		7.5		7.0		6.0					
	24	7.0		7.7		8.1		7.2		7.9		8.2					
	48	6.5		7.3		7.2		7.2		7.5		7.2					
	72	7.3		7.5		7.4		7.8		7.6		7.2					
	96	7.3		7.8		7.4		7.4		7.5		7.7					
pH	Start	8.8		8.7		8.5		8.1		7.9		7.5					
	24	6.5		8.2		8.1		8.0		8.2		8.3					
	48	6.5		7.9		8.0		8.0		8.3		8.2					
	72	7.1		7.7		7.9		7.9		8.1		8.0					
	96	7.2		7.5		7.6		7.6		7.8		7.9					

RESULTS 96 hr TL_m* none Toxicity Units < 0.59 Percent survival in undiluted sample 100

Length of fish, cm: Max. 3.8, Min. 3.1, Mean 3.4
 Weight of fish, g: Max. 0.63, Min. 0.44, Mean 0.52

*In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample no TL_m value is established.

Analyst C. Cox
 ft

GROUNDWATER QUALITY
REPORTS OF ANALYTICAL RESULTS
UNION STATION SITE #2 - RAMIREZ AND VIGNES STREETS

SUMMARY OF REPORTS

1. Brown and Caldwell Report of Analytical Results, Log No. P86-03-112, dated March 7, 1986. (Analytical Results of Groundwater Sampled Prior to Site #1 Pump Test Operations.)
2. Brown and Caldwell Report of Analytical Results, Wastewater Test Report, Log No. P86-04-497, dated April 24, 1986. (Analytical Results of Groundwater Sampled Prior to Site #1 Pump Test Operations.)
3. Brown and Caldwell Report of Analytical Results, Log No. 86-06-123, dated June 8, 1986. (Analytical Results of "UNTREATED" Groundwater Discharge Sampled After 48 Hours of Pumping Operation.)
4. Brown and Caldwell Report of Analytical Results, Log No. 86-06-123 dated June 8, 1986. (Analytical Results of "TREATED" Groundwater Discharge Sampled After 48 Hours of Pumping Operation.)



LOG NO: P86-03-112

Received: 07 MAR 86

Reported: 17 MAR 86

Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

Project: 83-1140-06 MRTC PUMP

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , GROUND WATER SAMPLES	DATE SAMPLED
03-112-1	Groundwater Site #2, Pump Well (UNTREATED*)	07 MAR 86
PARAMETER	03-112-1	
Filterable Residue (TDS), mg/L	1900	
Oil and Grease, mg/L	1.4	
Fuel Aromatics/Hydrocarbons		
Benzene, mg/L	<1	
Toluene, mg/L	<1	
Total Xylene Isomers, mg/L	<1	
Total Fuel Hydrocarbons, mg/L	<1	

Edward Wilson
Edward Wilson, Laboratory Director

*Analytical Results of groundwater sampled prior to Site#2 pump test operations on March 7, 1986.



LOG NO: P86-04-497

Received: 24 APR 86

Reported: 13 MAY 86

Mark Schluter
 Converse Consultants
 126 W. Del Mar Avenue
 Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WATER SAMPLES	DATE SAMPLED
04-497-1	Site #2 (UNTREATED*)	24 APR 86
PARAMETER	04-497-1	
Total Coliform, MPN/0.1L	2.2	
Aquatic Bioassay, LC-50, Percent	NONE	
Arsenic, mg/L	<0.0075	
Barium, mg/L	0.08	
Cadmium, mg/L	<0.009	
Chromium, mg/L	<0.03	
Lead, mg/L	<0.012	
Mercury, mg/L	0.001	
Selenium, mg/L	<0.0056	
Silver, mg/L	<0.02	
Dissolved Digestion, Date	04/28/86	
Fluoride, mg/L	1.0	
Non-filterable Residue (TSS), mg/L	230	
Volatile Suspended Solids, mg/L	21	
Filterable Residue (TDS), mg/L	2000	
Hardness, Total (as CaCO3), mg/L	1300	
Biochemical Oxygen Demand, mg/L	10	
Sulfide, mg/L	3.2	
Sulfate, mg/L	480	
Salinity, mg/L	330	
Oil and Grease, mg/L	44	
Chloride, mg/L	100	
Nitrate (as NO3), mg/L	<4	

* Analytical results of groundwater sampled prior to Site #2 pump test operations.

LOG NO: P86-04-497

Received: 24 APR 86

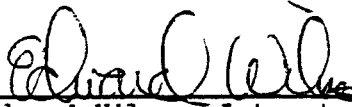
Reported: 13 MAY 86

Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

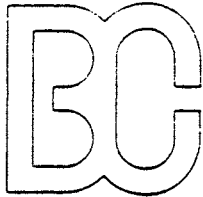
REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WATER SAMPLES	DATE SAMPLED
04-497-1	Site #2 (UNTREATED*)	24 APR 86
PARAMETER	04-497-1	
Phenolics, mg/L	<0.02	
Color, APHA U	5	
Floatable Oil and Grease, mg/L	<5	
Alkalinity		
Carbonate Alk (as CaCO3), mg/L	0	
Bicarb Alk (as CaCO3), mg/L	230	
Hydroxide Alk (as CaCO3), mg/L	0	
Total Alkalinity (as CaCO3), mg/L	230	


Edward Wilson, Laboratory Director

*Analytical results of groundwater sampled prior to Site #2 pump test operations.

TOXICITY BIOASSAY



BROWN AND CALDWELL

CONSULTING ENGINEERS

ANALYTICAL SERVICES DIVISION

373 SOUTH FAIR OAKS AVE.
PASADENA, CA 91105
PHONE (818) 795-7553

Log No. **P86-04-497**

Date Sampled **04-24-86**
Date Received **04-24-86**
Date Reported **05-13-86**

Project No. **83-1140-06 MRTC Pump**

Report To: **Converse Consultants
126 West Del Mar Boulevard
Pasadena, California 91105**

Attention: **Mark Schluter**

Edward Little
Laboratory Director

cc.

Sample Description Site #2 (UNTREATED*)
 Test Organism Gasterosteus aculeatus Source San Mateo
 Dilution Water Fresh Source Emeryville Temperature Range 15.0 - 18.0 °C
Dechlorinated Tap Water
 Aeration: Air Oxygen None

Bioassay Conditions	Time, hrs	Control		10%		18%		32%		56%		100%					
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Organisms Surviving	Start	10	100	10	100	10	100	10	100	10	100	10	100				
	24	10	100	10	100	10	100	10	100	10	100	10	100				
	48	10	100	10	100	10	100	10	100	10	100	10	100				
	72	10	100	10	100	10	100	10	100	10	100	10	100				
	96	10	100	10	100	10	100	10	100	10	100	10	100				
Dissolved Oxygen, mg/l	Start	10.0		9.0		7.2		6.0		6.0		6.0					
	24	9.2		8.7		8.4		7.5		7.4		7.3					
	48	10.0		9.4		9.6		8.5		8.8		9.2					
	72	9.3		8.1		7.9		8.7		8.3		7.5					
	96	8.9		8.3		7.4		8.9		8.0		7.3					
pH	Start	8.0		8.0		8.0		8.0		8.0		8.1					
	24	8.1		7.8		7.8		8.2		8.2		8.0					
	48	7.6		7.4		7.4		7.7		7.7		7.9					
	72	7.7		7.6		7.6		7.8		7.7		7.8					
	96	7.8		7.7		7.7		7.7		7.6		7.6					

RESULTS 96 hr TL_m* none Toxicity Units <0.59 Percent survival in undiluted sample 100

*In cases where 96 hour mortality does not equal exceed 50% in at least one dilution of the sample no TL_m value is established.

*Analytical results of groundwater sampled prior to Site #2 pump test operations.

Analyst C. Cox
Lah



LOG NO: P86-06-123

Received: 09 JUN 86

Reported: 03 JUL 86

Mark Schluter
 Converse Consultants
 126 W. Del Mar Avenue
 Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WASTEWATER SAMPLES	DATE SAMPLED
06-123-1	Site #2 Untreated	08 JUN 86
PARAMETER	06-123-1	
Aquatic Bioassay, LC-50, Percent	6.5	
Nitrate Nitrogen		
Nitrate (as NO ₃), mg/L	<4	
Nitrate (as N), mg/L	<1	
Phenolics, mg/L	<0.05	
Sulfide, mg/L	<0.1	
Biochemical Oxygen Demand, mg/L	70	
Color, APHA U	<5	
Salinity, mg/L	900	
Filterable Residue (TDS), mg/L	2090	
Floatable Oil and Grease, mg/L	<5	
Non-filterable Residue (TSS), mg/L	16	
Oil and Grease, mg/L	<5	
Volatile Suspended Solids, mg/L	16	
Alkalinity		
Carbonate Alk (as CaCO ₃), mg/L	0.0	
Bicarb Alk (as CaCO ₃), mg/L	410	
Hydroxide Alk (as CaCO ₃), mg/L	0.0	
Total Alkalinity (as CaCO ₃), mg/L	410	
Chloride, mg/L	470	
Fluoride, mg/L	0.8	
Hardness, Total (as CaCO ₃), mg/L	1000	
Sulfate, mg/L	530	

LOG NO: P86-06-123

Received: 09 JUN 86

Reported: 03 JUL 86

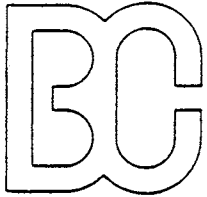
Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WASTEWATER SAMPLES	DATE SAMPLED
06-123-1	Site #2 Untreated	08 JUN 86
PARAMETER	06-123-1	
Arsenic, mg/L	<0.012	
Barium, mg/L	0.36	
Cadmium, mg/L	<0.02	
Chromium, mg/L	<0.05	
Iron, mg/L	<0.2	
Lead, mg/L	<0.5	
Manganese, mg/L	2.6	
Mercury, mg/L	0.0036	
Selenium, mg/L	<0.016	
Silver, mg/L	<0.02	
Nitric Acid Digestion, Date	06/13/86	
Total Coliform, MPN/0.1L	<2.2	


Edward Wilson, Laboratory Director



BROWN AND CALDWELL

CONSULTING ENGINEERS
ANALYTICAL SERVICES DIVISION
 1255 POWELL STREET
 EMERYVILLE, CA 94608
 PHONE (415) 428-2300

Log No. E86-06-171-1

Date Sampled 6/08/86
 Date Received 6/10/86
 Date Reported 6/20/86

Report To: Mr. Joe Coporon
 Converse Consultants
 126 W. Del Mar Avenue
 Pasadena, California 91105

J. Stafford
 Laboratory Director

cc.

Sample Description P86-06-123-1, Site #2 Untreated
 Test Organism Gasterosteus aculeatus, threespine stickleback Source San Mateo
 Dilution Water Fresh Source Emeryville Temperature Range 14.9-15.0 °C
Dechlorinated Tap Water

Aeration: Air Oxygen None

Bioassay Conditions	Time, hrs	Control		Dilution											
				10%		18%		32%							
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Surviving	Start	10	100	10	100	10	100	10	100						
	24	10	100	5	50	0	0	0	0						
	48	10	100	5	50	-	-	-	-						
	72	10	100	4	40	-	-	-	-						
	96	10	100	3	30	-	-	-	-						
Dissolved Oxygen, mg/l	Start	8.9		8.6		7.9		7.0							
	24	8.6		8.0		8.2		7.3							
	48	8.3		7.6		-		-							
	72	7.2		7.4		-		-							
	96	7.4		7.5		-		-							
pH	Start	8.3		8.2		7.9		7.5							
	24	7.8		7.8		7.8		7.1							
	48	8.0		8.2		-		-							
	72	8.1		8.3		-		-							
	96	7.9		8.2		-		-							

RESULTS 96 hr TL_m* 6.5% Toxicity Units 15.4 Percent survival in undiluted sample 0

Length of fish, cm: Max. 3.8, Min. 3.1, Mean 3.4
 Weight of fish, g: Max. 0.63, Min. 0.44, Mean 0.52

* In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample no TL_m value is established.

