

APR 05 2001

WASHOE COUNTY
DEPT. OF WATER RESOURCES**LETTER OF TRANSMITTAL***file*

WASHOE COUNTY SCHOOL DISTRICT
 PLANT FACILITIES DEPARTMENT
 7495 S. Virginia St.
 Reno, NV 89511
 Phone (775) 851-5672 Fax (775) 851-5683

TO: John Collins
 Utility Manager
 Washoe Co. Dept. of Water Resources
 4930 Energy Way
 Reno, NV 89502

RE: Verdi Elementary School Well

DATE: April 3, 2001

GENTLEMEN:

We are sending you the following:

- Attached
 Copy of letter

- Under separate cover
 Change order

- Specifications
 Drawings

# of Copies	DESCRIPTION
	Copy of Drilling & Testing of Verdi Elementary School Production Well

These are:

- For approval For your use As requested

REMARKS:

SIGNED: Dale Sanderson

DRILLING AND TESTING OF
VERDI ELEMENTARY SCHOOL PRODUCTION WELL
WASHOE COUNTY, NEVADA

July 8, 1986
Project No.: 86-402

Prepared for:
Washoе County School District

Prepared by:
WILLIAM E. NORK, INC.

William Snork
William E. Nork, President

WILLIAM E. NORK, Inc.

TABLE OF CONTENTS

	Page
1.0 FINDINGS	1
2.0 INTRODUCTION	2
3.0 PRODUCTION WELL CONSTRUCTION	4
4.0 AQUIFER STRESS TESTS	7
4.1 STEP-DRAWDOWN TESTING	7
4.2 CONSTANT-DISCHARGE TESTING	9
4.3 ANALYSIS OF PUMPING-TEST DATA	9
5.0 YIELD RATING OF THE WELL	16
5.1 WELL YIELD	16
5.2 PUMP DESIGN CRITERIA	16
6.0 WATER QUALITY	19
7.0 SOURCES OF INFORMATION	21

APPENDIX A CONTRACT SPECIFICATION AND COST MODIFICATION

APPENDIX B DRILLER'S REPORT

APPENDIX C CONSTRUCTION SUMMARY

APPENDIX D FIELD DATA SHEETS

FIGURES AND TABLES:

FIGURE 1. PROJECT REFERENCE MAP	3
FIGURE 2. PRODUCTION WELL CONSTRUCTION DIAGRAM	5
FIGURE 3. VERDI ELEMENTARY SCHOOL PRODUCTION WELL STEP-DRAWDOWN TEST, 0700 HRS 6/6/86 TO 1500 HRS 6/6/86, DRAWDOWN DATA	8
FIGURE 4. VERDI ELEMENTARY SCHOOL PRODUCTION WELL CONSTANT-DISCHARGE TEST 0900 HRS, 6/7/86 TO 1630 HRS, 6/7/86, DRAWDOWN DATA (THEIS ANALYSIS)	10

TABLE OF CONTENTS (continued)

FIGURE 5. VERDI ELEMENTARY SCHOOL PRODUCTION WELL CONSTANT-DISCHARGE TEST 0900 HRS, 6/9/86 TO 0900 HRS, 6/12/86, DRAWDOWN DATA (COOPER-JACOB ANALYSIS) . . .	11
FIGURE 6. VERDI ELEMENTARY SCHOOL PRODUCTION WELL CONSTANT-DISCHARGE TEST, 0900 HRS, 6/9/86 TO 0900 HRS, 6/12/86, RESIDUAL-DRAWDOWN DATA (THEIS ANALYSIS). . .	12
FIGURE 7. VERDI ELEMENTARY SCHOOL PRODUCTION WELL CONSTANT-DISCHARGE TEST, 0900 HRS, 6/9/86 TO 0900 HRS, 6/12/86, RESIDUAL-DRAWDOWN DATA (COOPER-JACOB ANALYSIS)	13
Figure 8. Anticipated draw-down for continuous, non-stop pumping at 30 gpm.....	17
TABLE 1. TRANSMISSIVITY VALUES CALCULATED FROM THE VERDI SCHOOL WELL PUMPING TEST DATA	14
TABLE 2. WATER QUALITY DATA, VERDI SCHOOL WELL	19

1.0 FINDINGS

- 1.0 The Verdi School Well was drilled to a depth of 602 feet. It was cased with 8 5/8-inch O.D. casing to a depth of 601 feet and completed with triple factory mill-slot perforations placed opposite the production horizon.
- 2.0 The well derives ground-water from fractured basaltic lava flows below a depth of 550 feet.
- 3.0 The well was test pumped for a total of 87.5 hours. Testing consisted of an 8-hour step-drawdown test at rates of 100 and 110 gallons per minute, a 7.5 hour constant-discharge test at 80 gpm, and a 72 hour constant-discharge test, also at 80 gpm.
- 4.0 Test results indicate that the well can be expected to meet the irrigation water supply demand of 30 gallons per minute for the school grounds and playing fields virtually indefinitely.
- 5.0 Chemical quality of the ground water is excellant, meets State of Nevada and federal drinking water standards, and is suitable for irrigation purposes.

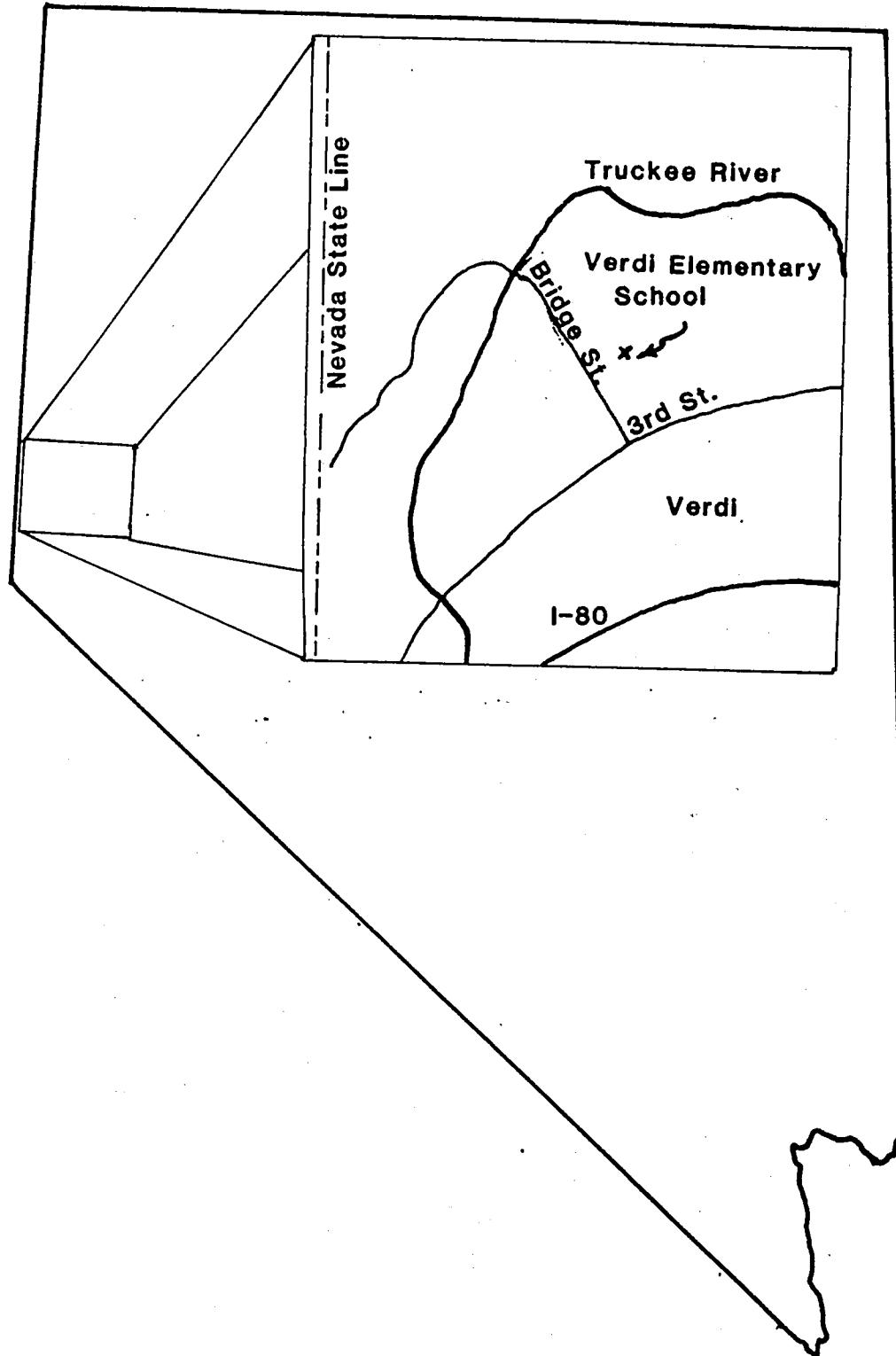
2.0 INTRODUCTION

A 601 feet deep, 8-inch diameter well was drilled for the Washoe County School District at the Verdi Elementary School. It is located in the SW 1/4 SW 1/4, Section 8, Township 19N., Range 18E., M.D.B. & M. in Verdi, Washoe County, Nevada. (Figure 1)

Drilling, construction, and testing of the well was orchestrated by WILLIAM E. NORK, INC. a Reno, Nevada based hydrogeologic consulting firm. Ultimate well design deviated substantially from the specified preliminary well design based on lithologic and construction data from the existing Verdi Elementary School water supply well (Appendix A). The completed well is 601 feet deep compared to an anticipated target depth of 400 feet because permeable water-bearing geologic materials were not penetrated above a depth of approximately 550 feet. The drilling discoveries illustrate a lack of uniformity in the geologic materials in the vicinity of the school not evident at the surface.

Paul Williams and Sons, a Sparks, Nevada based drilling firm, drilled and constructed the well and provided test-pumping equipment. The aquifer stress tests were accomplished by WILLIAM E. NORK, INC. personnel.

This report summarizes the results of the drilling and testing program and provides design criteria for the production pumping equipment to be installed in the well.



**Figure 1. Project location reference map,
Verdi Elementary School,
Washoe County, Nevada.**

3.0 PRODUCTION WELL CONSTRUCTION

A nominal 17 inch diameter borehole was drilled by the air-rotary method to a depth of 68 feet and lined with temporary 12-inch diameter steel conductor casing which was ultimately removed at a later date during installation of the cement sanitary seal. A nominal 12-inch diameter borehole was completed from 68 feet to a depth of 602 feet also by the air-rotary method. Geologic materials penetrated in drilling comprised sands, silts, clays, boulders, and basaltic lava flows. An abbreviated log of the materials penetrated is given below.

Depth Interval (feet)	Description
0 - 12	glacial outwash; sand, silt, clay, and boulders
12 - 45	well sorted sand, clay, and stringers of shale
45 - 65	sand, silt, clay; two thin gravel strata; minor lignite
350 - 602	basaltic lava flows; groundwater derived from fractures below 550 feet

Upon completion of drilling, the hole was cased with 8 5/8-inch O.D., 0.250-inch wall thickness steel casing to a depth of 601 feet. Blank casing was installed from one foot above land surface to a depth of 521 feet with triple factory mill slot perforations from 521 feet to a depth of 601 feet. The casing string was equipped with a steel drive shoe at the bottom and the casing string seated firmly in the formation material. A gravel formation stabilizer (nominal 3/8- x 1/2-inch size) was installed from 601 feet to a depth of 105 feet. A cement seal was placed in the annular space between the well casing and the formation walls via tremie pipe from a depth of 105 feet to land surface. Final well construction is summarized in Figure 2, below. A copy of the Driller's Report to the State Engineer and a construction summary form are provided in Appendices B and C, respectively.

Well development procedures to remove residual drilling debris from the well bore and adjacent formation walls and to enhance the hydraulic efficiency of the well commenced on June 3, 1986.

CONSTRUCTION DIAGRAM

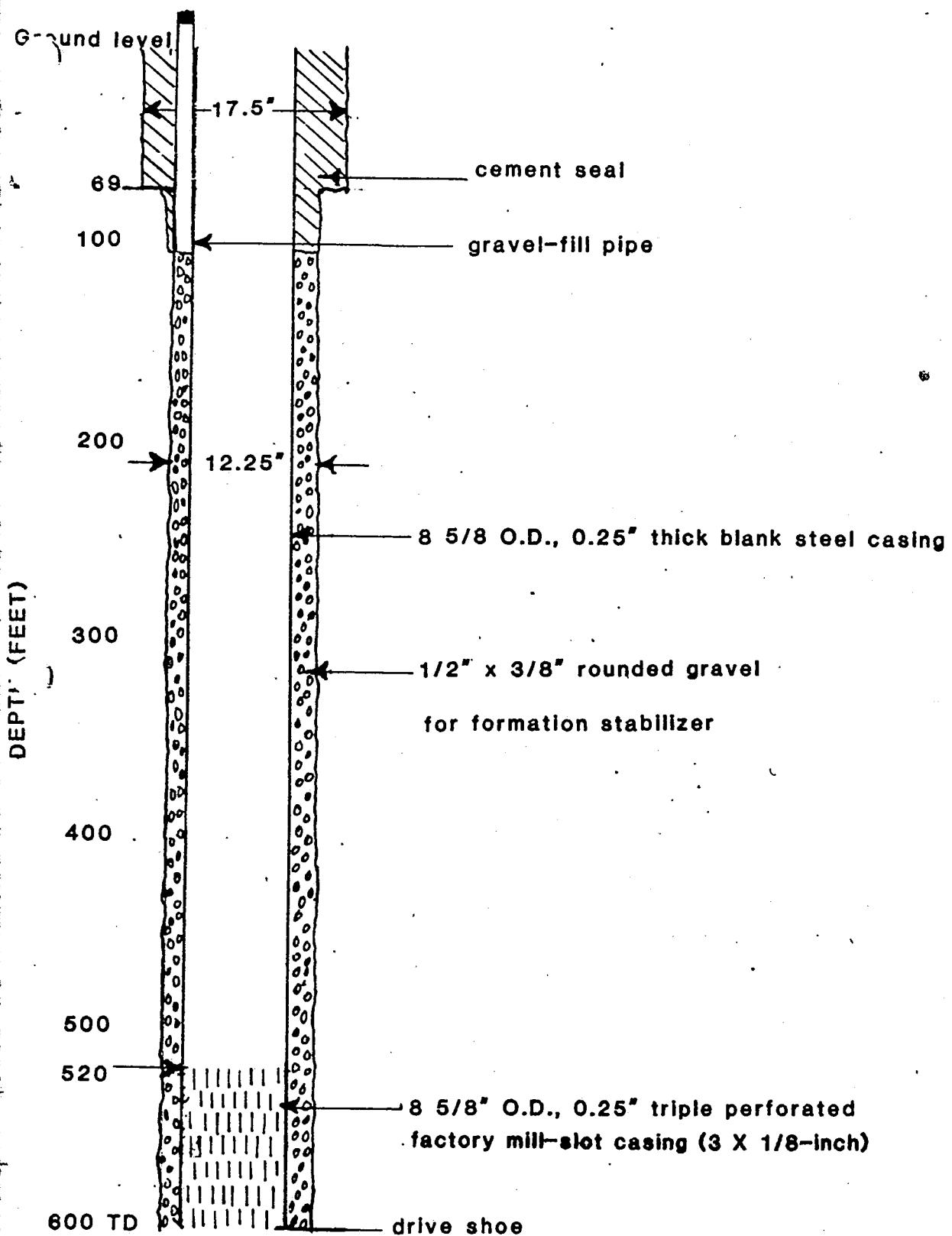


Figure 2.

Development consisted of high pressure air-jetting of the perforated casing interval. After 1 1/2 hours, the discharge was clear and sand free and development procedures were terminated.

4.0 AQUIFER STRESS TESTS

A 6-stage, 30 HP Georgia Pacific submersible pump was installed in the well to a depth of 260 feet on June 5, 1986. Testing of the well included an eight-hour step-drawdown test, a 7 1/2-hour constant-discharge test, and a 72-hour constant-discharge test followed by 36 hours of detailed water level recovery measurements and seven days of daily recovery measurements. The step-drawdown test was conducted in order to evaluate effectiveness of the well development procedures, well efficiency, and to determine an optimum pumping rate for the constant-discharge test. The constant-discharge test was performed to determine the long-term yield of the well and to assist in selection of production pumping equipment. The initial constant-discharge test was terminated when it became obvious that the 250 foot pump setting was inadequate to sustain the test for the desired 72 hour duration at a constant rate of 80 gpm. The pump was subsequently lowered to a setting of 410 feet and testing restarted after a suitable recovery period.

4.1 STEP-DRAWDOWN TESTING

An eight-hour step-drawdown test was conducted on June 5, 1986. Results of the test are summarized below.

Static water level prior to testing was 42.04 feet below measuring point (M.P. = top of stilling well). Testing commenced at 0700 hrs 5/6/86. Testing was terminated at 1500 hrs 5/6/86, after a duration of eight hours. Water levels recovered to 85 percent within four hours and 90 percent before the start of the constant-discharge test.

Step	Pumping Rate Q (GPM)	Duration t (Minutes)	Drawdown s (Feet)	Specific Capacity Cs (GPM/ft)
I	100	240	144.38	0.69
II	110	240	205.42	0.54

Step-drawdown data are plotted in Figure 3. Field data sheets are provided in Appendix D.

K-E SEMI-LOGARITHMIC 4 CYCLES X 70 DIV.
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6010

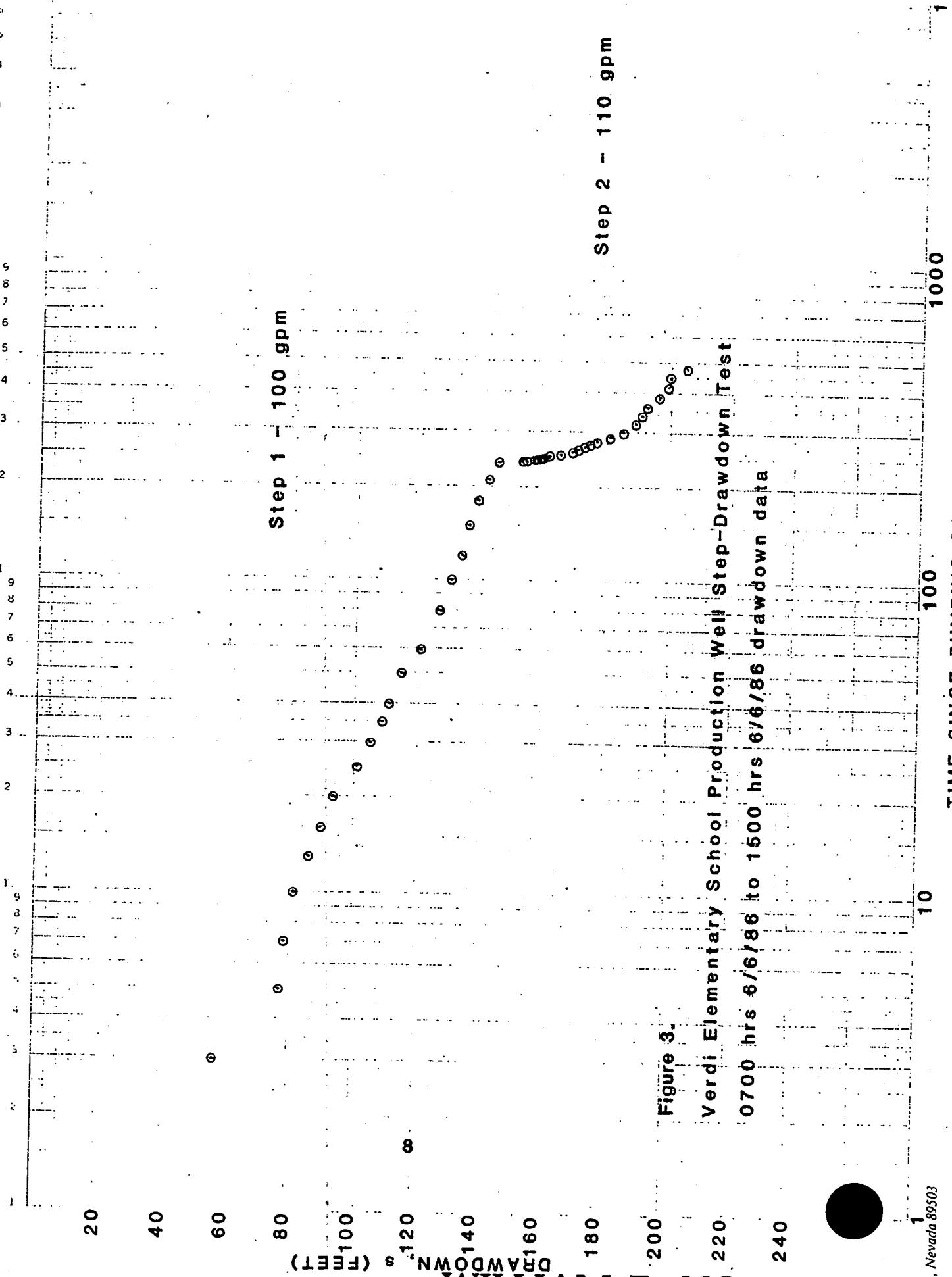


Figure 3.