Analyst C. Cox
 ft



JUL 10 1986
RECEIVED

LOG NO: P86-06-122

Received: 09 JUN 86

Reported: 03 JUL 86

Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WASTEWATER SAMPLES	DATE SAMPLED
06-122-1	Site #2 Treated	08 JUN 86
PARAMETER	06-122-1	
Aquatic Bioassay, LC-50, Percent	>32	
Nitrate Nitrogen		
Nitrate (as NO ₃), mg/L	<4	
Nitrate (as N), mg/L	<1	
Phenolics, mg/L	0.13	
Sulfide, mg/L	<0.1	
Biochemical Oxygen Demand, mg/L	<3	
Color, APHA U	<5	
Salinity, mg/L	920	
Filterable Residue (TDS), mg/L	2080	
Floatable Oil and Grease, mg/L	<5	
Non-filterable Residue (TSS), mg/L	85	
Oil and Grease, mg/L	<5	
Volatile Suspended Solids, mg/L	60	
Alkalinity		
Carbonate Alk (as CaCO ₃), mg/L	0.0	
Bicarb Alk (as CaCO ₃), mg/L	340	
Hydroxide Alk (as CaCO ₃), mg/L	0.0	
Total Alkalinity (as CaCO ₃), mg/L	340	
Chloride, mg/L	500	
Fluoride, mg/L	0.7	
Hardness, Total (as CaCO ₃), mg/L	1100	
Sulfate, mg/L	650	

LOG NO: P86-06-122

Received: 09 JUN 86


Reported: 03 JUL 86

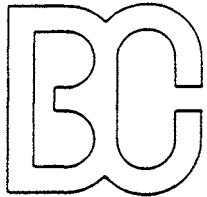
Mark Schluter
Converse Consultants
126 W. Del Mar Avenue
Pasadena, California 91105

Project: 83-1140-06 MRTC Pump

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION , WASTEWATER SAMPLES	DATE SAMPLED
06-122-1	Site #2 Treated	08 JUN 86
PARAMETER	06-122-1	
Arsenic, mg/L	<0.012	
Barium, mg/L	0.36	
Cadmium, mg/L	<0.02	
Chromium, mg/L	<0.05	
Iron, mg/L	<0.2	
Lead, mg/L	<0.5	
Manganese, mg/L	2.7	
Mercury, mg/L	0.0011	
Selenium, mg/L	<0.016	
Silver, mg/L	<0.02	
Nitric Acid Digestion, Date	06/13/86	
Total Coliform, MPN/0.1L	<2.2	


Edward Wilson, Laboratory Director



BROWN AND CALDWELL

CONSULTING ENGINEERS
ANALYTICAL SERVICES DIVISION

1255 POWELL STREET
EMERYVILLE, CA 94608
PHONE (415) 428-2300

Log No. E86-06-170-1

Date Sampled 6/08/86
Date Received 6/10/86
Date Reported 6/20/86

Report To: Mr. Joe Coporon
Converse Consultants
126 West Del Mar Avenue
Pasadena, California 91105

[Signature]
Laboratory Director

cc.

Sample Description P86-06-122-1, Site #2 Treated
Test Organism Gasterosteus aculeatus, threespine stickleback Source San Mateo
Dilution Water Fresh Source Emeryville Temperature Range 14.9-15.0 °C
Dechlorinated Tap Water
Aeration: Air Oxygen None

Bioassay Conditions	Time, hrs	Control		Dilution													
				10%		18%		32%									
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Surviving	Start	10	100	10	100	10	100	10	100								
	24	10	100	10	100	10	100	8	80								
	48	10	100	10	100	10	100	8	80								
	72	10	100	10	100	10	100	8	80								
	96	10	100	10	100	10	100	8	80								
Dissolved Oxygen, mg/l	Start	8.9		8.9		8.7		8.6									
	24	8.5		8.3		8.6		8.7									
	48	8.3		8.8		7.8		8.2									
	72	7.2		7.8		7.5		8.0									
	96	7.4		7.4		7.5		8.3									
pH	Start	8.3		8.1		7.9		7.6									
	24	7.8		7.8		7.8		7.8									
	48	8.0		8.0		8.1		8.2									
	72	8.1		7.8		8.1		8.3									
	96	7.9		7.8		7.8		7.9									

RESULTS 96 hr TL_m > 32% Toxicity Units _____ Percent survival in undiluted sample _____

Length of fish, cm: Max. 3.8, Min. 3.1, Mean 3.4
Weight of fish, g: Max 0.63, Min. 0.44, Mean 0.52

*In cases where 96 hour mortality does not equal or exceed 50% in at least one dilution of the sample no TL_m value is established.



JUN 26 1986

RECEIVED

Analyst C. Cox

APPENDIX D

CHEMICAL TREATMENT OF GROUNDWATER DISCHARGE

D.1 DISCHARGE REQUIREMENTS

On March 11, 1986, the Los Angeles Fire Department's Hazardous Waste Material Squad shutdown the Union Station Site #2 well development operation due to complaints received about the strong hydrogen sulfide odors emitted from the well discharge water. Samples of the discharge water collected by the City of Los Angeles Bureau of Sanitation's Industrial Waste Operations were found to contain unacceptably high levels of hydrogen sulfide, 45 mg/l of total sulfide and 35 mg/l of dissolved sulfide. (Appendix D - City of Los Angeles Department of Public Works Bureau of Sanitation Letter dated March 18, 1986).

The resulting work stoppage resulted in significant project delays and additional costs and expenses. The groundwater underlying the Union Station area was not expected to be polluted with substances in concentrations toxic to human, animal, plant or fish life. Additional expenditures and specialized equipment were required to treat the groundwater discharge to meet all the applicable standards, conditions and requirements imposed by the City of Los Angeles Sanitation Bureau and the California Regional Water Quality Board, Los Angeles Region.

The City of Los Angeles Bureau of Sanitation requested additional groundwater testing at Site #1 (Macy and Alameda Streets) and Site #2 (Ramirez and Vignes Streets) to analyze for Items 1 through 20 listed on "Additional Permit Conditions" (Appendix D). In compliance with these requests, groundwater sampling of Site #1 and Site #2 was performed on April 24, 1986. Results of this complete groundwater analysis are presented in Appendix C: Groundwater Quality - Reports of Analytical Results.

Based on review of the groundwater analysis and the treatment system proposed by Engineering Science for the mitigation of sulfides from groundwater during the Union Station Pump Tests, the City of Los Angeles Bureau of Sanitation granted conditional approval to discharge treated groundwater for up to 72 hours at each site. (Appendix D - City of Los Angeles Department of Public

Works Bureau of Sanitation Letter dated May 21, 1986). Longer periods would require permit application and written concurrence of the California Regional Water Quality Control Board, Los Angeles Region.

D.2 TREATMENT SYSTEM

The groundwater discharge from the Union Station Site #1 (Macy and Alameda Streets) and Site #2 (Rameriz and Vignes Streets) pump tests was chemically treated with hydrogen peroxide to reduce the hydrogen sulfide content to zero before storm drain disposal. The temporary treatment system used to accomplish this operation consisted of the following:

- o Groundwater was pumped from the test wells at rates between 225 to 400 gallons per minute (gpm) through a 4-inch pipe to the surface. A 4-inch gate valve and a McCrometer® flow meter located near the well head enabled control and monitoring of the discharge flow into the treatment system. Discharge rates were pre-determined from 1983 Site #1 pump test data and drawdown responses observed during pump well development.
- o Fifty percent hydrogen peroxide (H₂O₂) was injected into the discharge pipe through a ½" chemical feed point valve located near the well head. Pumping and injection of the hydrogen peroxide chemicals from the 55 gallon drums into the discharge pipe was done with an electronically controlled liquid metering pump. Chemical injection rates were adjusted to pump discharge flow with an average injection rate of 4.5 gallons of hydrogen peroxide per hour (gph).
- o 6-inch diameter pipe and hose was used to deliver groundwater discharge from the end of the 4-inch pipe located near the well head to the 4-inch gate valve located near the 21,000 gallon portable reactor tank. Approximately 82 feet of 6-inch pipe was used at Site #1 (Macy and Alameda Streets) and 185 feet at Site #2 (Ramirez and Vignes Streets).
- o Two ½-inch sampling valves were attached to the discharge pipe. One valve was positioned next to the pump well before the chemical feed point

for sampling of "UNTREATED" groundwater discharge and the other was positioned just before the 4" gate valve on the reactor tank for sampling of "TREATED" groundwater discharge.

- o The reactor tank consisted of a portable 21,000 gallon (500 barrel) safety vapor proof Baker tank. The tank dimensions were 35 feet in length, 8 feet in width and 12.5 feet in depth. The tank is equipped with a 4-inch and 6-inch gate valve at opposite ends, a railed catwalk spanning the top of the tank, and marine hatches on the top of the tank. The purpose of the tank was to provide detention time so that the injected hydrogen peroxide could chemically react with the hydrogen sulfide in the groundwater discharge. In addition, the air-tight tank provided a means of controlling hydrogen sulfide odors emitted from the groundwater discharge until suitable reaction time had occurred within the tank. Effluent flow and the level were controlled by throttling the 6-inch gate valve at the tank outlet. A depth of 6 to 8 feet of discharge water was maintained within the tank during pumping operations.
- o Tank effluent was discharged directly into the storm drain system approximately 40 feet away through 6-inch pipes and hoses. A ½-inch sampling valve was attached to the discharge pipe to permit sampling and field analysis of treated groundwater effluent before disposal into the storm drain.
- o Access to the Site #1 storm drain disposal point, located on the southeast corner of Macy and Alameda, was through a removable clean-out cover located in the sidewalk. A temporary pedestrian ramp was constructed to bridge the 6-inch discharge hose crossing a portion of the sidewalk during the test. Access to the Site #2 storm drain disposal point was through a manhole located on Union Station property adjacent to the southeast corner of the Macy Street track over-crossing bridge abutment. A 10-inch diameter hole was cored through the side of the concrete manhole at surrounding surface grade. Upon completion of pumping operations, the access hole was resealed and the manhole restored to its original condition.

- o Treated effluent flowed from the disposal points through the storm drains to the Los Angeles River Channel located between 2,000 and 3,000 feet east of the Union Station pump test sites.
- o Hydrogen peroxide chemicals used for water treatment were delivered to each site in ten 55-gallon plastic drums. During the pump test, these chemical drums were located within a contaminant structure designed to control any accidental chemical spills or leaks. Engineering Science personnel who handled the hydrogen peroxide chemicals were equipped with the required safety equipment.
- o Field analysis of treated and untreated groundwater discharge was periodically performed to monitor the effectiveness of the treatment system. A Hach Company Model HS-6 hydrogen sulfide test kit and an Orion Model SA230 pH meter were used to test water quality. Results of these field tests performed by Engineering Sciences are presented in Appendix D.
- o A complete chemical analysis was performed at each site on treated and untreated groundwater discharge sampled after 48 hours of pumping operation. These tests were designed to monitor changes in groundwater quality from initial test conditions and provide information on the influence and effectiveness of chemical treatment with 50% hydrogen peroxide.

D.3 GROUND WATER TREATMENT REPORTS

Groundwater treatment reports and field test logs for the Union Station Site #1 (Macy and Alameda Streets) and Site #2 (Ramirez and Vignes Streets) ground water treatment operations are presented following the text of this appendix. These reports and logs were prepared by Engineering Science who chemically treated and field tested the groundwater discharge during the two pump tests.

CITY OF LOS ANGELES
CALIFORNIA



TOM BRADLEY
MAYOR

DEPARTMENT OF
PUBLIC WORKS
BUREAU OF SANITATION

DELWIN A. BIAGI
DIRECTOR

STERLING C. BUESCH
HARRY M. SIZEMORE
ASSISTANT DIRECTORS

ROOM 1410, CITY HALL EAST
200 NORTH MAIN STREET
LOS ANGELES, CALIFORNIA 90012
(213) 485-5115

MAR 19 1986

RECEIVED

BOARD OF
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HOMER F. BROOME, JR.
VICE-PRESIDENT
EDWARD J. AVILA
STEVE HARRINGTON
ROYAL O. SCHWENDINGER

MAR 18 1986

Howard A. Spellman, Jr.
Vice President
Converse Consultants, Pasadena
126 West Del Mar Blvd., Suite A
Pasadena, CA 91105

Dear Mr. Spellman:

GROUNDWATER DISPOSAL TO THE L.A. RIVER - UNION STATION TEST WELLS (S)

DISTRIBUTION		
EMPL	✓	DATE
ADS	✓	3/17/86
MES	✓	3-19-86
BILLING FILE		
PROJECT FILE		86-1140-06

This letter is to confirm verbal permission granted by Sterling C. Buesch, Assistant Director March 17, 1986, to discharge treated groundwater from two test wells from the proposed Union Station Subway Terminal site. The groundwater sample contained 30 mg/l of dissolved sulfide which must be reduced to zero to preclude nuisance. Discharge up to 72 hours will be permitted by this letter. Longer periods will require permit application and written concurrence of the California Regional Water Quality Control Board, Los Angeles Region (RWQCB). Any nuisance will be abated immediately or the discharge stopped.

Dennis Dasker, Supervising Engineering of the RWQCB is in agreement.

For the record our analyses of the water is as follows:

pH	7.2
Conductivity	3000 m-mhos/centimeter
Total sulfide	45 mg/l
Dissolved sulfide	30 mg/l
Metals	None
Total toxic organics	None

DELWIN A. BIAGI, Director
Bureau of Sanitation

SCB:vr
SCB-48

LOS ANGELES RIVER - DOWNSTREAM RIVERSIDE-DAYTON
BRIDGE - BALLONA CREEK, COMPTON CREEK, DOMINGUEZ
CHANNEL, AND TRIBUTARIES THERETO

ADDITIONAL PERMIT CONDITIONS

Which Must Be Fulfilled By Permittee

1. Clarify and/or treat such waste liquids so as not to exceed the following limits:
2. 100 parts per million of suspended solids of which not more than 60% may be volatile;
3. 1500 parts per million of dissolved solids;
4. 500 parts per million of total hardness (as Ca CO₃) (Versenate Method);
5. 20 parts per million of biochemical oxygen demand (B.O.D.);
6. 1 part per million of sulphide;
7. 750 parts per million of sulphate plus chloride salinity (any combination);
8. 100 parts per million of caustic alkalinity;
9. 25 parts per million of grease, oil, fats, waxes, (Wet Extraction Method);
10. Floatable oil and grease, none visible;
11. 300 parts per million of chloride;
12. 50 parts per million of nitrate;
13. pH 5.5 (for acidity) to 9.0 (for alkalinity);
14. 1 part per million of phenols or cresols;
15. Salts of heavy metals, United States Public Health Standard for drinking water;
16. 20 parts per million of color; and
17. Sewage, none
18. Discharge no waste which is, or might cause, a health menace; or be the cause of nauseous, noxious, or dangerous odors or gases.
19. Agree to reimburse the City for the full cost of cleaning or repair of the storm drain, watercourse, or channel which may be necessary because of its use under this permit.
20. Discharge no wastes containing any substance in concentrations toxic to animal, human, plant, or fish life.

CITY OF LOS ANGELES

CALIFORNIA

BOARD OF
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TOM BRADLEY
MAYOR

83-1140-06

DEPARTMENT OF
PUBLIC WORKS
BUREAU OF SANITATION

DELWIN A. BIAGI
DIRECTOR

STERLING C. BUESCH
HARRY M. SIZEMORE
ASSISTANT DIRECTORS

ROOM 1410, CITY HALL EAST
200 NORTH MAIN STREET
LOS ANGELES, CA 90012
(213) 485-5112



MAY 21 1986

RECEIVED

MAY 21 1986

Howard A. Spellman, Jr.

Vice President

Converse Consultants, Pasadena

126 W. Del Mar Blvd., Suite A

Pasadena, CA 91105

Dear Mr. Spellman:

GROUNDWATER DISPOSAL TO THE L.A. RIVER - UNION STATION TEST WELLS

This is in response to your letter dated May 12, 1986 with which you transmitted sketches and design data to remove dissolved sulfides from the groundwater testing program in the vicinity of Union Station Subway Terminal site. Your proposal is hereby approved with the following conditions:

1. Discharge up to 72 hours will be permitted.
Call the Chief Industrial Waste Inspector's office, (213) 485-5886 24 hours prior to discharge.
2. Sufficient monitoring shall be performed to ensure system reliability.
3. Forward copies of operational data upon completion of the project including flows, sulfide concentrations, Ph and chemical usage.
4. Inspection fees not to exceed \$275.00 will be assessed upon completion of the project.
5. Any nuisance will be abated immediately or the discharge stopped.

For documentation purposes, industrial waste permits for two test sites as requested have been assigned permit numbers W449413 (Vignes and Ramirez) and W450659 (Macy and Alameda).

Sincerely,

STERLING C. BUESCH
Acting Director

cc: Dennis Dasker
CRWQCB, LA Region

SCB:dz
SCB-57



ES**ENGINEERING-SCIENCE, INC.**Street Address:
75 N. FAIR OAKS
PASADENA, CA 91103Mailing Address:
P.O. BOX 7107
PASADENA, CA 91109Tel: (818) 440-6000
Cable: ENGINSI ARIA
Telex: 67-5428

1 July 1986

ES File 66351

Mr. Howard A. Spellman
 Converse Consultants
 126 West Del Mar Boulevard, Suite A
 Pasadena, California 91105

Subject: Metro Rail Pump Test at Site No. 1

Dear Mr. Spellman:

Five copies of the groundwater treatment report and test log
 are enclosed. Test results are very satisfactory.

If you have any questions, please call me.

Very truly yours,

Tin Veerakit

Tin Veerakit
 Project Engineer

TV/pg

Enclosure

DISTRIBUTION		
EMPL	✓	DATE
<i>Buzz</i>	✓	<i>7/2/86</i>
<i>MJF</i>	✓	<i>7/2/86</i>
BILLING FILE		
PROJECT FILE		



JUL 02 1986

RECEIVED

METRO RAIL PUMP TEST (Site #1)
GROUNDWATER TREATMENT REPORT

Groundwater treatment at site No. 1 (Alameda Street and Macy Street) west of the Union Station was started on Tuesday, 24 June 1986 at 11:40 a.m. Groundwater was pumped at 370-400 gallons per minute (gpm). Fifty percent hydrogen peroxide (H_2O_2) was injected at the well pump discharge at an average 4.5 gallons per hour (gph). Approximately one hundred and ten feet of 6-inch pipe was used to deliver water from well to reactor tank which has a maximum capacity of 21,000 gallons. An average depth of 6.5 feet of water, which is equivalent to 8,000 gallons, was used to maintain 20 minutes detention time. Mixing time in the 6-inch pipe was approximately 21 seconds at 400 gpm. Tank effluent was discharged to a manhole approximately 40 feet away. Effluent flow and tank level were controlled by throttling a 6-inch gate valve at tank outlet. From the manhole it flowed through a storm drain to the Los Angeles River approximately 4,000 feet east of the drilling site.

The raw groundwater contained high hydrogen sulfide (H_2S). When taking samples, water is clear and H_2S odor is very strong. The H_2S concentration and pH in both raw groundwater and treated effluent were determined periodically as shown in the attached test logs. H_2S concentrations in raw groundwater ranged from 50-95 mg/l with the pH typically 7.35. The treated effluent had H_2S concentration less than 0.01 mg/l and pH values in the range of 7.8 - 7.95. Residual hydrogen peroxide in the effluent was also monitored.

Experiment of H_2O_2 feed rate was conducted on Tuesday afternoon (24 June 1986) to determine exact amount of H_2O_2 required by varying feed rates from 4.5 to 8 gph. Samples were taken from a point before entering the reactor tank. Distance between feeding and sampling points was 97 feet which gave approximately 21 seconds mixing time for 400 gpm flow. Hydrogen sulfide concentration was 51-68mg/l. At 4.5 and 5 gph feed rates, H_2O_2 residuals were more than 15 mg/l with H_2S concentrations of 21 and 15 mg/l respectively. At 6 and 8 gph feed rates, H_2O_2 residuals were more than 20 mg/l with H_2S concentrations of 28.6 and 8.5 mg/l respectively. After 2 minutes of taking samples, H_2S concentration is zero.

Feed rate had been set at 6.0 gph before the experiment and was changed to 4.5 gph to be conservative and due to the fluctuation of H_2S concentrations.

After hours of operation and several examinations, treated effluent could be visually tested. Milky yellow white in the reactor tank and effluent samples indicated zero concentration of H_2S . All sulfide ions were oxidized to free sulfur and suspended in the water.

Pump test ended at 1:40 p.m. on 26 June 1986. Data from test logs indicated that the treatment system worked very effectively as designed.

TEST LOG

METRO RAIL DRILLING WASTE

DATE 6-24-86 OPERATOR L. Tran & Magin

* sample @ point before entering the reactor tank (97' betw. feed & sampling pts.)

Time	Flow	H ₂ O ₂	Raw Influent				Treated Effluent			Note
			pH	Test Reading	Dilution Factor	Total H ₂ S (mg/l)	pH	Total H ₂ S (mg/l)	H ₂ O ₂ (mg/l)	
10:35 AM	9pm	(9ph)								
	Pour 8 gals. of H ₂ O ₂ into raw water contained in reactor tank									
10:50 am	350	6.0	7.50	1.60	40	68				Brown color Pump started
11:40 am	400	8.00	7.30	1.60	40	68	7.97	8.5*	>20	(stop @ 11:00 am) Pump started
12:00 PM	400	6.00	—	—	—	—	7.97	28.6*	>20	
1:00 PM	400	6.00	7.42	1.20	40	51	7.92	0	>20	
1:20 PM	400	5.00	—	—	—	—	7.50	15.0*	:15	
1:30 PM	400	4.50	—	—	—	—	7.33	21.0*	15	After 2 min. H ₂ S ≈ 0 mg/l
3:00 PM	400	4.50	7.32	1.55	40	66	7.96	0	8	
3:10 PM	400	4.50	—	—	—	—	7.30	18.0*	15	After 2 min. H ₂ S ≈ 0 mg/l
4:00 PM	400	4.50	7.33	1.25	40	53	7.93	0	8	
7:00 PM	370	4.50	7.35	1.75	40	74				
10:00 PM	370	4.50	7.36	2.25	40	95	7.95	0		
1:00 am	370	4.5	7.39	1.30	40	55	7.95	0	.4	
4:00 am	370	4.5	7.39	1.35	40	57	7.95	0	.3	

* Water level in tank ~ 6'-6" ≈ 8,000 gal or 20 min. detention time

TEST LOG

Water Temp = 23°C

METRO RAIL DRILLING WASTE

DATE 6-25-86

OPERATOR Mazin Ibrahim & Ernie Rodriguez & L. TRAN

Time	Flow	H ₂ O ₂	Raw Influent x 1.06				Treated Effluent			Note
			pH	Test Reading	Dilution Factor	Total H ₂ S (mg/l) ²	pH	Total H ₂ S (mg/l) ²	H ₂ O ₂ (mg/l)	
7:00 AM	370	4.5	7.39	1.30	40	55	7.92	0	—	← COULD NOT GET A READING
10:00 AM	370	4.5	7.38	1.50	40	63	7.90	0	—	
1:00 PM	370	4.5	7.31	1.30	40	55	7.91	0	12	
4:00 PM	370	4.5	7.33	1.30	40	55	7.90	0	12	
7:00 PM	"	"	7.43	1.30	40	55	7.96	0	10	
10:00 PM	"	"	7.41	1.35	40	57	7.96	0	10	
1:00 AM	370	4.5	7.37	1.25	40	53	7.84	0	8	
4:00 AM	370	4.5	7.31	1.25	40	53	7.86	0	8	
7:00 AM	370	4.5	7.34	1.25	40	53	7.85	0	8.5	
10:00 AM	"	"	7.35	1.20	40	50	7.81	0	10	
11:00 PM	"	"	7.34	1.30	40	55	7.80	0	10	
1:40 PM	→	Pump Test ended @ 1:40 PM on 6/26/86								

7:00 PM to 11:00 PM
6-26-86

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13 June 1986

ES File 66351

JUN 16 1986

RECEIVED

*B3-1140-06 MRTC
Pump Test*

Mr. Howard A. Spellman
Converse Consultants
126 West Del Mar Boulevard, Suite A
Pasadena, California 91105

Subject: Metro Rail Pump Test at Site No. 2

Dear Mr. Spellman:

Five copies of the groundwater treatment report and test log are enclosed. Test results are very satisfactory. Data obtained from this test provided us useful information and will make the next test a lot easier.

If you have any questions, please call me.

Very truly yours,

Tim Veerakit

Tin Veerakit
Project Engineer

TV/pg

Enclosure

METRO RAIL PUMP TEST (Site #2)
GROUNDWATER TREATMENT REPORT

Groundwater treatment at site No. 2 (Vignes Street and Ramirez Street) east of the Union Station was started on Friday, 6 June 1986 at 4:15 p.m. Groundwater was pumped at 225 gallons per minute (gpm) for 48 hours (4:15 p.m. on 6 June 1986 to 4:15 p.m. on 8 June 1986). Fifty percent hydrogen peroxide (H_2O_2) was injected at the well pump discharge at an average 4.5 gallons per hour (gph). Approximately two hundred and thirty feet of 6-inch pipe was used to deliver water from well to reactor tank which has a maximum capacity of 21,000 gallons. An average depth of 8 feet of water, which is equivalent to 14,000 gallons, was used to maintain 60 minutes detention time. Mixing time in the 6-inch pipe was approximately 1.2 minutes at 225 gpm. Tank effluent was discharged to a manhole approximately 40 feet away. Effluent flow and tank level were controlled by throttling a 6-inch gate valve at tank outlet. From the manhole it flowed through a storm drain to the Los Angeles River approximately 2,000 feet east of the drilling site.

The raw groundwater contained high hydrogen sulfide (H_2S) and iron. When taking samples, water is clear for less than 10 seconds, then turns to dark green or black within one minute and H_2S odor is very strong. The H_2S concentration and pH in both raw groundwater and treated effluent were determined periodically as shown in the attached test logs. H_2S concentrations in raw groundwater ranged from 35-90 mg/l with the pH typically 6.85. The treated effluent had H_2S concentration less than 0.01 mg/l and pH values in the range of 6.9 - 7.0. Residual hydrogen peroxide in the effluent was also monitored.