Verdi Elementary School Production Well Step-Drawdown Test
0700 hrs 6/6/86 to 1500 hrs 6/6/86 drawdown data

WILLIAM E. NORK, Inc.

4.2 CONSTANT-DISCHARGE TESTING

A 72-hour constant-discharge pumping test was initiated after the water level in the production well had totally recovered following completion of the step-drawdown test. Testing was aborted after 7 1/2 hours because the pumping water level was rapidly approaching the level of the pump intake. Because the transmissivity of the aquifer was not as high as the original drilling discoveries suggested, the pump was lowered to a depth of 410 feet to allow completion of a 72-hour test. The test was restarted 6/9/86. Results of the latter test are summarized below.

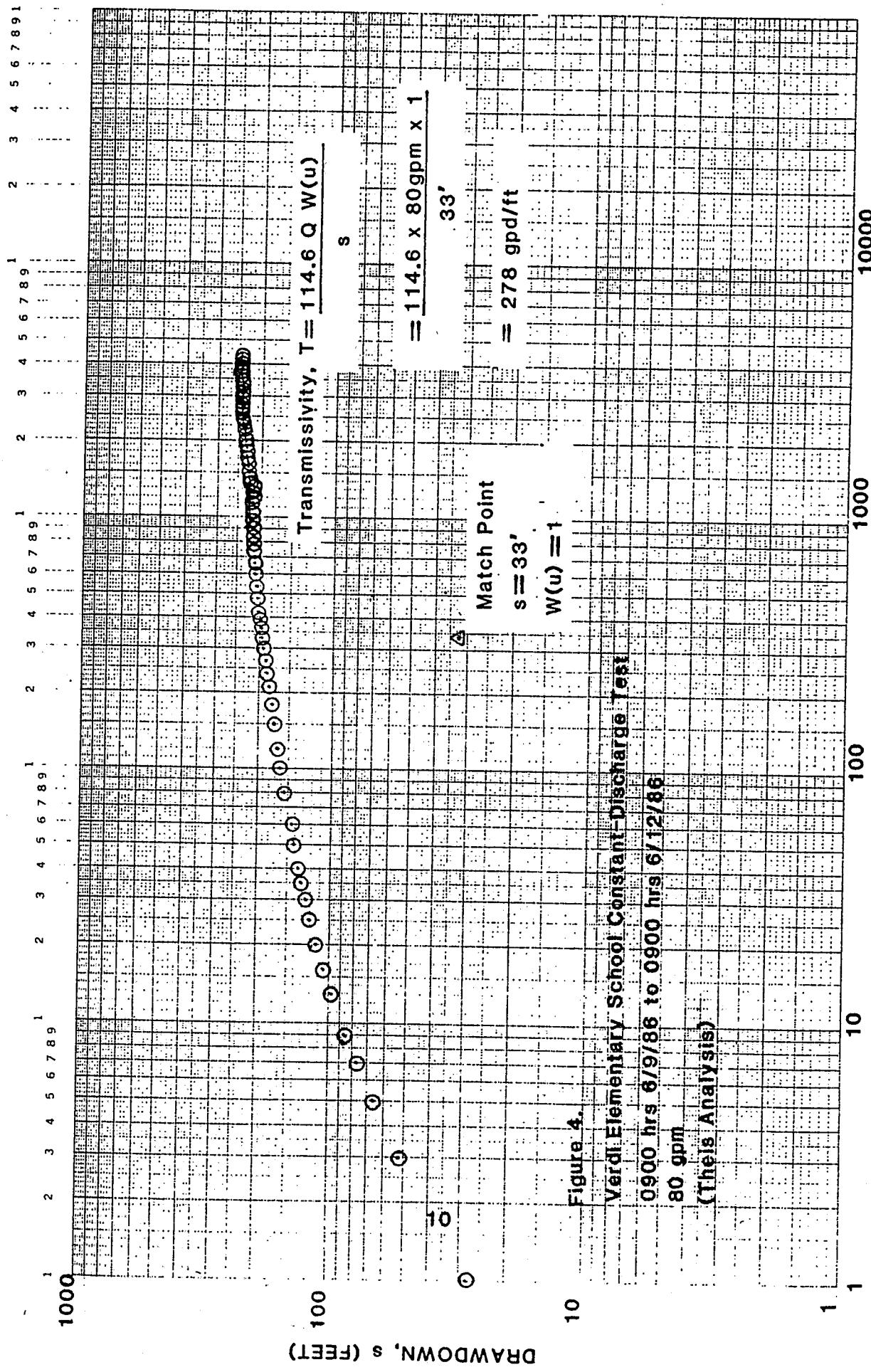
Static water level prior to testing was 46.9 feet below M.P. Testing commenced at 0900 hrs 6/9/86. Discharge for the duration of the test was held constant at 80 gpm. Pumping was terminated at 0900 hrs 6/12/86. Drawdown at completion of testing was 247.38 feet, a pumping water level of 294.28 feet below M.P. for a specific capacity of 0.32 gpm/ft of drawdown. Water levels recovered 90.0 percent within 13 hours and 94.0 percent within 36 hours.

Drawdown and residual-drawdown data are plotted in Figures 4, 5, 6, and 7. Field data are provided in Appendix D.

4.3 ANALYSIS OF PUMPING TEST DATA

Pumping test data were analyzed to determine the hydraulic characteristics of the aquifer. Transmissivity, the overall ability of the aquifer to transmit ground-water, was calculated utilizing the Theis non-equilibrium equation and the Cooper-Jacob approximation of the Theis equation. The other principal hydraulic characteristic of the aquifer, the coefficient of storage, was not calculated due to the lack of a suitable observation well. Although nearby, the existing well which provides the source of water supply to the school was not used. The principal reasons were:

1. It was in use during testing. Drawdown resulting from pumping the new well would have been masked by drawdown induced by pumping the existing well.
2. Access to the interior of the well bore for measuring water levels was poor.
3. The well lacked a stilling well necessary to protect the water-level sounder from tangling with the submersible



Verdell Elementary School Constant-Discharge Test

0900 hrs 6/9/86 to 0900 hrs 6/12/86

80 gpm

(Theis Analysis)

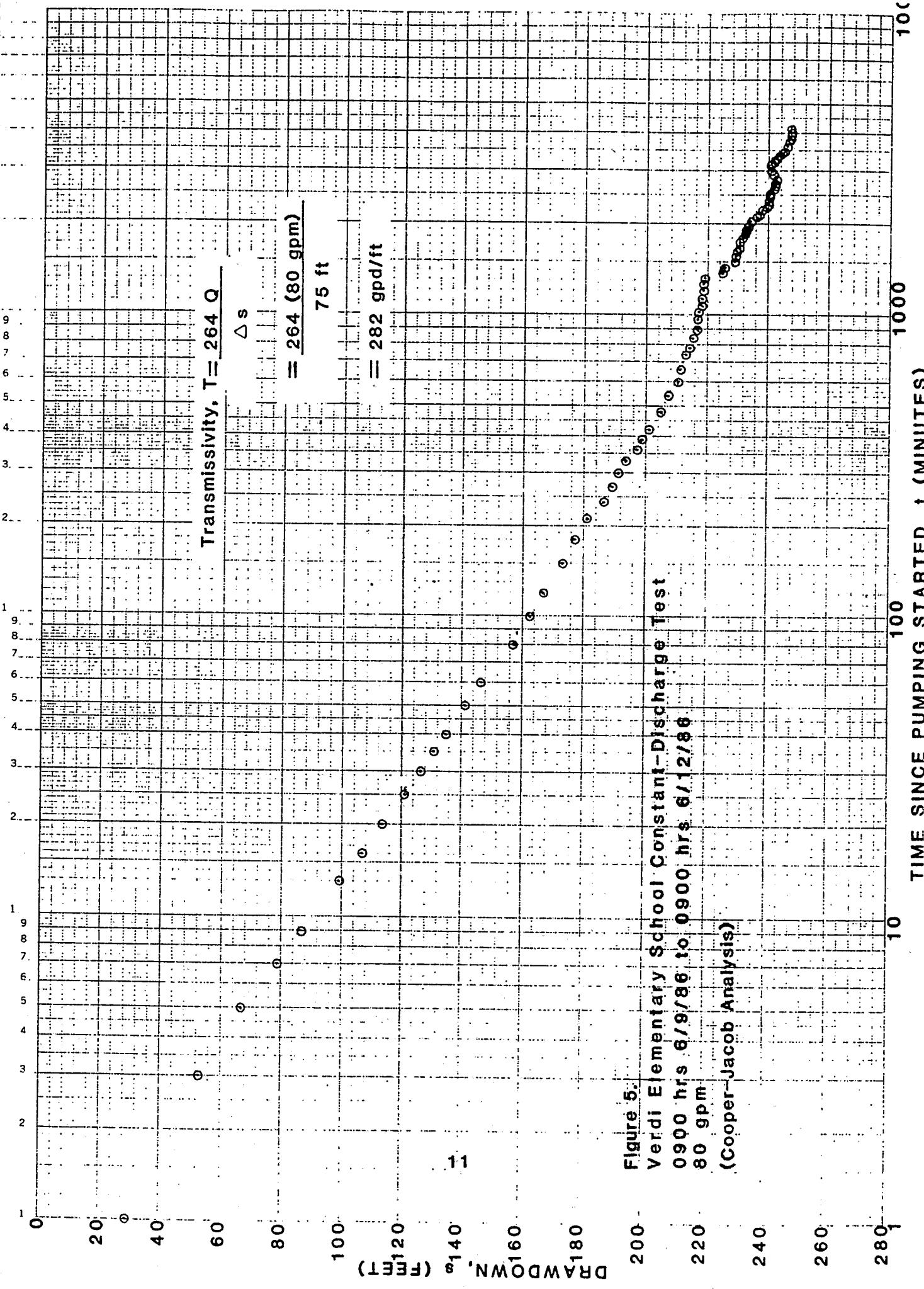


Figure 5:
Verdi Elementary School Constant-Discharge Test
0900 hrs 6/9/86 to 0900 hrs 6/12/86
80 gpm
(Cooper-Jacob Analysis)