Experiment of H_2O_2 feed rate was conducted on Saturday afternoon (7 June 1986) to determine exact amount of H_2O_2 required by varying feed rates from 3 to 5 gph. Samples were taken from a point before entering the reactor tank. Distance between feeding and sampling points was 173 feet which gave approximately 1 minute mixing time for 225 gpm flow. Hydrogen sulfide concentration was 53 mg/l. At 3 and 3.5 gph feed rates, H_2O_2 residuals were zero with H_2S concentrations of 19 and 9.5 mg/l respectively. At 4 and 5 gph feed rates, H_2O_2 residuals were 12 and 26 mg/l with H_2S concentrations of 3.2 and 0 mg/l respectively.

Feed rate had been set at 4.0 gph before the experiment and was changed to 5.0 gph to be conservative and due to the fluctuation of H_2S concentrations.

After hours of operation and several examinations, treated effluent could be visually tested. Milky yellow white in the reactor tank and effluent samples indicated zero concentration of H_2S . All sulfide ions were oxidized to free sulfur and suspended in the water.

Pumping capacity was increased to 450 gpm on Sunday afternoon (8 June 1986) at 6:15 p.m. H_2O_2 feed was initially set at 10 gph but later lowered to 9 gph when high H_2O_2 residual was observed in the effluent. Pump test ended at 3:30 p.m. on 9 June 1986.

Data from test logs indicated that the treatment system worked very effectively as designed.

TEST LOG

METRO RAIL DRILLING WASTE

DATE 06-06-86 OPERATOR LYLE TRAN

Time	Flow (gpm)	H ₂ O ₂ (gph)	Raw Influent				Treated Effluent			Note
			pH	Test Reading	Dilution Factor	Total H ₂ S (mg/l) ²	pH	Total H ₂ S (mg/L) ² x 1.06	H ₂ O ₂ (mg/l)	
4:30 PM	225	5	6.87	1.65	20	35	6.91	0.1	Excessive	Dark Brown Col
4:40 PM	"		—	—	—	—	6.91	0.01	—	—
5:30 PM	"	4	6.90	2.2	20	46.6	6.97	0.01	—	—
6:30 PM	"	3.5	6.89	1.9	40	80.6	7.13	0.01	4	
7:30 PM	"	3.5	—	—	—	—	7.05	0.01	2	
8:30 PM	"	4.0	—	1.85	40	78.4	7.04	0.01	1	TANK LEVEL 7'-11 1/2"
9:30 PM	"	4.0	—	—	—	—	7.03	0.01	1	
10:30 PM	"	4.0	6.83	1.75	40	74.2	7.00	0.01	1	
11:30 PM	"	4.0	—	—	—	—	6.94	0.01	1	
12:30 AM	"	4.0	6.86	1.75	40	74.2	6.99	0.01	1	
1:30 AM	"	4.0	—	—	—	—	6.98	0.01	1	
2:30 AM	"	4.0	6.82	1.85	40	75.6	6.96	0.01	1	
3:30 am	"	4.0	—	—	—	—	6.94	0.01	1	
4:30 am	"	4.0	6.82	1.70	40	76.5 72.1	6.98	0.01	1	Meter Pump off 5 m.
5:30 am	"	4.0	6.82	—	—	—	6.92	0.01	1	

TEST LOG

METRO RAIL DRILLING WASTE

DATE 6-7-86

OPERATOR Tim Teeple + L. Tran

Time	Flow (gpm)	H ₂ O ₂ (gph)	Raw Influent				Treated Effluent			Note
			pH	Test Reading <i>x 1.06</i>	Dilution Factor	Total H ₂ S (mg/l) ²	pH	Total H ₂ S (mg/l) ² <i>x 1.06</i>	H ₂ O ₂ (mg/l)	
6:30am	225	4.0	6.82	1.50 1.60	40	63.6 67.8	6.94	0.01	1.0	
7:30am	225	4.0	-	-	-	-	7.0	0.01	1.0	
8:00am	225	7.0	6.85	1.60	40	67.9	6.93	0	20	
10:00 AM	225	5.0	6.86	1.60	40	67.9	6.99	0.01	13	
12:00 PM	225	5.0	6.86	1.70 2.05	40	72.1 86.92	7.0	0.01	9	
2:00 PM	"	5.0	6.91	1.40	40	59.4	6.95	0.01	13	
4:00 PM	"	4.0	6.9	1.25	40	53.00	6.95	.2	1	
6:00 PM	225	5.0	6.84	1.65	40	70.00	6.92	0.0	10	
9:00 PM	225	4.5	6.91	1.60	40	67.9	6.93	0.0	13	
12:00 AM	225	4.5	6.88	1.65	40	70.00	6.98	0.01	13	changed barrels 7.0 gph-11
3:00 AM	225	5.5	6.86	1.5	40	63.3	6.96	0	20	
6:00 AM	225	5.0	6.77	1.6	40	67.87	6.93	0	15	
9:00 AM	225	5.0	6.88	1.35	40	57.00	6.98	0.0	4	9.22.11 AM 6.5 2 B. of 11.25.11.1
12:00 PM	225	5.0	6.91	1.10	40	46.7	6.99	0.0	8	water pump was down for 1.5 hrs chemical losing prime ~ 15 min. 2 Buckets of H ₂ O poured to tank. 11
6:30 PM	450	10.0	6.99	1.3	40	55.	6.82	23.32*	0	

* No discharge was made until H₂S is ...

* CHECK DRUM AT 400 AM

TEST LOG

METRO RAIL DRILLING WASTE

DATE 6-8-86

OPERATOR Tim Teeple + E. Rodrigues

Time	Flow	H ₂ O ₂ (gph)	Raw Influent				Treated Effluent			Note	
			pH	Test Reading	Dilution Factor	Total H ₂ S (mg/l) ²	pH	Total H ₂ S (mg/l) ²	H ₂ O ₂ (mg/l)		
10:00 7:10 PM	450	10	—	—	—	—	7.00	0.0	720.0	Discharge @ 7:15 PM	
12:00 AM	"	"	6.85	1.90	40	80.56	7.03	0.0	4.0	DILUTE FACTOR 1:20	
5:00 AM	"	"	6.98	1.65	40	69.96	7.01	0.0	3.0	"	
5:30 AM	"	"	SWITCHED TO NEW DRUM AND ADDED A BUCKET OF H ₂ O ₂ IN CASE OF DECAY IN SWITCH								
10:00 AM	450	10	6.90	1.05	40	44.50	6.98	0.0	720.0		
2:45 PM	450	9	6.83	1.30	40	55.00	6.93	0.0	20.0	Final Test	
Pump Test ended at 3:30 PM 6/9/86											
T. Verakait											

APPENDIX E

1983 UNION STATION SITE #1 PUMP TEST

APPENDIX-E REFERENCE

: Geotechnical Report, Metro Rail Project, Design Unit A140,
dated October 1983, Appendix B- 1983 Pump Test Results.

APPENDIX B PUMP TEST RESULTS

B.1 INTRODUCTION AND SUMMARY

A pump test was performed near Union Station to provide data for construction dewatering. Two pump tests were run at the same well to determine aquifer properties and boundary conditions. Two pump tests were performed because gas, entrained in the water, caused the first test to be terminated prematurely and additional testing was needed to confirm test results. The location of the pumping well and three observation holes (5-1, OW-1, OW-2) are shown on Drawing 2.

The methodology used for the test consisted of constant discharge tests with time-drawdown measurements in the observation wells. These measurements were plotted on log-log paper as drawdown versus t/r^2 where t = time in days and r = the radial distance of the observation well from the pumped well in feet. The data plots for the test were matched to a family of type curves by Newman (1975) for wells fully penetrating an unconfined aquifer. Under these conditions the typical log of drawdown versus the log of time response is an S-shaped curve with delayed drainage causing a flattening of the curve between early and late responses. Field data plots are shown for each test along with matching curves, formulas used and computations. Aquifer test data sheets for each test and observation well are included in this appendix.

An effective hydraulic conductivity of 500 gpd/ft² is believed appropriate due to methane and hydrogen sulfide gas in the water. Gas bubbles in the pores reduce the ability of the aquifer to transmit water. Also, gas flow through the orifice plate used to measure well discharges result in a lower than measured water discharge. Both factors combine to reduce computed transmissivities. However, if gas production dissipates during dewatering, hydraulic conductivity will increase to an estimated value on the order of 1,000 gpd/ft².

B.2 SITE CONDITIONS

The pump test was located at the north end of the public parking lot near Macy Street (see Drawing 2). Bedrock of the Puente Formation underlies the test area at a depth of 80 feet. This formation consists of siltstone/claystone and clayey sandstone. The bedrock acts as an aquiclude and for practical dewatering purposes is impermeable.

Overlying the Puente Formation is 78 feet of Young (coarse-grained) alluvium and about 2 feet of artificial fill and asphalt pavement. The alluvium thickness is very uniform over the test area. The alluvium consists of (from top to bottom) silty sand/sandy silt to a depth of about 8 feet, gravelly sand from 8 to 70 feet, and a boulder-gravel zone from a depth of 70 to 80 feet (see Boring 5-1, Appendix A). Based on boring samples, the aquifer generally contains high percentages of fine to medium sand.

Static water level was 20 feet below ground surface. The saturated thickness of the unconfined aquifer was 60 feet.

B.3 WELL CONSTRUCTION AND DEVELOPMENT

The test well is located about 11 feet southwest of test Boring 5-1. The well was drilled by the cable tool method, driving 12-inch double walled casing. The well was drilled to a depth of 82.5 feet and the casing was perforated in place from 21 feet to 77 feet. Perforations consist of 12 horizontal punched slots per foot that are 1-1/4 by 5/32 inches, in staggered rows.

The existing test boring, 5-1, has 2-inch PVC casing that is slotted from 45 feet to 85 feet. The boring was 4-3/4 inches in diameter drilled by the mud rotary method. The annulus between the PVC casing and the well bore was filled with pea gravel and sealed with bentonite above the perforations. This well was used as a supplemental observation well during the pump tests.

Two new observations wells were drilled by mud rotary methods, in line to the west of the test well. OW-1 is located 51 feet west of the well and was drilled to a depth of 84 feet. PVC casing, 4 inches in diameter, was installed with perforations from 5 to 70 feet. The annulus of the 6-inch bore was backfilled with pea gravel and sealed with 4 feet of cement and gravel.

Observations well OW-2 is located 110.6 feet west of the well and was drilled to a depth of 85 feet. PVC casing, 4 inches in diameter, was installed to a depth of 83 feet with perforations from 5 to 75 feet. The annulus of the 6-inch bore was backfilled with pea gravel and sealed with 4 feet of cement and gravel. The layout of the observation wells and the test well are shown on Drawing 3.

The pumping well was developed to flush mud and cuttings to provide hydraulic communication with the aquifer. The 12-inch test well was surged by bailing and then developed with the test pump for about 20 hours. Gas was noticed in the pump discharge during development pumping at maximum drawdowns. Near the end of the pump tests, distant drawdown measurements indicate that the pumped well was operating at a hydraulic efficiency of about 30%. That is, 70% of well drawdown was due to well losses in the pumped well.

B.4 PUMP TESTING PROCEDURE

A constant discharge test was planned with a test duration of 24 to 48 hours. However, because of gas problems that developed with time, two relatively short duration tests were performed.

The gas problems are discussed at the end of the Section under comments on test results.

The first test was run on March 24, 1983 for approximately 500 minutes at a well discharge rate of 175 gpm. The test was terminated because gas was causing the discharge rate to fluctuate and observation wells began to recover indicating a reduced well discharge. The second test was run at a reduced discharge rate of 150 gpm for 1380 minutes during March 25 and 26, 1983. Again, the test was terminated because of gas interference resulting in recovery of observation wells.

The test well was pumped with an Aurora lineshaft turbine pump (capacity 500 gpm) powered by a Cummings diesel engine. Discharge was measured with an inline orifice plate and a mercury manometer. The base of the 10-inch diameter bowls were set at a depth of 78 feet below the ground surface. Water from the well was discharged through a pipe to a storm drain near the southeast corner of the intersection of Alameda and Macy Streets.

Drawdowns in the pumped well (maximum 30 feet) were measured occasionally by air line during the tests, but were not used for test interpretations because of the high well losses. Drawdowns were measured in each observation well at times selected to provide suitable logarithmic distributions of time. Drawdown measurements in observation wells OW-1 and OW-2 were made with Stevens Recorders. Times were recorded manually on the chart paper because the recorder clocks are not sensitive enough particularly during the early more frequent measurements. Drawdowns in observation well 5-1 were measured with a hand-held electric sounder. Generally, measurements of drawdown were accurate within ± 0.01 foot.

Recovery tests were planned after the pumping ceased. However, during both tests, recoveries had already started prior to stopping the pump due to gas problems. Regardless, recovery measurements were made in OW-1 and OW-2 after the first test. These measurements, however, produced unreliable results because of the premature recovery combined with delayed drainage effects. As a result, it was decided to test the gas responses at various pumping rates after the second test (in place of recovery measurements) using a gas detector.

Rubber tubing with a metal tip, attached to the methane reading gas detector (made by Gastech Inc.), was inserted to a depth of 5 feet in the pumping well's water level measuring hole, immediately after the pump was turned off. Instantly the methane gas detector needle surged to a reading of 100% lower explosive limit (LEL) and for some unexplainable reason the gas ignited in the instrument causing a small explosion that blew the rubber tubing out of the hole. Prior to this, the gas detector indicated around 30% LEL methane gas each time gas was measured during the second pump test and did not explode.

B.5 TEST INTERPRETATIONS

Time-drawdown data were plotted on log-log graphs as shown on interpretation charts. Figures B-1 and B-2 show data for the first and second tests, respectively, for observation wells OW-1 and OW-2 with the log of drawdown(s) in feet plotted versus the log of time (days) divided by the distance (feet) from the pump well squared (t/r^2). These data plots were matched to the type curves indicated and appropriate match points were selected to determine values of s and t/r^2 for corresponding values of $W(u)$ and $1/u$. The calculations for transmissivity (T), Storativity (S) or Specific yield (S_y) are shown.

Figure B-3 shows data plots, match points and calculations for observation well 5-1 for both the first and second tests.

The water level responses of OW-1 indicate the typical S-shaped curve of an unconfined aquifer with delayed drainage for both tests. The plots of the first test are somewhat distorted possibly due to gas.

The second test at the reduced pumping rate provided better matches for both the A region and B region of the type curves.

Data from well 5-1 indicate on both tests that most of the drawdown occurred in the first minute of pumping and the plot is in the region of delayed drainage. However, using OW-1 as a guide, reasonable matches were obtained.

Data from OW-2 indicate the possibility of delayed well response. OW-2 may have been damaged by siltation when runoff water flowed into the well immediately prior to the first test. However, good matches were obtained in the B region of the curves for both tests. Results from OW-2 for both tests must remain somewhat suspect, however.

Distance-drawdown plots shown on Figure B-4, were used as a check where log of the distance is plotted against drawdown on a semi-log chart. Wells OW-1 and OW-2 were used in this plot primarily. Well 5-1 is very close to the pumped well in a region where potential lines are relatively distorted. Since the bottom 40 feet of this observation well are perforated, drawdowns at a given time would tend to be greater than should be the case in the distance-drawdown relationship. The results of the analyses from the best fit type of curves along with distance drawdown analyses are summarized in Table B-1 below.

TABLE B-1
SUMMARY OF PUMP TEST RESULTS

Test	Observation Well	Curve Match	Transmissivity (gpd/ft)	Average Hydraulic Conductivity (gpd/ft ²)	Storativity (S) or Specific Yield (Sy)
1st	OW-1	B Type, B=0.06	20,055	334	0.064 (Sy)
1st	OW-2	B Type, B=6.0	30,386	506	0.021 (Sy)
1st	5-1	B Type, B=0.01	20,055	334	0.23 (Sy)
1st	OW-1, OW-2, S-1	Dist. d.d.	24,973	416	0.028 (Sy)
2nd	OW-1	A Type, B=0.06	20,464	341	0.0044 (S)
2nd	OW-1	B Type, B=0.06	21,488	358	0.069 (Sy)
2nd	OW-2	B Type, B=6.0	41,927	699	0.022 (Sy)
2nd	5-1	B Type, B=0.01	15,627	260	0.27 (Sy)
2nd	OW-1, OW-2, S-1	Dist. d.d.	21,405	357	0.061 (Sy)

The transmissivities range from 16,000 to 42,000 gpd/ft with a mean of about 24,000 gpd/ft. The average hydraulic conductivity is the transmissivity divided by the saturated thickness of 60 feet. Average hydraulic conductivities range from 250 to 700 gpd/ft² ($\sim 1.3 \times 10^{-2}$ to 3.2×10^{-2} cm/sec). These values are in a low range for clean stream channel deposits, but these low values may be explained by free gas, which would tend to reduce hydraulic conductivities, influencing results significantly. A hydraulic conductivity of 1,000 gpd/ft² or more is judged reasonable for these deposits near Union Station, if gas were not present.

Most of the computed specific yields appear to be very low for this type of aquifer. The values computed range from 0.021 to 0.27. A specific yield in the 0.15 to 0.25 range would be reasonable, and a value of 0.2 to 0.25 is more probable. For dewatering purposes the use of a specific yield of 0.25 is recommended because this would be more conservative.

B.6 COMMENTS ON TEST RESULTS

Boundary conditions were not detected from the pump tests at Union Station. This was primarily due to the relatively short duration of both tests. Longer term dewatering operations should encounter barrier boundary effects as the pumping cone intersects the boundary of the aquifer about 1000 feet west of the pumping well as shown on Drawings 2 and 3. This will enhance dewatering to some degree. The effect can be estimated by determining distance to a barrier(s) from geologic maps and factoring the barrier(s) into dewatering computations.

The gases encountered were probably methane and hydrogen sulfide, based on the gas detector methane readings as well as the "rotten egg" odor. These gases are potentially hazardous and will affect the hydraulic efficiencies of pumps and wells. The gases are assumed to originate from the underlying Puente Formation and confined by the aquifer. When wells are drawn down, the reduction in hydrostatic pressure releases the gas. This implies that gas volume will increase with well drawdowns which appeared to be the case during pump tests. There seemed to be a threshold where relatively large amounts of gases were released at about 9 to 10 feet of true drawdown (discounting well losses). It is unknown how long it would take to vent the gases present and what effect this would have on aquifer transmissivity.

The following information regarding gas and oil in this area helps explain the source, if not the pressure or quantity of gas in the pump test well:

- ° The Union Station Oil Field is located some 2000 feet south of the proposed station site. Little is known about the oil field, but it does produce from the Puente Formation at very shallow depths.
- ° Boring CEG-2 (see Drawing 2) located some 2000 feet east of the Union Station site penetrated the Young alluvium/Puente Formation contact at a depth of 38 feet. Oil was encountered at this contact as well as in sandstone layers within the Puente Formation from 38 to 100 feet (bottom of hole). Gas (hydrogen sulfide) was first detected by odor at a depth of 37 feet in Boring CEG-2. Gas chromatograms run in Boring CEG-1 indicate 100 ppm methane and 500 ppm ethane, and this would thus be classified in the lower explosive limit (5% LEL).

It is believed that at least a portion of the ground water underlying the site may be either saturated with gas which originated from the underlying Puente Formation and/or contain free gas in the aquifer or underlying Puente Formation that is released as hydrostatic pressures are reduced during pumping. During the pump test, there was a considerable drop in pressure head near the well as water flowed into the pump. This pressure drop would have resulted in

release of the gas and into the well head. Additional data would be required to confirm these concepts and delineate the problem. The engineering implications of these observations are discussed in Chapter 6.

The pump tests resulted in reasonably consistent data in terms of transmissivity and hydraulic conductivity. A mean transmissivity of 24,000 gpd/ft is considered a good effective value for gassy conditions, however permeability along the length of the Union Station excavation may vary significantly because of the variable conditions.

It is beyond the scope of this report to recommend specific dewatering systems. However, the aquifer is amenable to well dewatering, providing the gases are controlled safely and effectively. Also, more efficient wells would be needed to be cost effective. Mainly well screens with larger open areas are needed such as wire wound screens or Rosco Moss' "Full Flo" louvered screen, along with careful well development. The presence of hydrogen sulfide gas suggests some corrosion potential which should be considered with the time that dewatering is required for construction.

Union Station 1st Test 3/24/83

47 7520

K-E LOGARITHMIC 3 X 5 CYCLES
NEUFEL & ESSER CO. MADE IN U.S.A.

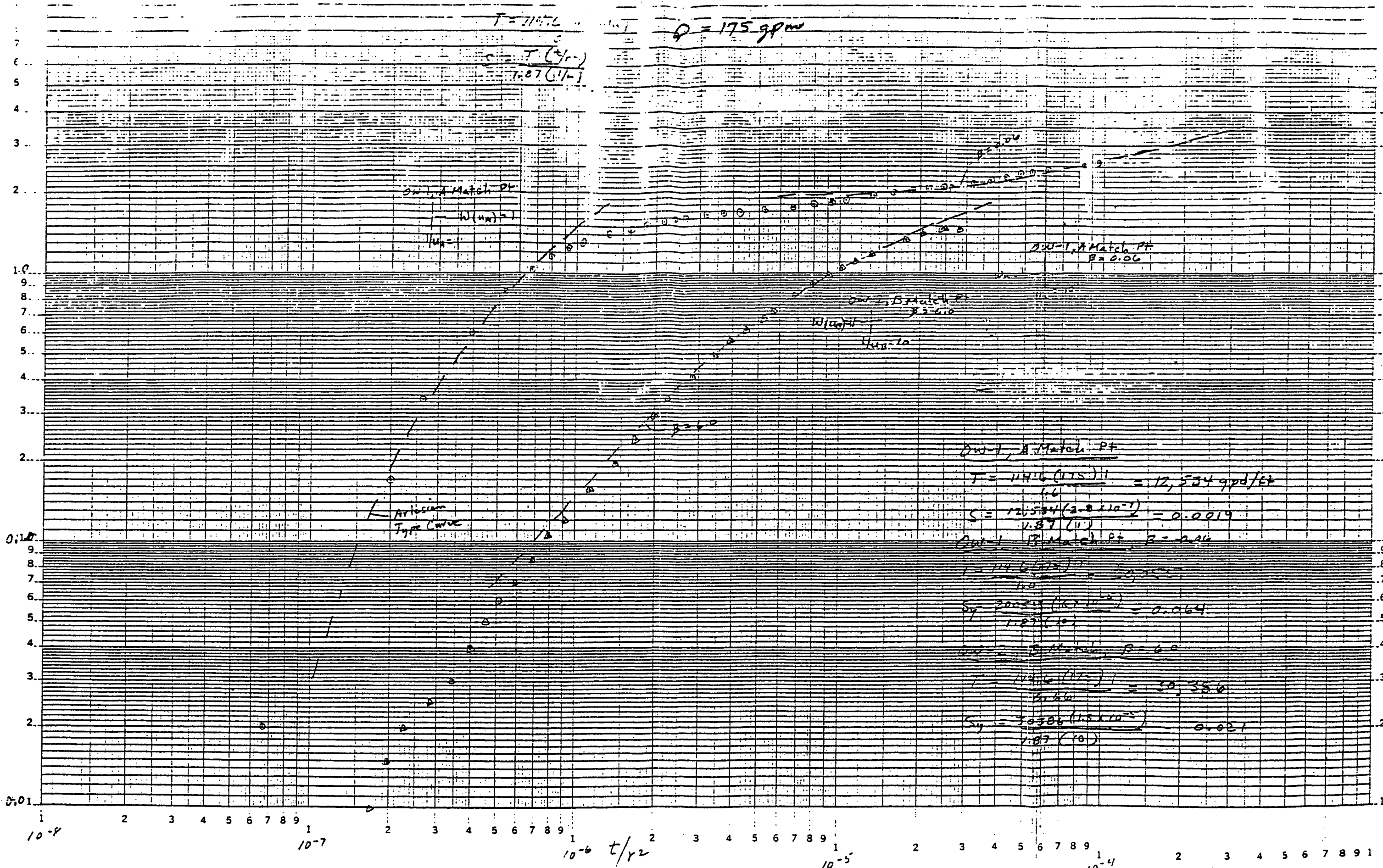


FIGURE B-1

47 7520

K&E LOGARITHMIC 3 X 5 CYCLES KEUFFEL & ESSER CO. MADE IN U.S.A.

Drawdown - ft.