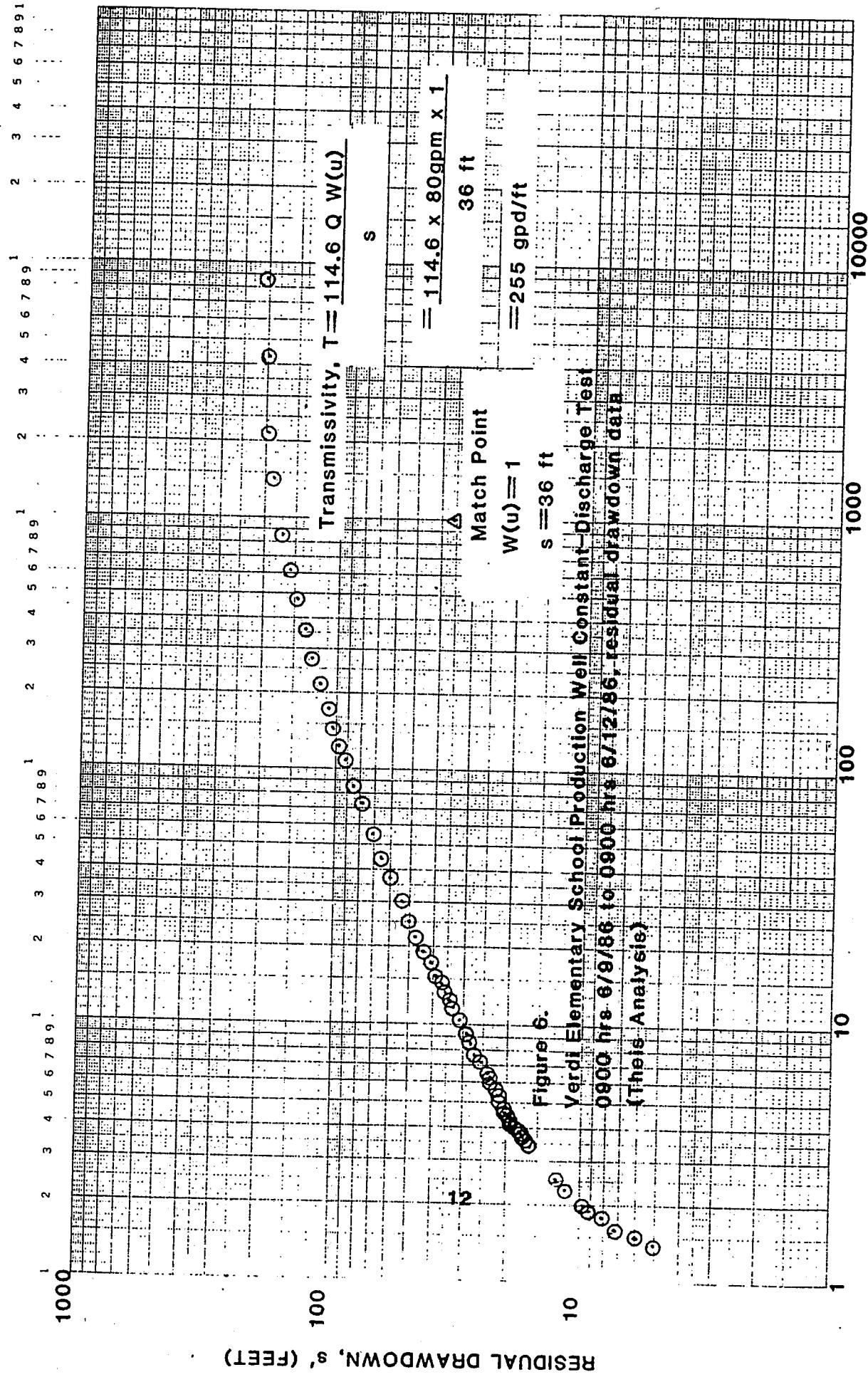


Figure 6.
Verdi Elementary School Production Well Constant Discharge Test
0900 hrs 8/9/86 to 0900 hrs 8/12/86, residual drawdown data
(Theis Analysis)

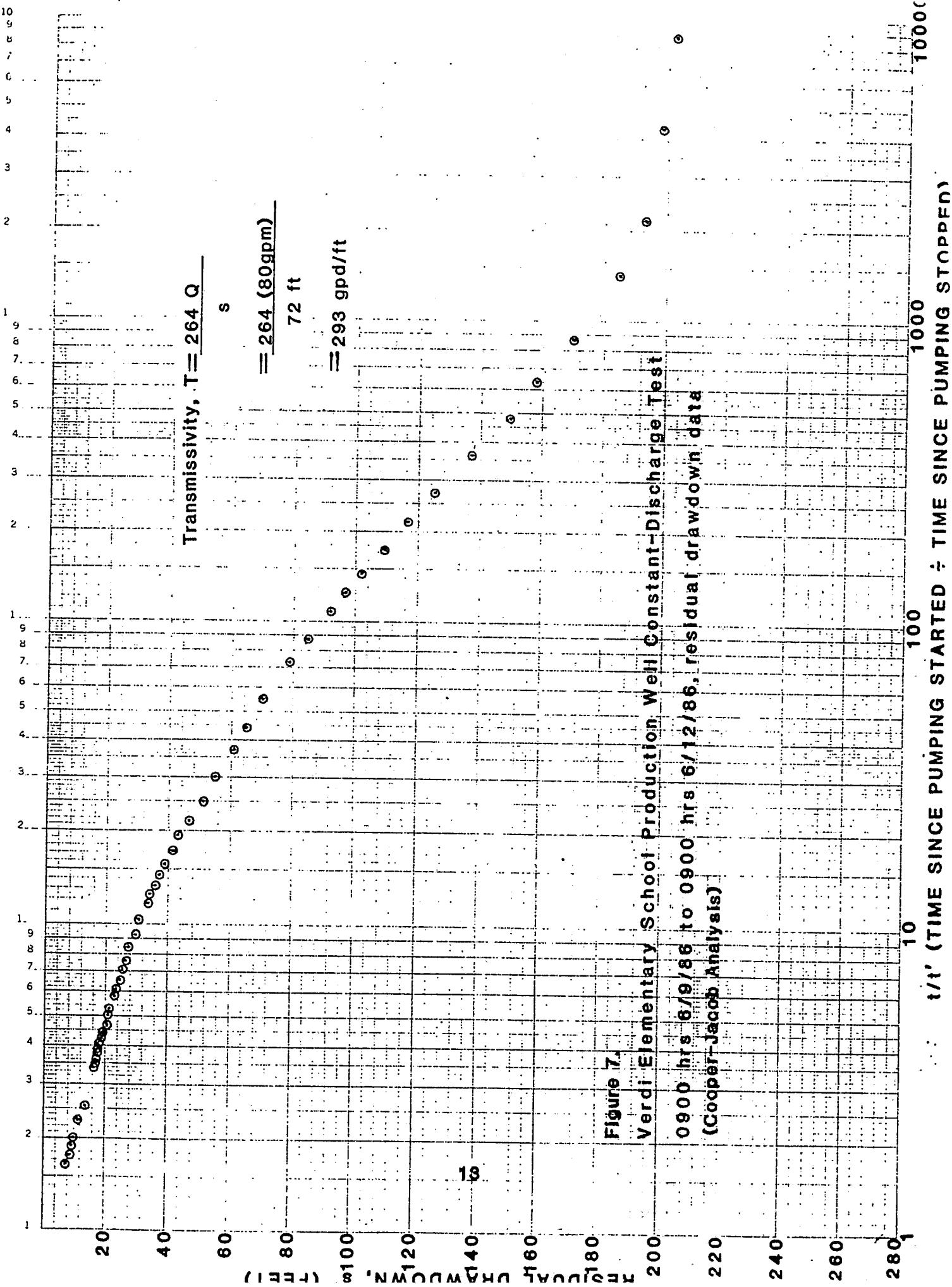


Figure 7.
Verdi Elementary School Production Well Constant-Discharge Test
0900 hrs 6/19/86 to 0900 hrs 6/12/86, residual drawdown data
(Cooper-Jacob Analysis)

electric cable.

The Theis equation depicts radial flow to a well in a homogeneous, isotropic aquifer. While these conditions typically do not exist in nature, particularly in a fractured-rock aquifer, they are approximated closely enough to fulfill the assumptions of the equation. The analysis methodology was applied to early-time drawdown and residual-drawdown (a.k.a. recovery) data (Figures 4, 5, 6, and 7). Results are summarized below in Table 1.

Table 1. Transmissivity values calculated from the Verdi School well pumping test data.

Method	Data	Transmissivity (GPD/ft)
Theis	drawdown	278
Cooper-Jacob	drawdown	282
Theis	residual-drawdown	255
Cooper-Jacob	residual-drawdown	293
	Average	277

The similarity of the values calculated from the four separate analyses suggests that the value for transmissivity is probably representative of the aquifer in the vicinity of the Verdi School well. This value for transmissivity of the geologic materials comprising the aquifer (fractured basaltic lava flows) may be regarded as low, but sufficient to meet the irrigation water-supply demand of the school grounds and playing fields.

Examination of the test data plots (Figures 3, through 6) show a departure from the Theis equation. The reduction in slope may be attributable to a variety of causes. Among them are:

1. interception of a recharge boundary such as the Truckee River by the drawdown cone of depression of the well,
2. vertical leakage from overlying or underlying water-producing horizons,
3. variations in the thickness of the aquifer, or
4. a range of responses peculiar to well hydraulics of fractured-rock aquifers.

However, it is difficult to differentiate among these various causes without data from multiple observation wells. While

) defining the hydraulics of an aquifer serves to clearly define
the long-term yield of a well, the cost of constructing the
observation wells necessary in this instance is not warranted.
The demand which will be placed on the well under normal use is
small; few, if any, nearby users tap the same water-bearing
horizon; and the data are sufficiently precise to yield a
conservative or worst-case interpretation of well performance.

5.0 YIELD RATING OF THE WELL

5.1 WELL YIELD

The anticipated irrigation water-supply demand placed on the well is estimated at approximately 30 gpm for three hours per day (reference: personal communication with Dale Doerr, OMNI-MEANS, LTD.) Figure 8 illustrates the anticipated drawdown in the well for continuous, non-stop pumping at 30 gpm. The analysis assumes no recharge. Moreover, the value of transmissivity calculated from early-time data is probably conservative. The analysis, therefore, represents a worst-case condition which will likely not occur. For the pumping schedule of 30 gpm for three hours pumping followed by 21 hours of recovery each day, actual drawdown in the well will more closely resemble the solid-line portion of the line depicted in Figure 8.

For the pumping schedule described above the well is capable of yielding as much as 80 gpm. Consequently, the well will meet water supply requirements beyond the immediate future needs of the school.