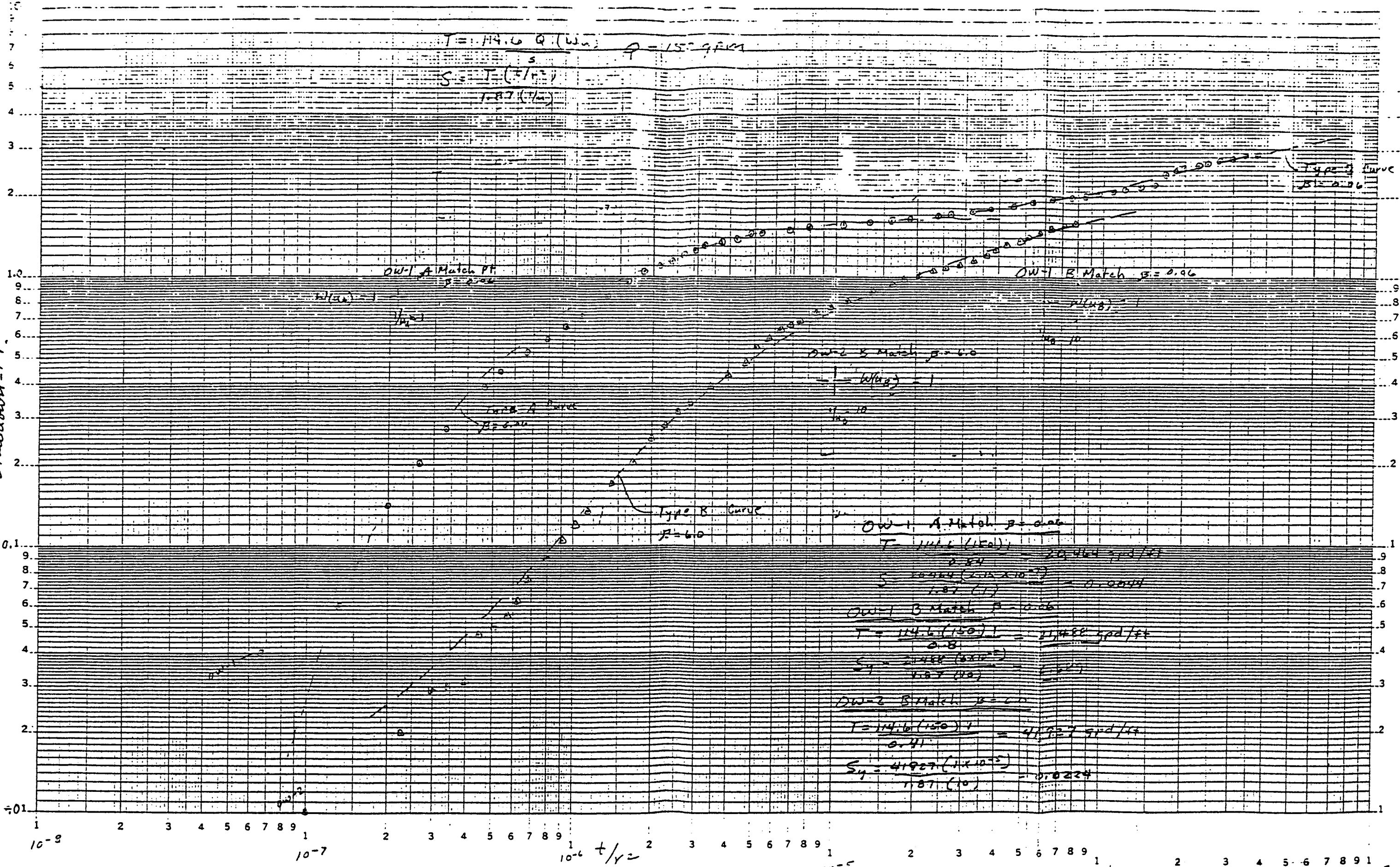


FIGURE B-2 10^-3

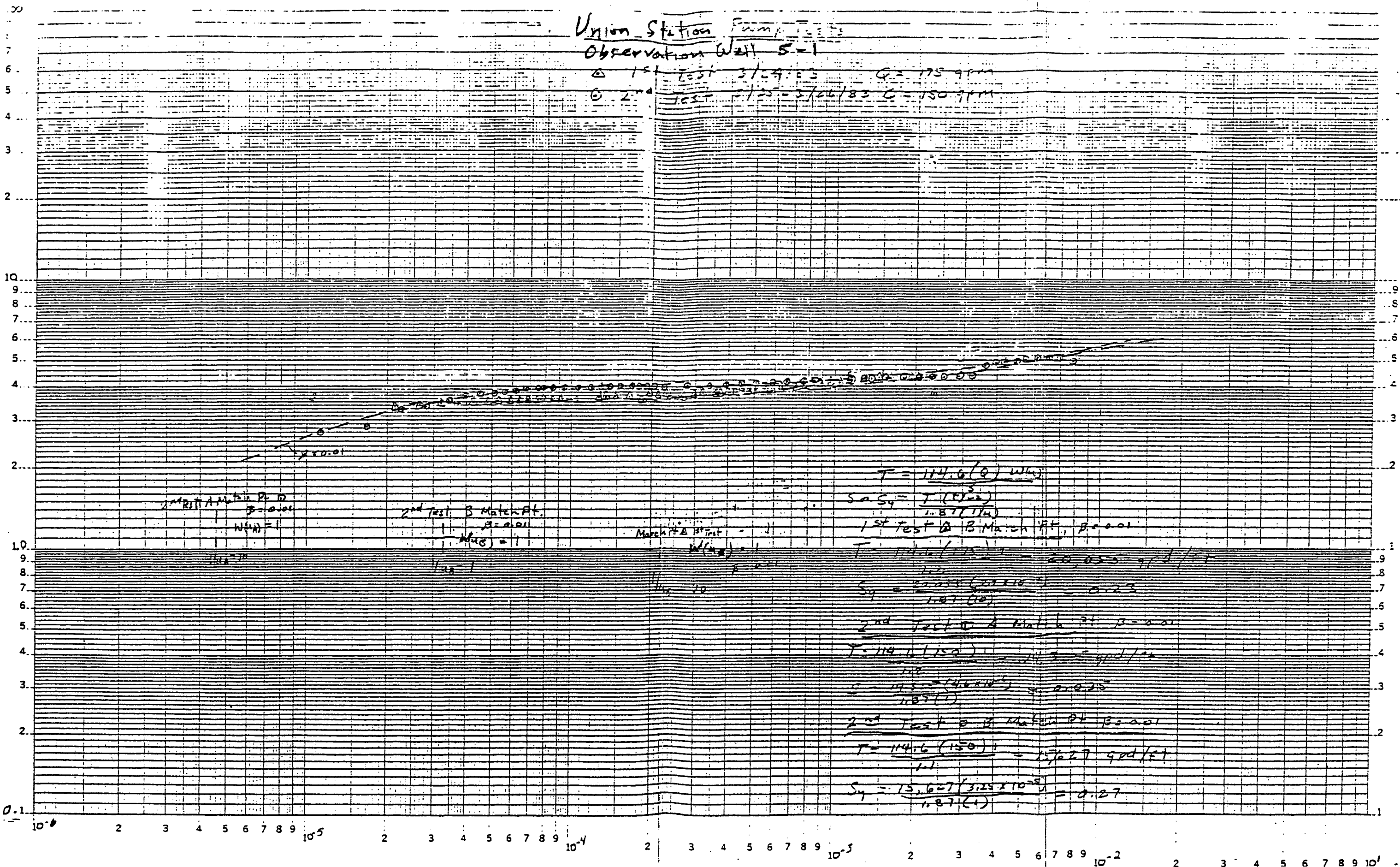
477520

dd ft.

K-E LOGARITHMIC 3 X 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Union Station Pump Observation Well 5-1

Δ 1st Test 3/4/83 Q = 175 gpm
○ 2nd Test 1/25 - 3/26/83 Q = 150 gpm



1st Test A Match Pt. B
B = 0.01
W(175) = 1

2nd Test B Match Pt.
B = 0.01
W(150) = 1

March 1st Test B Match Pt.
B = 0.01
W(150) = 1

$$T = \frac{114.6(Q)}{W(u)} = \frac{114.6(175)}{1.87(175)} = 20,023 \text{ gpd/ft}$$

$$S = S_y = \frac{T(r^2 s)}{1.87(Q)} = \frac{20,023(20 \times 10^{-5})}{1.87(175)} = 0.23$$

$$T = \frac{114.6(Q)}{W(u)} = \frac{114.6(150)}{1.1} = 15,627 \text{ gpd/ft}$$

$$S = S_y = \frac{T(r^2 s)}{1.87(Q)} = \frac{15,627(3.125 \times 10^{-5})}{1.87(150)} = 0.27$$

$$T = \frac{114.6(Q)}{W(u)} = \frac{114.6(150)}{1.1} = 15,627 \text{ gpd/ft}$$

$$S = S_y = \frac{T(r^2 s)}{1.87(Q)} = \frac{15,627(3.125 \times 10^{-5})}{1.87(150)} = 0.27$$

$$T = \frac{114.6(Q)}{W(u)} = \frac{114.6(150)}{1.1} = 15,627 \text{ gpd/ft}$$

$$S = S_y = \frac{T(r^2 s)}{1.87(Q)} = \frac{15,627(3.125 \times 10^{-5})}{1.87(150)} = 0.27$$

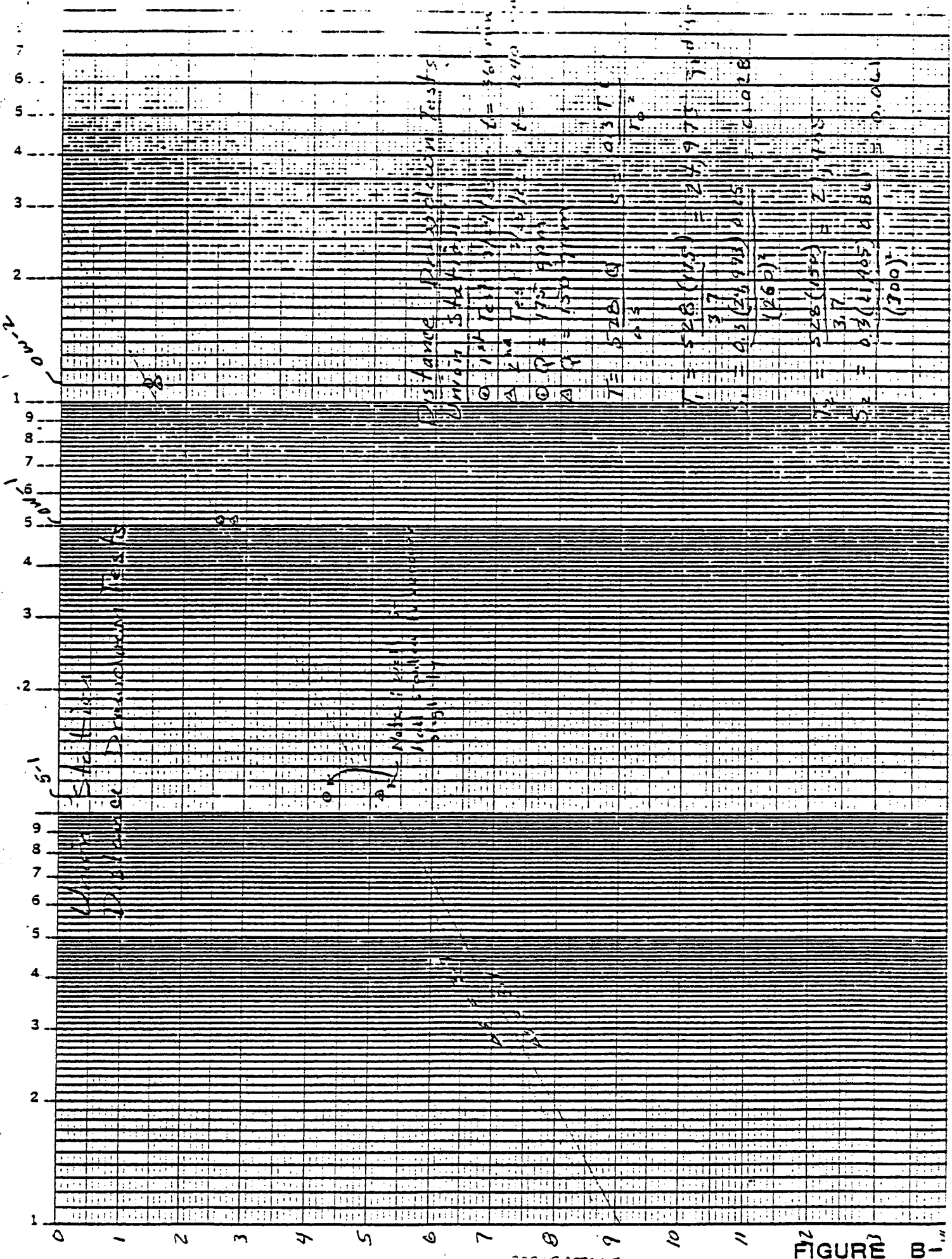


FIGURE B-11

AQUIFER TEST DATA SHEET

Observation Well No. OW-1

Project No. E167

Test Well No. Union Station

Date of Test 05/24/83

Static Water Level 20.49

Observed By WRH, TDH

Radius from Pumped Well 51.1

Average Discharge 175 gpm

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
11:45	0	---	---	20.49	0	
	.25	1.74x10 ⁻⁴	6.66x10 ⁻⁸	20.51	0.02	
	.50	3.47x10 ⁻⁴	1.33x10 ⁻⁷	20.56	0.07	
	.75	5.21x10 ⁻⁴	2.00x10 ⁻⁷	20.66	0.17	
	1	6.94x10 ⁻⁴	2.66x10 ⁻⁷	20.83	0.34	
	1.5	1.04x10 ⁻³	3.98x10 ⁻⁷	21.09	0.60	
	2	1.39x10 ⁻³	5.32x10 ⁻⁷	21.34	0.85	
	2.5	1.74x10 ⁻³	6.66x10 ⁻⁷	21.52	1.03	
	3	2.08x10 ⁻³	7.97x10 ⁻⁷	21.65	1.16	
	3.5	2.43x10 ⁻³	9.31x10 ⁻⁷	21.74	1.25	
	4	2.77x10 ⁻³	1.06x10 ⁻⁶	21.79	1.30	
	5	3.47x10 ⁻³	1.33x10 ⁻⁶	21.89	1.40	
	6	4.17x10 ⁻³	1.60x10 ⁻⁶	21.94	1.45	
	7	4.86x10 ⁻³	1.86x10 ⁻⁶	21.99	1.50	
	8	5.56x10 ⁻³	2.13x10 ⁻⁶	22.03	1.54	
	9	6.25x10 ⁻³	2.39x10 ⁻⁶	22.07	1.58	
	10	6.94x10 ⁻³	2.66x10 ⁻⁶	22.09	1.60	
	12	8.33x10 ⁻³	3.19x10 ⁻⁶	22.13	1.64	
	14	9.72x10 ⁻³	3.72x10 ⁻⁶	22.16	1.67	
	16	1.11x10 ⁻²	4.25x10 ⁻⁶	22.18	1.69	
	20	1.39x10 ⁻²	5.32x10 ⁻⁶	22.21	1.72	
	25	1.74x10 ⁻²	6.66x10 ⁻⁶	22.26	1.77	