5.2 PUMP DESIGN CRITERIA

Because the transmissivity of the aquifer tapped by the well is moderately low, the lift experienced by a pump will be time-dependent and will increase with time. Assuming that the static water level will be approximately 45 feet below land surface, the minimum allowable pressure at the well head is 50 psi, the pump is set at a depth of 300 feet below land surface, pump column is two inches in diameter, the Total Dynamic Head which must be overcome by the pump will vary between

$$45 \text{ ft} + (50 \text{ psi} \times 2.31 \text{ ft/psi}) + (1.88 \text{ ft/100 ft} \times 300 \text{ ft}) = \\ 166 \text{ feet}$$

immediately upon startup and

$$110 \text{ ft} + (50 \text{ psi} \times 2.31 \text{ ft/psi}) + (1.88 \text{ ft/100 ft} \times 300 \text{ feet}) = \\ 231 \text{ feet}$$

after three hours of pumping.

The simplest way to overcome this design difficulty is to allow the pump to develop higher pressure early in the pumping cycle which will taper off as the pumping lift increases. However, the initial pressure upon start-up must not exceed 70 psi (Doerr, ibid.)

SEMILOGARITHMIC 46 6463
7 CYCLES X 60 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.

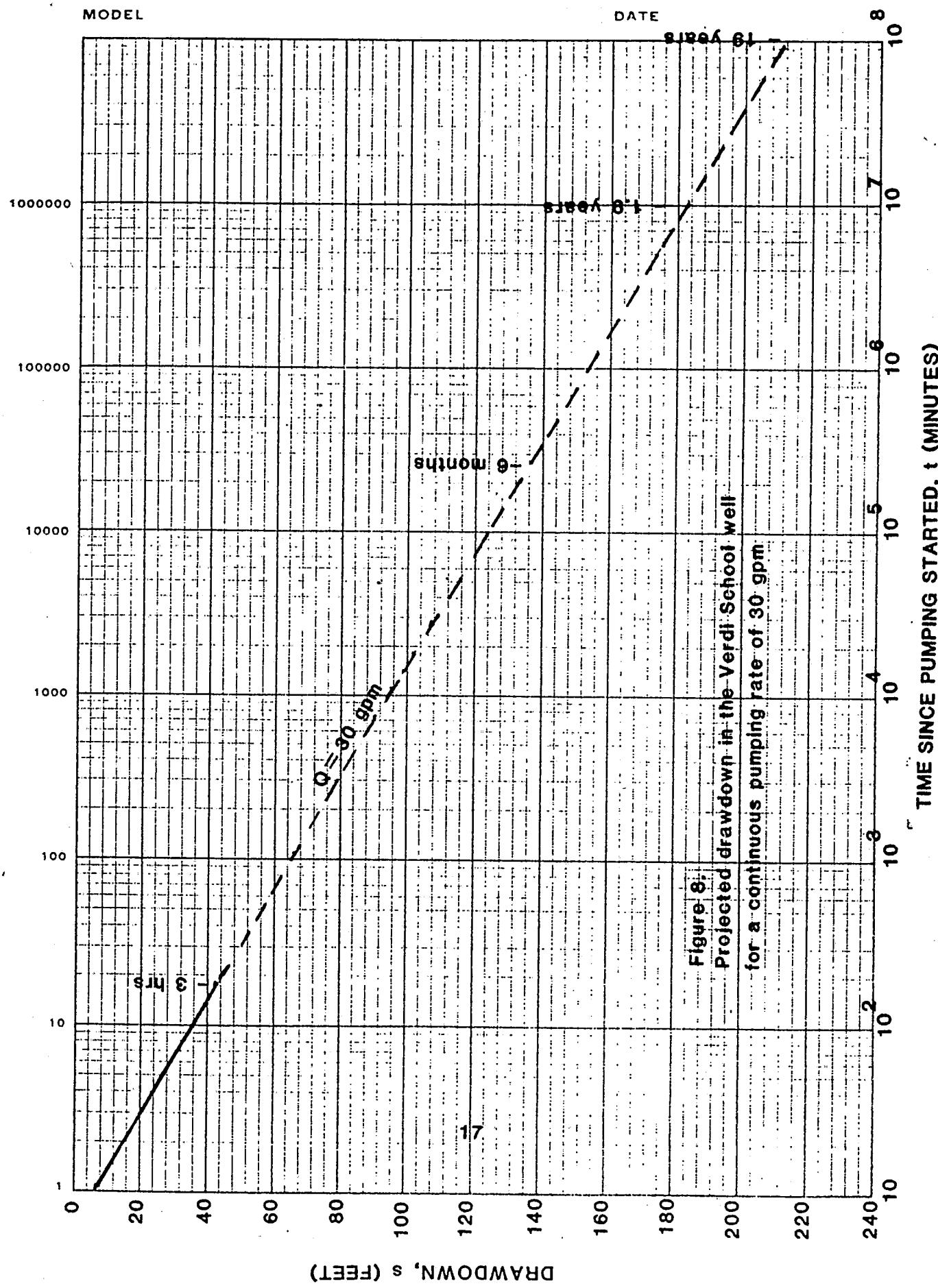


Figure 8:
Projected drawdown in the Verd School well
for a continuous pumping rate of 30 gpm

The recommended design criteria to meet the immediate water-supply requirements of the project are as follows:

1. 30 gpm from a lift of 110 feet and 50 psi at the well head (TDH = 230 feet).
2. Pump setting is 200 feet below land surface.
3. Drop pipe diameter is two inches.
4. Pump is equipped with a 230 volt three phase electric motor.
5. Installation includes a totalizing flow meter.
6. System pressure must be held to a maximum of 70 psi at the well head either by a pressure-relief valve or by pump design.

Pumps which meet the system requirements are readily available. An example of such a pump is a four-inch diameter, 11 stage, 3HP Goulds Model UTS30 which will discharge 30 gpm at a TDH of 231 feet and 36 gpm at a TDH of 220 feet (assuming 70 psi immediately upon startup). Note that this is not an endorsement of the Goulds product, but simply an example of a shelf-item pump that is readily available. Pumps from a variety of manufacturers may meet the same criteria.

An alternative to the criteria above is to overdesign the pump to account for any future increase in the water-supply demand of the project over and above the immediate needs. A pump capable of a discharge of 40 gpm could be equipped with a pressure regulating valve and set at a depth of 300 feet.

6.0 CHEMICAL QUALITY

A water sample for chemical analysis was collected at the end of the constant-discharge test. Results of the analysis are given in Table 2.

Table 2. Water quality data, Verdi Elementary School well.

	Sample	Drinking Water Standard
Date	6/12/86	
Time	0900	
pH (field)	7.7	
(lab)	8.9	6.5-8.5 ²
E.C. (field)	340 mho/cm	
Temperature (°C)	17.8	
TDS	218	500 ²
Hardness (as CaCO ₃)	10	
Ca	2.9	
Mg	0.7	125 ²
Na	78	
K	1.0	
Fe	0.04	0.3 ²
Mn	<0.02	0.05 ²
HCO ₃ alkalinity	144	
CO ₃ alkalinity	24	
Cl	5	250 ²
SO ₄	12	250 ²
NO ₃	0.1	45 ¹
F	0.5	1.4-2.4 ¹
P	0.16	
As	0.008	0.05 ¹
Ba	<0.4	1.0 ¹
B	0.2	
Cd	<0.01	0.01 ¹
Cr	<0.02	0.05 ¹
Cu	0.11	1.0 ²
Pb	<0.05	0.05 ¹
Hg	<0.0005	0.002 ¹
Se	<0.005	0.01 ¹
Ag	<0.01	0.5 ¹
Zn	<0.01	5.0 ²
SiO ₂	24	

1. USEPA Primary Drinking Water Standard
 2. State of Nevada Secondary Standard

The overall quality of the ground water derived from the well is excellent with the exception of a slightly elevated pH. This is not a health hazard although it could cause scaling in hot water heaters or boilers. To reduce the potential for scaling in domestic hot water heaters, the pH may be reduced by the addition of a small amount of chlorine with a drip chlorinator. Use in hot-water heating may require additional treatment.

The salinity hazard is low. Sodium Adsorption Ratio (SAR) is 12.3. Sodium (alkali) hazard is medium (Wilcox, 1955). Consequently, the water appears to be suitable for irrigation purposes.

7.0 SOURCES OF INFORMATION

, 1966. Ground Water and Wells: Johnson Division,
U.O.P., Inc.

Bruin, J. and Hudson, H.E., Jr., 1961. Selected Methods for
Pumping Test Analysis: Illinois State Water Survey Report
No. 25.

Lohman, S. W., 1972. Ground-water Hydraulics: U.S.G.S. Professional Paper 708, 72 pp.

Wilcox, L.V., 1955. Classification and use of irrigation water:
U.S. Dept. of Agr. Cir. No. 969, 19 pp.

APPENDIX A
CONTRACT SPECIFICATION AND COST MODIFICATIONS

WILLIAM E. NORK, Inc.

The original contract (No. 86-12) issued by the Washoe County School District required several work order changes and cost adjustments. These changes are summarized below. Specific explanations for each individual work order change are given in order of their occurrence.

Modifications to Contract 86-12

Schedule	Item(s)	Unit Price	Total Price	Cost Differential
A	2&3	35.00/ft.	2380.00	+ 1330.00
A	4	30.00/ft.	16020.00	+ 4920.00
A	5	11.00/ft.	5742.00	+ 1892.00
A	6	14.00/ft.	1120.00	- 840.00
A	8	58.00/yd.	406.00	+ 116.00
B	2	L.S.	1200.00	+ 420.00
B	3	40.00/hr.	4720.00	- 560.00
B	4	65.00/hr.	487.50	+ 487.50
B	7	80.00/hr.	1400.00	+ 1400.00
other	generator	162.00/day		+ 162.00
	gravel fill pipe		173.65	+ 173.65
	steel shoe		68.00	+ 68.00
Total			9569.15	

1. Schedule A, Items 2 & 3

The original contract called for a nominal 14-inch diameter borehole and 12-inch casing from 1 foot above land surface to 30 feet below the surface. Due to the geologic materials encountered (sands, silts, clays, and gravels), it was necessary to extend this design to a depth of 68.0 feet. The additional 38.0 feet of 14-inch borehole and 12-inch casing at the unit price of \$35.00 per foot increased the cost of these items by \$1330.00. This brings the total cost for this item to \$2380.00

2. Schedule A, Item 4

The contract design in this case called for a nominal 12-inch diameter borehole from a depth of 30 feet to a depth of 400 feet. Due to the extension of the nominal 14-inch diameter borehole to 68.0 feet, the 12-inch diameter borehole was not initiated until this depth. This diameter borehole was extended to 602 feet, an addition of 202 feet of depth, however the increase in item 4 will includes only 164 feet at the unit cost of \$30.00 per foot. This increase amounts to \$4920.00. The overall depth of the well was extended by 202 feet to 602



WILLIAM E. NORK, Inc.

feet initially because no ground-water had been encountered until a depth of 555 feet, and finally to allow penetration of a sufficient thickness of the aquifer.

3. Schedule A, Item 5

Specifications in the original contract required 261 feet of blank casing at a unit price of \$11.00 per foot. Since the aquifer was considerably deeper than expected, an additional 261 feet of casing was installed. This increase amounts to \$1892.00. The total price for Item 5 becomes \$5742.00.

4. Schedule A, Item 6

Item 6 initially called for 140 feet of triple perforated casing at a unit cost of \$14.00 per foot. This amount was not warranted since only 55 feet of aquifer was penetrated. 80 feet of perforated casing was used for an overall price of \$1120.00, a savings of \$840.00.

5. Schedule A, Item 8

Installation of 5 cubic yards of gravel at \$58.00 per cubic yard was increased to 7 cubic yards due to the additional 200 feet of borehole. This amounts to an increase of \$116.00. Total cost for formation stabilization is \$406.00

6. Schedule B, Item 2

Installation of a test pump to a depth of 260 feet was increased to a depth of 410 feet since the transmissivity of the aquifer was less than expected. The resultant cost was \$420.00

7. Schedule B, Items 3 & 4

Due to the fact that the step-drawdown test ran for a total of 8 pumping and 2 recovery hours, this item decreased in cost by \$560.00. The additional 7 1/2 hour constant-discharge test however, increased by \$487.50. This results in an overall savings of \$72.50.

8. Schedule B, Item 7

Before drilling began, the well site itself was moved approximately 80 feet east to allow room for a proposed soccer/playing field. Since rig and crew were ready to begin drilling operations at this time, an \$80.00 per hour charge was incurred for a period of 4.5 hours during the

move. On Sunday June 8, a standby charge rate of \$0.00 per hour was allowed for 13 hours due to the fact that the pump had to be lowered to a depth of 410 feet and pumping could not resume until June 9th. This cost amounts to \$1400.00

9. Miscellaneous

A generator-rental fee of \$162.00 for one additional day was charged because of the necessity of lowering the pump and subsequent recovery time needed before re-initiation of the constant-discharge test.

A gravel-fill pipe was required by Washoe County. A total of 115 feet of 2-inch diameter galvanized pipe was installed at a cost of \$173.65.

A steel drive shoe was installed at the bottom of the casing string at a cost of \$68.00

Total miscellaneous costs \$403.65.

CHANGE ORDER #1

PROJECT: VERDI ELEMENTARY SCHOOL WELL

TO CONTRACTOR: Paul Williams & Sons Well Drilling
22 South Patterson Place
Sparks, NV 89431

CONTRACT FOR: 86-12

CONTRACT DATE: May 14, 1986

You are directed to make the following changes in this Contract:

Increase well depth from 400 feet to 600 feet (only
a minimal, insufficient amount of water found at
400 feet) as per the bid unit prices.

ADD \$8,019.65

The original Contract Sum was.....\$ 24,845.00
 Net Change by previous Change Orders.....\$ -0-
 The Contract Sum prior to this Change Order was.....\$ 24,845.00
 The Contract Sum will be (increased) (decreased) (unchanged) by this Change Order...\$ 8,019.65
 The new Contract Sum including this Change Order will be.....\$ 30,864.65
 The Contract Time will be (increased) (decreased) (unchanged) by..... Days
 The Date of Completion as of the date of this Change Order therefore is

William E. Nork, Inc.	Paul Williams & Sons Well Dril.	Washoe County School Distric
Architect	Contractor	Owner

1026 West First Street	22 South Patterson Place	425 East Ninth Street
Address	Address	Address

Reno, Nevada 89503	Sparks, Nevada 89431	Reno, Nevada 89520
--------------------	----------------------	--------------------

By William S Nork	By Paul Williams	By Dale Sanderson
Date 7-1-86	Date 7-3-86	Date 6/30/86

Date of Issuance June 30, 1986

Change Order Number

CHANGE ORDER #2

PROJECT: VERDI ELEMENTARY SCHOOL WELL

TO CONTRACTOR: Paul Williams & Sons's Well Drilling
22 South Patterson Place
Sparks, Nevada 89431

CONTRACT FOR: 86-12

CONTRACT DATE: May 14, 1986

You are directed to make the following changes in this Contract:

Net change in pumping and testing (Schedule B)
due to increase in well depth and associated
standby charges.

ADD \$1,549.50

The original Contract Sum was.....\$ 24,845.00
 Net Change by previous Change Orders.....\$ 8,019.65
 The Contract Sum prior to this Change Order was.....\$ 32,864.65
 The Contract Sum will be (increased)(decreased)(unchanged) by this Change Order....\$ 1,549.50
 The new Contract Sum including this Change Order will be.....\$ 34,414.15
 The Contract Time will be (increased)(decreased)(unchanged) by..... Days
 The Date of Completion as of the date of this Change Order therefore is

William E. Nork, Inc.
Architect

1026 West First Street
Address

Reno, Nevada 89503

By William E. Nork
Date 7-1-86

Date of Issuance June 30, 1986

Paul Williams & Son's Well Dril. Washoe County School District
Contractor Owner

22 South Patterson Place
Address

Sparks, Nevada 89431

By Paul Williams
Date 7-3-86

425 East Ninth Street
Address

Reno, Nevada 89520

By Dale Henderson
Date 7/1/86

Change Order Number

WILLIAM E. NORK, Inc.

APPENDIX B
DRILLER'S REPORT

WILLIAM E. NORK, Inc.

Driller
Driller's License No.
Contractor's License No.

00668 upman tanner

DAILY DRILLING REPORT

RIG NO.

CLIENT *Kendall County School Area* DATE *5-7-65*

WATER TRUCK

WATER-TRUCK *17 K-11*

PICKUP

DRILLER *T. E. Hill*

HELPER

Hrs. HELPER

ARRIVED

Hrs. ARRIVED

Departed

From Town *17 K-11* at Field *17 K-11*

Departed

from Field *17 K-11* at Town

Total Rig Hours

Total Drive Hours

Down Time

Other Time

Rig Hours

Time

HOLE NO.

DEPTH

REMARKS

Type

Size

Condition

BITS USED

After Use

MATERIALS USED

REASON FOR DOWN TIME

*Sent rig operator to clean
drill pipe, then return to place*

EQUIPMENT USED ON HIGHWAY

UNIT NO.

MILES

STATE

TOTAL FOOTAGE

OTHER REMARKS

*Plated drill with rock to ream
site, truck driver leaving
tow truck down on highway
ready to serve as
resupply, to service road
3 1/2 hr. standing time
Supervisor *T. E. Hill**

WILLIAM E. NORK, Inc.

Driller Driller's License No.
Contractor's License No.

DAILY DRILLING REPORT

FIG NO.

WATER TRUCK

HELPER

Departed
En route

Total

King Hours . . .

Hrs. 8/2

KNOCK...

卷之三

... Hrs.

HELPER ..

DRILLER *Kinder*

1
1
ld

Arrived
at Town

4'50

Down Time -----

Other Times

HOLE NO.	DEPTH	DATA SHEET
-	-	-

卷之三

ANTS USE

100

WILLIAM E. NORK, Inc.

HOLE NO.	From		REMARKS		BITS USED		After Use
	To				Type	Size	
34	0	34	drilled 12 1/2' hole				
34	70		drilled 12 1/4' hole, sawn installed 3.5 ft. of 12 3/4" side reamed 1 3/4" hole from 34 ft to 6.5 ft. resawed 3.5 ft of 12 3/4"				
			need more 12 3/4' shot down 4:30				
			20 ft total drilled today				
EQUIPMENT USED ON HIGHWAY							
UNIT NO.	MILES	STATE	TOTAL FOOTAGE	OTHER REMARKS	REASON FOR DOWN TIME		
					In evening my to see Section		

Driller Driller's License No.
Contractor's License No.

DAILY DRILLING REPORT

RIG NO.-

WATER TRUCK

HELPER

From Town ...

Total Rig Hours.....

HOLE NO.

卷之三

100

GOVERNMENT IN

UNIT NO.

卷之三

卷之三

110

100

三

WATER TRUCK	✓	WATER TRUCK	✓	PICKUP	✓	DRILLER	<i>Per</i>		
HELPER	<i>George</i>	Hrs.	<input type="text"/>	HELPER	Hrs.	<input type="text"/>	HELPER	Hrs.	<input type="text"/>
Departed				Arrived			Arrived		
From Town	7:00	at Field	10:30	Departed			Departed		
Total		Total		from Field			from Field		
Rig Hours	5	Drive Hours		Down			At Town		
				Time			Other		
				Time			Time		

HOLE NO.	DEPTH		REMARKS	Type	Size	BITS USED	
	From	To				Condition	After Use
1	70	150	Sandy clay w/ some sand & gravelly at bottom	B.B.	$1\frac{1}{4}$ "	Good	O.K.
			12 sec. c. 12 $\frac{1}{4}$ " bit				
			Sandstone formation				

REASON FOR DOWN TIME
Traveling to Laredo, TX, conductor from 8:00 AM to 10:30 AM arrived at 11:45 AM, 11:45 to 3:10 returning to Laredo 3:10 to 4:50

EQUIPMENT USED ON HIGHWAY			TOTAL FOOTAGE	OTHER REMARKS
UNIT NO.	MILES	STATE		
			Bricklaying 12 1/4 " thick from 20 to 30 ft.	

80 gsf.

Supervision

WILLIAM E. NORK, Inc.

Miller Miller's License No.
Instructor's License No.

DAILY DRILLING REPORT

RIG NO. 4 CLIENT Veski School AREA Verde DATE 5-23-86
 WATER TRUCK ✓ WATER TRUCK ✓ PICKUP ✓ DRILLER Paul Williams
 HELPER Dongle Hrs. 2 1/2 HELPER _____ Hrs. HELPER
 Departed From Town S. 00 Arrived at Field 08.30 Departed from Field 11.00 Arrived at Town 1.30
 Total Rig Hours 4 1/2 Total Down Time Other Time
 Drive Hours 1 Down Time

WILLIAM E. NORK, Inc.

Driller Driller's License No.
Contractor's License No.

DAILY DRILLING REPORT

RIG NO. 4 CLIENT Verdell School AREA Verdell DATE 5-24-86

WATER TRUCK	✓	WATER TRUCK	✓	PICKUP	✓	DRILLER	<i>Prey & George</i>
HELPER	<i>Karage</i>	HELPER	Hrs. <input type="text" value="8"/>	HELPER	Hrs. <input type="text"/>	HELPER	Hrs. <input type="text"/>
Departed		Arrived		Departed		Arrived	
From Town	<i>S. I.O.A.M.</i>	at Field	<i>2:45 AM</i>	from Field	<i>3:00 PM</i>	at Town	<i>3:30 PM</i>
Total		Total		Total		Total	
Rig Hours	<i>8</i>	Drive Hours	<i>1</i>	Down Time	<i>N/A</i>	Other Time	

WILLIAM E. NORK, Inc.