AQUIFER TEST DATA SHEET

Observation Well No. OW-1

Project No. E167

Test Well No. Union Station

Date of Test 03/25/83

Static Water Level 20.84

Observed By WRH, TDH

Radius from Pumped Well 51.1

Average Discharge 150 gpm

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
11:30a	0	--	--	20.84	0	
	.25	1.74x10 ⁴	6.66x10 ⁸	20.88	0.04	
	.50	3.47x10 ⁴	1.33x10 ⁷	20.90	0.06	
	.75	5.21x10 ⁴	2.00x10 ⁷	20.98	0.14	
	1	6.94x10 ⁴	2.66x10 ⁷	21.04	0.20	
	1.25	8.68x10 ⁴	3.32x10 ⁷	21.11	0.27	
	1.75	1.21x10 ³	4.63x10 ⁷	21.23	0.39	
	2	1.39x10 ³	5.32x10 ⁷	21.28	0.44	
	2.5	1.74x10 ³	6.66x10 ⁷	21.36	0.52	
	3	2.08x10 ³	7.97x10 ⁷	21.42	0.58	
	3.5	2.43x10 ³	9.31x10 ⁷	21.49	0.65	
	4	2.77x10 ³	1.06x10 ⁶	21.55	0.71	
	5	3.47x10 ³	1.33x10 ⁶	21.68	0.84	
	6	4.17x10 ³	1.60x10 ⁶	21.79	0.95	
	7	4.86x10 ³	1.86x10 ⁶	21.88	1.04	
	8	5.56x10 ³	2.13x10 ⁶	21.95	1.11	
	9	6.25x10 ³	2.39x10 ⁶	21.98	1.14	
	10	6.94x10 ³	2.66x10 ⁶	22.05	1.21	
	11	7.64x10 ³	2.93x10 ⁶	22.10	1.26	
	12	8.33x10 ³	3.19x10 ⁶	22.14	1.30	
	14	9.72x10 ³	3.72x10 ⁶	22.18	1.34	
	16	1.11x10 ³	4.25x10 ⁶	22.22	1.38	

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
	18	1.25x10 ⁻²	4.79x10 ⁻⁶	22.28	1.44	
	20	1.39x10 ⁻²	5.32x10 ⁻⁶	22.30	1.46	
	25	1.74x10 ⁻²	6.66x10 ⁻⁶	22.33	1.49	
	30	2.08x10 ⁻²	7.97x10 ⁻⁶	22.36	1.52	
	40	2.77x10 ⁻²	1.06x10 ⁻⁵	22.40	1.56	
	50	3.47x10 ⁻²	1.33x10 ⁻⁵	22.43	1.59	
	60	4.17x10 ⁻²	1.60x10 ⁻⁵	22.46	1.62	
	70	4.86x10 ⁻²	1.86x10 ⁻⁵	22.48	1.64	
	90	6.25x10 ⁻²	2.39x10 ⁻⁵	22.53	1.69	
	100	6.94x10 ⁻²	2.66x10 ⁻⁵	22.55	1.71	
1:30p	120	8.33x10 ⁻²	3.19x10 ⁻⁵	22.60	1.76	
	140	9.72x10 ⁻²	3.72x10 ⁻⁵	22.63	1.79	
	170	1.18x10 ⁻¹	4.52x10 ⁻⁵	22.67	1.83	
	200	1.39x10 ⁻¹	5.32x10 ⁻⁵	22.73	1.89	
3:30	240	1.67x10 ⁻¹	6.40x10 ⁻⁵	22.78	1.94	
4:15	285	1.98x10 ⁻¹	7.58x10 ⁻⁵	22.82	1.98	
4:49	319	2.22x10 ⁻¹	8.50x10 ⁻⁵	22.85	2.01	
5:30	360	2.50x10 ⁻¹	9.57x10 ⁻⁵	22.89	2.05	
6:15	405	2.81x10 ⁻¹	1.08x10 ⁻⁴	22.93	2.09	
7:00	450	3.13x10 ⁻¹	1.20x10 ⁻⁴	22.97	2.13	
8:00	510	3.54x10 ⁻¹	1.36x10 ⁻⁴	23.01	2.17	
9:04	574	3.99x10 ⁻¹	1.53x10 ⁻⁴	23.04	2.20	
10:02	632	4.39x10 ⁻¹	1.68x10 ⁻⁴	23.26	2.42	
10:58	688	4.78x10 ⁻¹	1.83x10 ⁻⁴	23.34	2.50	
11:58	748	5.19x10 ⁻¹	1.99x10 ⁻⁴	23.38	2.54	
1:30a	840	5.83x10 ⁻¹	2.23x10 ⁻⁴	23.46	2.62	
	900	6.25x10 ⁻¹	2.39x10 ⁻⁴	23.51	2.67	
4:00a	1000	6.94x10 ⁻¹	2.66x10 ⁻⁴	23.56	2.72	

AQUIFER TEST DATA SHEET

Observation Well No. OW-2

Project No. E167

Test Well No. Union Station

Date of Test 03/25/83

Static Water Level 19.50

Observed By WRH, TDH

Radius from Pumped Well 110.6

Average Discharge 150 gpm

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
11:30	0	--	--	19.500	0	
	.25	1.74x10 ⁻⁴	1.42x10 ⁻⁸	19.500	0	
	.50	3.47x10 ⁻⁴	2.84x10 ⁻⁸	19.500	0	
	.75	5.21x10 ⁻⁴	4.26x10 ⁻⁸	19.504	0.004	
	1	6.94x10 ⁻⁴	5.67x10 ⁻⁸	19.504	0.004	
	1.25	8.68x10 ⁻⁴	7.10x10 ⁻⁸	19.504	0.004	
	1.50	1.04x10 ⁻³	8.50x10 ⁻⁸	19.504	0.004	
	1.75	1.22x10 ⁻³	9.97x10 ⁻⁸	19.510	0.010	
	3	2.08x10 ⁻³	1.70x10 ⁻⁷	19.515	0.015	
	3.50	2.43x10 ⁻³	1.99x10 ⁻⁷	19.515	0.015	
	4	2.78x10 ⁻³	2.27x10 ⁻⁷	19.520	0.020	
	5	3.47x10 ⁻³	2.83x10 ⁻⁷	19.520	0.020	
	5.25	3.65x10 ⁻³	2.98x10 ⁻⁷	19.529	0.029	
	6	4.17x10 ⁻³	3.41x10 ⁻⁷	19.530	0.030	
	7	4.86x10 ⁻³	3.97x10 ⁻⁷	19.532	0.032	
	8	5.56x10 ⁻³	4.55x10 ⁻⁷	19.547	0.047	
	9	6.25x10 ⁻³	5.11x10 ⁻⁷	19.550	0.050	
	10	6.94x10 ⁻³	5.67x10 ⁻⁷	19.555	0.055	
	11	7.64x10 ⁻³	6.25x10 ⁻⁷	19.562	0.062	
	12	8.33x10 ⁻³	6.81x10 ⁻⁷	19.575	0.075	
	14	9.72x10 ⁻³	7.95x10 ⁻⁷	19.590	0.090	
	16	1.11x10 ⁻²	9.07x10 ⁻⁷	19.605	0.105	

Time	t min.	t days	t/r^2	Water Level feet	Drawdown, s feet	Remarks
	30	2.08×10^{-2}	1.70×10^{-6}	19.750	0.240	
	35	2.43×10^{-2}	1.99×10^{-6}	19.805	0.295	
	40	2.78×10^{-2}	2.27×10^{-6}	19.850	0.340	
	50	3.47×10^{-2}	2.84×10^{-6}	19.920	0.410	
	60	4.17×10^{-2}	3.41×10^{-6}	20.000	0.490	
	70	4.86×10^{-2}	3.97×10^{-6}	20.070	0.560	
	80	5.56×10^{-2}	4.55×10^{-6}	20.125	0.615	
	92	6.39×10^{-2}	5.22×10^{-6}	20.190	0.680	
	100	6.94×10^{-2}	5.67×10^{-6}	20.230	0.720	
	120	8.33×10^{-2}	6.81×10^{-6}	20.340	0.830	
	140	9.72×10^{-2}	7.95×10^{-6}	20.420	0.910	
	160	1.11×10^{-1}	9.07×10^{-6}	20.490	0.980	
2:45	180	1.25×10^{-1}	1.02×10^{-5}	20.560	1.050	
3:05	200	1.39×10^{-1}	1.14×10^{-5}	20.620	1.110	
3:35	230	1.60×10^{-1}	1.31×10^{-5}	20.690	1.180	
4:05	260	1.81×10^{-1}	1.48×10^{-5}	--	--	
4:56	311	2.16×10^{-1}	1.77×10^{-5}	20.850	1.340	
5:47	362	2.51×10^{-1}	2.05×10^{-5}	20.920	1.410	
6:47	422	2.93×10^{-1}	2.40×10^{-5}	20.980	1.470	
7:07	442	3.07×10^{-1}	2.51×10^{-5}	20.985	1.475	
8:04	499	3.47×10^{-1}	2.84×10^{-5}	20.990	1.480	

AQUIFER TEST DATA SHEET

Observation Well No. OW-2

Project No. E167

Test Well No. Union Station

Date of Test 03/24/83

Static Water Level 19.51

Observed By WRH, TDH

Radius from Pumped Well 110.6

Average Discharge 175 gpm

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
11:45	0	--	--	19.510	0	
	.25	1.74x10 ⁻⁴	1.42x10 ⁻⁸	19.510	0	
	.50	3.47x10 ⁻⁴	2.84x10 ⁻⁸	19.510	0	
	.75	5.21x10 ⁻⁴	4.26x10 ⁻⁸	19.510	0	
	1	6.94x10 ⁻⁴	5.67x10 ⁻⁸	19.510	0	
	1.5	1.04x10 ⁻³	8.50x10 ⁻⁸	19.515	0.005	
	2	1.39x10 ⁻³	1.14x10 ⁻⁷	19.515	0.005	
	2.5	1.74x10 ⁻³	1.42x10 ⁻⁷	19.515	0.005	
	3	2.08x10 ⁻³	1.70x10 ⁻⁷	19.520	0.010	
	3.5	2.43x10 ⁻³	1.99x10 ⁻⁷	19.525	0.015	
	4	2.78x10 ⁻³	2.27x10 ⁻⁷	19.530	0.020	
	5	3.47x10 ⁻³	2.83x10 ⁻⁷	19.535	0.025	
	6	4.17x10 ⁻³	3.41x10 ⁻⁷	19.540	0.030	
	7	4.86x10 ⁻³	3.97x10 ⁻⁷	19.550	0.040	
	8	5.56x10 ⁻³	4.55x10 ⁻⁷	19.560	0.050	
	9	6.25x10 ⁻³	5.11x10 ⁻⁷	19.570	0.060	
	10.5	7.29x10 ⁻³	5.96x10 ⁻⁷	19.580	0.070	
	12	8.33x10 ⁻³	6.81x10 ⁻⁷	19.595	0.085	
	14	9.72x10 ⁻³	7.95x10 ⁻⁷	19.615	0.105	
	16	1.11x10 ⁻²	9.07x10 ⁻⁷	19.630	0.120	
	20	1.39x10 ⁻²	1.14x10 ⁻⁶	19.665	0.155	
	25	1.74x10 ⁻²	1.42x10 ⁻⁶	19.705	0.195	