APPENDIX C
CONSTRUCTION SUMMARY

WILLIAM E. NORK, Inc.

APPENDIX D
FIELD DATA SHEETS

WILLIAM E. NORK, Inc.

LOG OF BOREHOLE

BOREHOLE _____

PAGE 1 of 4

Elementary School
Verdi
LOGGED BY JKG

PROJECT 86-402

LOC. or COORDS.	DRILLER P. Williams					START	FINISH
GROUND ELEV.						DATE 5-21-86	
TOTAL DEPTH						TIME 9:25 AM	
BOREHOLE DIAM. (17.5", 0'-30')						GEOPHYS LOG YES X NO	
HOW LEFT							
DEPTH	PENE-TRATE	CIRC. RET. LOSS (gpm)	A-LIFT	MATERIAL	SYM-BOL	DESCRIPTION AND COMMENTS	
0	18 hr			ALLUVIUM GLACIAL OUTWASH	0.0 5.0 5.0	POORLY SORTED SANDS, CLAY, & BOULDERS GLACIAL OUTWASH	
5				BOULDERS POORLY SORTED SANDS	0.0 0.0	1	
10							
15				SANDS, CLAYS, fine	0.0	@ 12' OUT OF BOULDERS.	
20	50 hr					Well sorted sands, clay seams	
25				GRAVELS	---	SNAIL FARM 25' TO 30' END OF 17.5" HOLE	
30				SHALE	---		
35						SAMPLE TAKEN @ 40' GRAVEL / bed	
40				GRAVEL	---		
50	RD 1 CASE			GRAVEL	---	GRAVEL IS MEDIUM TO FINE GRAINED, ANGULAR TO WELL ROUNDED UP TO 1CM.	
60					0.0	2ND GRAVEL BED	
70						SANDS, CLAYS, SOME BITS OF SHALE	
80				SANDS & SILTS / CLAYS		THICKER FM. GRAVELS ALONG WITH FINE SANDS & SILTS STANFORD, USING 12 1/2" BIT	
90						SANDY, SILTY FINE WITH GREEN CLAY SEAMS INTER. SPERSED	
100	50 hr			SANDS, SILTS & CLAYS		MEDIUM TO FINE GRAINED SAND, SILT AND GREENISH CLAYS	
110						MEDIUM SANDS, SILTS AND GREENISH CLAYS - MORE SILTS THAN CLAY HERE.	
120				SANDS SILTS / CLAYS		MEDIUM TO FINE SANDS, SILTS AND GREENISH CLAYS - NO CHANGE IN LITHOLOGY	
130						11	
140					" "	11	
150					" "	11	
160							
170				SANDS SILTS & CLAYS		medium to fine ground sands, silts & some shale chips	
180						SANDS CHIPS	

WILLIAM E. NORK, Inc.

LOG OF BOREHOLE

BOREHOLE

PAGE 2 of 4

PROJECT 86-402	LOC. or COORDS.		DRILLER P.W. NORK		START	FINISH
	GROUND ELEV.				DATE 5-23-86	
	TOTAL DEPTH		RIG #4 SPEEDSTAR, STAR 150K		TIME 10 30 AM	
	BOREHOLE DIAM.		BIT(S) 17.5" TRICON, 12 1/4" TRICON		GEOPHYS LOG YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	
			FLUID 4:1:2, MIST		HOT LEFT	
	DEPTH	PENE-TRATE	CIRC. A-LIFT RET LOSSO (gpm)	MATERIAL	SYMBOL	DESCRIPTION AND COMMENTS
	190	50'/hr		SAND, SILT CLAYS, shale		Shale bits, sands, silts, greenish clays.
	200					Same
	210			Shale, coe. SANDS, SILTS, Greenish clays		
	220					1ST EVIDENCE OF GROUNDWATER, 8-10 gpm @ ABOUT 225' Depth.
LOCATION LOGGED BY Vernon T. K. G.	230	↓		SANDS, SILTS, CLAYS LIGNITE		1ST EVIDENCE OF Lignite stringer
	240	50'/hr				
	250			SANDS, SILTS LIGNITE CLAYS, shale		Medium to fine sands, silty bits of shale
	260					
	270			SANDS, SILTS, clays		Medium to fine grained sands, silts, greenish clay some lignite particles still surfacing
	280	↓				
	290					
	300	60'/hr		Sands, SILTS, CLAYS		NO continued evidence of lignite
	310					
	320					
	330			SANDS, SILTS, CLAYS, LIGNITE		LAST evidence of clays, last stringer of lignite.
	340	↓				
	350	50'/hr		VOLCANIC BASALT		Hitting distinguishably harder material, VOLCANIC BASALT
	360					VOLCANIC BASALT, POSSIBLY ANDES, DRK GREEN TO BLACK
	370	↓		VOLCANIC BASALT		

WILLIAM E. NORK, Inc.

LOC. or COORDS.	DRILLER	P. Williams	START	FINISH	
GROUND ELEV.			DATE	5-24-86	
TOTAL DEPTH	RIG		TIME		
BOREHOLE DIAM.	BIT(S)		GEOPHYS LOG	YES NO	
	FLUID		HOW LEFT		
DEPTH	PENE- TRATE RET. LOSS (gpm)	CIRC. A-LIFT LOSS (gpm)	MATERIAL	SYMBOL	DESCRIPTION AND COMMENTS
380	50'/hr		VOLC BASALT		Volcanic BASALT
390				"	
400				"	
410			VOLC BASALT		material seems to be slightly harder here
420	50'/hr				
430					
440					
450			VOLCANIC BASALT		POSSIBLE INCREASE IN WATER, NOT ENOUGH TO VISUALIZE, SAME MATERIAL
460	50'/hr				VOLCANIC BASALT shows very little evidence of fracturing at this point
470					
480			VOLCANIC BASALT		no change
490					
500					
510					
520			VOLCANIC BASALT		NO CHANGE - DARK GREEN TO BLACK NO VISIBLE INDICATIONS OF FRACTURING
530					
540	50'/hr				
550			VOLCANIC BASALT		HIT WATER, UP TO 60 gpm. DRILLING RIG INDICATING FRACTURING MAY BE UNUSUAL
560			VOLCANIC BASALT		

Verne

LOCATION
LOGGED BY

PROJECT
86-402

Reno, Nevada 89503

WILLIAM E. NORK, Inc.

LOG OF BOREHOLE

BOREHOLE

PAGE 4 of 4

WILLIAM E. NORK, Inc.

PUMPING TEST DATA

WELL NO. 25-442

TYPE OF PUMPING TEST STATIONARY TESTPUMPING RECOVERY DATAM.P. FOR WATER LEVELS TOP OF STANDING

DISTANCE FROM PUMPING WELL

LOCATION VENUE SCHOOL
PUMPING/OBSERVATION WELL
~~OTHER OBSERVATION WELL(S)~~ none
PUMP ON: DATE 6-6-86 TIME 7:00 AM
PUMP OFF: DATE _____ TIME _____

CLOCK TIME	ELAPSED TIME (minutes)		t/t'	WATER LEVEL MEASUREMENT (feet)	PUMPING RATE (gpm)		REMARKS
	t	t'			42.04	s or s'	
0720	0			47.44	2		100
0723	3			49.15	56.11	"	only 1st water (1 min) = cloudy
0725	5			116.92	46.88	"	
0727	7			120.65	49.61	"	
0730	10			123.18	51.14	"	
0733	13			127.41	55.37	"	63°F + damp
0736	16			131.67	89.63	"	
0739	19			136.82	92.78	"	
0745	25			142.67	100.63	"	64°F
0750	30			146.82	104.78	"	
0755	35			151.24	108.34	"	
0800	40			152.95	110.91	"	
0805	50			156.96	114.92	"	
0810	60			162.67	120.63	"	64°F CLEAR
0820	80			168.50	126.46	"	
0840	100			171.79	129.77	"	
0900	120			174.51	132.47	"	
0930	150			177.97	135.93	"	
1000	180			180.44	138.40	"	66°F CLEAR
1030	210			184.34	142.30	"	
1100	240			186.42	144.38		
1102	242			194.10	152.06	6.5"	110 upped to 110 gpm @ 1100 hrs
1103	243			195.95	153.91		
1105	245			198.61	156.57		
1107	247			200.60	158.56		
1109	249			202.03	159.99		
1112	252			204.62	162.58		
1115	255			206.95	164.91		
1120	260			210.62	168.58		
1125	265			212.96	170.92		
1130	270			215.44	173.40		65°F CLEAR

PROJECT NO. 86-402

PUMPING TEST DATA

Page 2 of

WELL NO. *Vexdi School*

TYPE OF PUMPING TEST STEP - DRAWDOWN
PUMPING RECOVERY DATA
M.P. FOR WATER LEVELS TOP OF STILLING WELL
DISTANCE FROM PUMPING WELL _____
LOCATION KERDI SCHOOL

PUMPING/OBSERVATION WELL
OTHER OBSERVATION WELL(S)

PUMP ON: DATE 6-6-86 TIME 0700
PUMP OFF: DATE 6-6-86 TIME 1500

Project No. 86-902

PUMPING TEST DATA

Page _____ of _____

WELL NO. Verdi *Explor.*

TYPE OF PUMPING TEST _____
PUMPING / RECOVERY DATA _____
M.P. FOR WATER LEVELS TOP OF STYLING WELL
DISTANCE FROM PUMPING WELL _____
LOCATION Verdi School

PUMPING/OBSERVATION WELL
OTHER OBSERVATION WELL(S)

PUMP ON: DATE _____ TIME _____
PUMP OFF: DATE _____ TIME _____

WELL NO. _____

TYPE OF PUMPING TEST CONSTANT DISCHARGE

PUMPING RECOVERY DATA

M.P. FOR WATER LEVELS TOP OF STILLING WELL

DISTANCE FROM PUMPING WELL

LOCATION Virabi SchoolPUMPING OBSERVATION WELL
OTHER OBSERVATION WELL(S) _____PUMP ON: DATE 6-7-86 TIME 0900
PUMP OFF: DATE TIME

CLOCK TIME	ELAPSED TIME (minutes)		t/t'	WATER LEVEL MEASUREMENT (feet)	PUMPING RATE (gpm)		REMARKS
	t	t'		(s) or s'	JG	Q	
0900	0			46.12			
0901	1			67.46	21.34	182142	80
0903	3			91.91	45.79	182150	"
0905	5			107.78	61.66	182171	"
0907	7			119.84	73.72	182187	"
0910	10			131.00	84.88	182204	"
0915	13			141.41	95.29	182248	"
0916	16			146.60	102.48	182276	"
0920	20			153.86	107.74	182302	"
0925	25			159.81	113.69	182340	"
0930	30			164.03	117.91	182378	"
0940	40			170.79	124.67	182455	"
0950	50			175.51	129.39	182530	"
1000	60			178.81	132.69	182610	"
1020	80			184.28	138.16	182745	"
1040	100			187.72	141.60	182881	"
1100	120			194.00	147.88	183041	"
1130	150			203.09	156.97	183270	"
1200	180			211.84	165.72	183502	"
1230	210			218.28	172.16	183738	"
1300	240			220.86	174.74	183973	"
1330	270			223.04	176.92	184206	"
1400	300			225.38	179.26	184436	"
1430	330			230.75	184.63	184672	"
1500	360			233.76	187.64	184912	"
1530	390			235.06	189.04	185149	"
1600	420			236.77	190.65	185385	"
1630	450			237.70	191.58		
1700	480						Pump OFF 1630
1730	510						
1800	540						

Project No.