Time	t min.	t days	t/r^2	Water Level feet	Drawdown, s feet	Remarks
	18	1.25×10^{-2}	1.02×10^{-6}	19.620	0.120	
	20	1.39×10^{-2}	1.14×10^{-6}	19.635	0.135	
	25	1.74×10^{-2}	1.42×10^{-6}	19.670	0.170	
	30	2.08×10^{-2}	1.70×10^{-6}	19.705	0.205	
12:05	35	2.43×10^{-2}	1.99×10^{-6}	19.750	0.250	
12:10	40	2.77×10^{-2}	2.27×10^{-6}	19.780	0.280	
	45	3.13×10^{-2}	2.56×10^{-6}	19.815	0.315	
12:20	50	3.47×10^{-2}	2.84×10^{-6}	19.840	0.340	
12:30	60	4.17×10^{-2}	3.41×10^{-6}	19.890	0.390	
12:40	70	4.86×10^{-2}	3.97×10^{-6}	19.930	0.430	
12:52	82	5.69×10^{-2}	4.65×10^{-6}	19.980	0.480	
1:00	90	6.25×10^{-2}	5.11×10^{-6}	20.050	0.550	
1:10	100	6.94×10^{-2}	5.67×10^{-6}	20.090	0.590	
1:20	110	7.64×10^{-2}	6.25×10^{-6}	20.130	0.630	
1:30	120	8.33×10^{-2}	6.81×10^{-6}	20.160	0.660	
1:40	130	9.03×10^{-2}	7.38×10^{-6}	20.180	0.680	
2:00	150	1.04×10^{-1}	8.50×10^{-6}	20.230	0.730	
2:20	170	1.18×10^{-1}	9.65×10^{-6}	20.270	0.770	
2:46	196	1.36×10^{-1}	1.11×10^{-5}	20.310	0.810	
3:30	240	1.67×10^{-1}	1.37×10^{-5}	20.390	0.890	
4:15	285	1.98×10^{-1}	1.62×10^{-5}	20.440	0.940	
4:47	317	2.20×10^{-1}	1.80×10^{-5}	20.480	0.980	
5:30	360	2.50×10^{-1}	2.04×10^{-5}	20.510	1.010	
6:14	404	2.81×10^{-1}	2.30×10^{-5}	20.550	1.050	
7:00	450	3.13×10^{-1}	2.56×10^{-5}	20.580	1.080	
7:56	506	3.51×10^{-1}	2.87×10^{-5}	20.620	1.120	
9:00	570	3.96×10^{-1}	3.24×10^{-5}	20.660	1.160	
10:00	630	4.38×10^{-1}	3.58×10^{-5}	20.700	1.200	

AQUIFER TEST DATA SHEET

Observation Well No. 5-1

Project No. E167

Test Well No. Union Station

Date of Test 05/24/85

Static Water Level 19.92

Observed By DG

Radius from Pumped Well 11.1 ft.

Average Discharge 175 gpm

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
11:45	0	0	---	19.92	0.00	large initial drawdown-missed
	1	6.94x10 ⁻⁴	5.33x10 ⁻⁶	--	--	1 min. reading
	2	1.39x10 ⁻³	1.07x10 ⁻⁵	23.58	3.66	
	3	2.08x10 ⁻³	1.60x10 ⁻⁵	23.60	3.68	
	4	2.78x10 ⁻³	2.14x10 ⁻⁵	23.31	3.39	
	5	3.47x10 ⁻³	2.67x10 ⁻⁵	23.52	3.40	
	6	4.17x10 ⁻³	3.20x10 ⁻⁵	23.40	3.48	
	7	4.86x10 ⁻³	3.73x10 ⁻⁵	--	--	
	8	5.56x10 ⁻³	4.27x10 ⁻⁵	23.42	3.50	
	9	6.25x10 ⁻³	4.80x10 ⁻⁵	23.42	3.50	
	10	6.94x10 ⁻³	5.33x10 ⁻⁵	23.43	3.51	
	11	7.64x10 ⁻³	5.87x10 ⁻⁵	23.43	3.51	
	12	8.33x10 ⁻³	6.40x10 ⁻⁵	23.46	3.54	
	13	9.03x10 ⁻³	6.94x10 ⁻⁵	23.47	3.55	
	14	9.72x10 ⁻³	7.47x10 ⁻⁵	23.47	3.55	
	15	1.04x10 ⁻²	7.99x10 ⁻⁵	23.50	3.58	
	16	1.11x10 ⁻²	8.53x10 ⁻⁵	23.48	3.56	
	17	1.18x10 ⁻²	9.06x10 ⁻⁵	23.47	3.55	
	18	1.25x10 ⁻²	9.60x10 ⁻⁵	--	--	
	19	1.32x10 ⁻²	1.01x10 ⁻⁴	--	--	
	20	1.39x10 ⁻²	1.07x10 ⁻⁴	23.47	3.55	
	22	1.53x10 ⁻²	1.18x10 ⁻⁴	--	--	

Time	t min.	t days	t/r^2	Water Level feet	Drawdown, s feet	Remarks
	24	1.67×10^{-2}	1.28×10^{-4}	23.53	3.61	
	25	1.74×10^{-2}	1.34×10^{-4}	23.55	3.63	
	28	1.94×10^{-2}	1.49×10^{-4}	23.57	3.65	
	31	2.15×10^{-2}	1.65×10^{-4}	23.55	3.63	
	35	2.43×10^{-2}	1.87×10^{-4}	23.50	3.58	
	37	2.57×10^{-2}	1.97×10^{-4}	23.71	3.79	
	40	2.78×10^{-2}	2.14×10^{-4}	23.62	3.70	
	43	2.99×10^{-2}	2.30×10^{-4}	23.67	3.75	
	45	3.13×10^{-2}	2.40×10^{-4}	23.64	3.72	
	50	3.47×10^{-2}	2.67×10^{-4}	23.65	3.73	
	56	3.89×10^{-2}	2.99×10^{-4}	23.66	3.74	
	60	4.17×10^{-2}	3.20×10^{-4}	23.66	3.74	
	67	4.65×10^{-2}	3.57×10^{-4}	23.70	3.78	
	70	4.86×10^{-2}	3.73×10^{-4}	23.69	3.77	
	75	5.21×10^{-2}	4.00×10^{-4}	23.71	3.79	
	80	5.56×10^{-2}	4.27×10^{-4}	23.71	3.79	
	85	5.90×10^{-2}	4.53×10^{-4}	23.83	3.91	
	90	6.25×10^{-2}	4.80×10^{-4}	23.75	3.83	
	95	6.60×10^{-2}	5.07×10^{-4}	23.80	3.88	
	100	6.94×10^{-2}	5.33×10^{-4}	--	--	
1:30	105	7.29×10^{-2}	5.60×10^{-4}	23.77	3.85	
	110	7.64×10^{-2}	5.87×10^{-4}	23.78	3.86	
1:45	120	8.33×10^{-2}	6.40×10^{-4}	23.90	3.98	
1:50	125	8.68×10^{-2}	6.67×10^{-4}	23.92	4.00	
2:00	135	9.38×10^{-2}	7.20×10^{-4}	23.91	3.99	
2:10	145	1.01×10^{-1}	7.76×10^{-4}	23.98	4.06	
2:26	155	1.08×10^{-1}	8.29×10^{-4}	24.03	4.11	
2:30	165	1.15×10^{-1}	8.83×10^{-4}	24.03	4.11	
2:45	180	1.25×10^{-1}	9.60×10^{-4}	24.01	4.09	

AQUIFER TEST DATA SHEET

Observation Well No. 5-1

Project No. E167

Test Well No. Union Station

Date of Test 03/25/83

Static Water Level 19.01

Observed By DG

Radius from Pumped Well 11.1 ft.

Average Discharge 150 gpm

Time	t min.	t days	t/r ²	Water Level feet	Drawdown, s feet	Remarks
11:30	0	0	--	19.01	0.0	started pump 11:15, stopped
	1	6.94x10 ⁻⁴	5.63x10 ⁻⁶	--	--	11:20-start 11:30 static before 1st start-19.01
	2	1.39x10 ⁻³	1.13x10 ⁻⁵	21.72	2.71	
	3	2.08x10 ⁻³	1.69x10 ⁻⁵	21.85	2.84	
	4	2.78x10 ⁻³	2.26x10 ⁻⁵	22.30	3.29	
	5	3.47x10 ⁻³	2.82x10 ⁻⁵	22.35	3.34	
	6	4.17x10 ⁻³	3.38x10 ⁻⁵	22.55	3.54	
	7	4.86x10 ⁻³	3.94x10 ⁻⁵	22.69	3.68	
	8	5.56x10 ⁻³	4.51x10 ⁻⁵	22.76	3.75	
	9	6.25x10 ⁻³	5.07x10 ⁻⁵	22.77	3.76	
	10	6.94x10 ⁻³	5.63x10 ⁻⁵	22.82	3.81	
	11	7.64x10 ⁻³	6.20x10 ⁻⁵	22.86	3.85	
	12	8.33x10 ⁻³	6.76x10 ⁻⁵	22.90	3.89	
	13	9.03x10 ⁻³	7.55x10 ⁻⁵	22.86	3.85	
	14	9.72x10 ⁻³	7.89x10 ⁻⁵	22.90	3.89	
	15	1.04x10 ⁻²	8.44x10 ⁻⁵	22.90	3.89	
	17	1.18x10 ⁻²	9.58x10 ⁻⁵	22.94	3.93	
	19	1.32x10 ⁻²	1.07x10 ⁻⁴	22.95	3.94	
	21	1.46x10 ⁻²	1.19x10 ⁻⁴	22.97	3.96	
	23	1.60x10 ⁻²	1.30x10 ⁻⁴	23.01	4.00	
	25	1.74x10 ⁻²	1.41x10 ⁻⁴	23.00	3.99	
	27	1.88x10 ⁻²	1.53x10 ⁻⁴	23.02	4.01	

Time	t min.	t days	s/r^2	Water Level feet	Drawdown, s feet	Remarks
12:00	30	2.08×10^{-2}	1.69×10^{-4}	23.01	4.00	
	32	2.22×10^{-2}	1.80×10^{-4}	23.02	4.01	
	34	2.36×10^{-2}	1.92×10^{-4}	22.99	3.98	
	36	2.50×10^{-2}	2.03×10^{-4}	23.00	3.99	
	40	2.78×10^{-2}	2.26×10^{-4}	23.00	3.99	
12:20	50	3.47×10^{-2}	2.82×10^{-4}	23.03	4.02	
12:30	60	4.17×10^{-2}	3.38×10^{-4}	23.05	4.04	
12:40	70	4.86×10^{-2}	3.94×10^{-4}	23.06	4.05	
12:50	80	5.56×10^{-2}	4.51×10^{-4}	23.09	4.08	
1:00	90	6.25×10^{-2}	5.07×10^{-4}	23.08	4.07	
1:15	105	7.29×10^{-2}	5.92×10^{-4}	23.10	4.09	
1:30	120	8.33×10^{-2}	6.76×10^{-4}	23.13	4.12	
1:45	135	9.38×10^{-2}	7.61×10^{-4}	23.14	4.13	
2:00	150	1.04×10^{-1}	8.44×10^{-4}	23.17	4.16	
2:50	200	1.39×10^{-1}	1.13×10^{-3}	23.20	4.19	
3:15	225	1.56×10^{-1}	1.27×10^{-3}	23.26	4.25	
3:30	240	1.67×10^{-1}	1.36×10^{-3}	23.30	4.29	
4:00	270	1.88×10^{-1}	1.53×10^{-3}	23.31	4.30	
4:50	320	2.22×10^{-1}	1.80×10^{-3}	23.31	4.30	
5:34	364	2.53×10^{-1}	2.05×10^{-3}	23.33	4.32	
6:20	410	2.85×10^{-1}	2.31×10^{-3}	23.36	4.35	
7:03	453	3.15×10^{-1}	2.56×10^{-3}	23.35	4.34	
8:04	514	3.57×10^{-1}	2.90×10^{-3}	23.37	4.36	
9:08	578	4.01×10^{-1}	3.25×10^{-3}	23.38	4.37	
10:06	636	4.42×10^{-1}	3.59×10^{-3}	23.82	4.81	
11:04	694	4.82×10^{-1}	3.91×10^{-3}	23.91	4.90	
3 12:03	753	5.23×10^{-1}	4.25×10^{-3}	23.92	4.91	
	843	5.85×10^{-1}	4.75×10^{-3}	23.95	4.94	