PUMPING TEST DATA

Page _____ of _____

WELL NO.

TYPE OF PUMPING TEST _____
PUMPING RECOVERY DATA _____
M.P. FOR WATER LEVELS _____
DISTANCE FROM PUMPING WELL _____
LOCATION _____

PUMPING/OBSERVATION WELL
OTHER OBSERVATION WELL(S)

PUMP ON: DATE _____ TIME _____
PUMP OFF: DATE _____ TIME _____

WELL NO. _____

TYPE OF PUMPING TEST CONSTANT DISCHARGE
 PUMPING/RECOVERY DATA
 M.P. FOR WATER LEVELS TOP OF STILLING WELL
 DISTANCE FROM PUMPING WELL
 LOCATION Verde Elementary School

PUMPING/OBSERVATION WELL
 OTHER OBSERVATION WELL(S) _____

PUMP ON: DATE 6/9/86 TIME 9:07 AM
 PUMP OFF: DATE TIME

CLOCK TIME	ELAPSED TIME (minutes)	t/t'	WATER LEVEL MEASUREMENT (feet)	PUMPING RATE (gpm)	REMARKS
			46.90 (s) or s'	185659 Q	
0900	0		46.90	0	80
0901	1		74.91	28.01	"
0903	3		98.96	52.06 185683	" C/cm 63°F
0905	5		113.35	66.45 185698	"
0907	7		125.38	78.48 185716	"
0909	9		133.57	86.67 185731	"
0913	13		145.95	99.05 185761	"
0916	16		153.24	206.34 185785	" CLEAR 63°F
0920	20		160.25	113.35 185815	"
0925	25		167.23	120.33 185856	"
0930	30		172.96	126.06 185893	"
0935	35		178.22	131.32 185932	"
0940	40		182.17	135.27 185971	"
0950	50		188.24	141.34 186050	" 63°F, C/cm.
1000	60		193.33	146.43 186124	" 35 micromhos (E.C) 23.5 ppm. CLEAR
1020	80		204.08	157.18 186282	" ADJUST FLOW
1040	100		209.44	162.54 186438	"
1100	120		214.01	167.11 186595	" EC 34 micromhos 64°F CLEAR
1130	150		219.75	172.85 186827	"
1200	180		224.00	177.10 187055	" PH 7.75 E.C 35 micromhos 23 ppm, 63°F CLEAR
1230	210		228.71	181.81 187289	"
1300	240		233.46	186.56 187528	" T-66°F, EC 35 micromhos 23 ppm,
1330	270		235.68	188.78 187762	" PH 7.78 EC 33 micromhos 22.5 ppm, T=64°F
1400	300		238.52	191.62 187992	" ADJUST FLOW
1430	330		240.68	193.78 188227	" T 64°F, 34 micromhos
1500	360		243.96	197.06 188463	" T 65°F, 32 micromhos, 7.79 PH
1530	390		246.11	199.21 188697	"
1600	420		248.83	201.93 188933	" T 64°F, CLEAR ADJUST FLOW
1700	480		252.34	205.44 189408	" EC 38 micromhos, T 65°F, PH 7.87 AF.
1800	540		254.64	207.74 189882	" E.C 33 micromhos, T 63°F, PH 7.78 AF
1900	600		257.27	210.37 190406	87 EC = 30 mhos, T=63°F, pH = 7.81

WELL NO.

TYPE OF PUMPING TEST CONSTANT DISCHARGE
PUMPING/RECOVERY DATAM.P. FOR WATER LEVELS TOP OF STANDING WELL
DISTANCE FROM PUMPING WELL
LOCATION VERDI ELEM. SCHOOLPUMPING/OBSERVATION WELL
OTHER OBSERVATION WELL(S)

N/A

PUMP ON: DATE 6-10-86 TIME _____
PUMP OFF: DATE _____ TIME _____

CLOCK TIME	ELAPSED TIME (minutes)	t/t'	WATER LEVEL MEASUREMENT (feet)	PUMPING RATE (gpm)		REMARKS
				46.70	S OR S'	
2000	660		258.80	211.90	190830	71 EC = 355 umohs T = 63°F ADJUSTED FLOW
2100	720		259.95	213.05	1910280	75 EC = 360 umohs T = 63°F pH = 7.72 ADJUSTED FLOW
2200	780		261.17	214.27	191759	70 EC = 355 umohs T = 63°F
2300	840		262.11	215.21	192229	78 EC = 360 umohs T = 64°F pH = 7.69 ADJUSTED FLOW
2400	900		262.93	216.03	192680	75 EC = 385 umohs T = 63°F ADJUSTED FLOW
0110	970		263.71	216.81	193250	81 EC = 370 umohs T = 64°F pH = 7.70
0200	1020		264.15	217.25	193615	73 EC = 390 umohs T = 63°F ADJUSTED FLOW
0300	1080		264.68	217.78	194081	78 EC = 370 umohs T = 63°F pH = 7.73 ADJUSTED FLOW
0400	1140		265.23	218.33	194530	75 EC = 380 umohs T = 62°F ADJUSTED FLOW
0500	1200		265.76	218.86	195006	79 EC = 360 umohs T = 62°F pH = 7.72
0600	1260		266.18	219.28	195481	79 EC = 360 umohs T = 64°F
0700	1320		266.43	219.53	195930	75 EC = 390 umohs T = 64°F pH = 7.73 AF
0800	1380		272.49	225.59	196412	80 EC = 360 umohs T = 64°F ..
0900	1440		272.89	225.99	196892	78 EC = 350 umohs T = 64°F pH = 7.76 AF
1000	1500		276.10	229.10	197365	80 EC = 340 umohs, T = 67°F, pH = 7.68
1100	1560		276.13	229.23	197844	79 EC = 340 umohs, T = 65°F, pH = 7.79
1200	1620		276.32	229.42	198320	79 EC = 330 umohs, T = 66°F, pH = 7.68 AF
1300	1680		277.61	230.71	198779	80 EC = 340 umohs - T = 64°
1400	1740		277.88	230.98	199276	79 EC = 340 umohs, T = 64°F pH = 7.69 AF
1500	1800		278.92	232.02	199754	80 EC = 350 umohs, T = 65°F PLOT EVERY OTHER POINT FROM 1-100 FT,
1600	1860		279.15	232.25	200232	80 EC = 320 umohs, T = 68°F pH = 7.60
1700	1920		279.60	232.70	200720	80
1800	1980		280.54	233.64	201189	80 EC = 320 umohs, T = 65°F pH = 7.72
1900	2040		281.13	234.23	201668	80
2000	2100		283.04	236.14	202147	80 EC = 350 umohs T = 64°F pH = 7.77
2100	2160		283.91	237.01	202620	79 ADJ. FLOW
2200	2220		285.66	238.76	203098	80 EC = 360 umohs T = 65°F pH = 7.73
2300	2280		286.60	239.70	203583	81 ADJ. FLOW
2400	2340		287.21	240.31	204060	80 EC = 360 umohs T = 64°F pH = 7.76
0100	2400		287.47	240.57	204545	81 ADJ. FLOW
0200	2460		287.80	240.90	204023	80 EC = 365 umohs T = 64°F pH = 7.77

WELL NO. _____

TYPE OF PUMPING TEST CONSTANT DISCHARGE
PUMPING/RECOVERY DATA
M.P. FOR WATER LEVELS TYPICALLY TILLING WELL
DISTANCE FROM PUMPING WELL
LOCATION VETTEL ELEMENTARY SCHOOL

PUMPING OBSERVATION WELL
OTHER OBSERVATION WELL(S) _____

PUMP ON: DATE 6-11-86 TIME _____
 PUMP OFF: DATE _____ TIME _____

CLOCK TIME	ELAPSED TIME (minutes)		t/t'	WATER LEVEL MEASUREMENT (feet)		PUMPING RATE (gpm)	REMARKS
	t	t'		46.90	s or s'		
0300	2520			288.24	241.34	204519	83 ADJ FLOW
0400	2590			288.62	241.72	205063	EC = 365 umhos, T = 63°F PH = 7.74 ADJ FLOW
0500	2640			288.90	242.00	205473	82 ADJ FLOW
0600	2700			289.18	242.28	205957	EC = 370 umhos T = 64°F PH = 7.76
0700	2760			289.31	242.41	206443	81
0800	2820			289.08	242.18	206939	EC = 350 umhos T = 64°F PH = 7.79 - ADJUST FLOW -
0900	2880						(TOWN) GAS UP -
1000	2940			288.41	241.51	208899	82 EC = 33 umhos, T = 67°F, PH = 7.63 - ADJUST FLOW (MISSING 10 MIN)
1100	3000			288.18	241.28	209377	80
1200	3060			287.93	241.03	209854	79 EC = 320 umhos, T = 65°F PH = 7.79 - ADJ FLOW -
1300	3120			287.83	240.93	210331	79 ADJ FLOW
1400	3180			287.92	241.02	2108065	79 EC = 310 umhos, T = 66°F, PH = 7.82 - ADJ FLOW -
1500	3240			289.16	242.26	211285	80
1600	3300			290.61	243.71	211766	80 EC = 330 umhos, T = 64°F, PH = 7.73
1700	3360			290.74	244.04	212246	80
1800	3420			291.57	244.67	212728	80 EC = 350 umhos T = 66°F PH = 7.75
1900	3480			291.77	244.87	2132085	80
2000	3540			292.33	245.43	213685	80 EC = 360 umhos T = 66°F PH = 7.73
2100	3600			293.01	246.11	214166	80
2200	3660			292.94	246.04	214646	80 EC = 340 umhos T = 65°F PH = 7.74
2300	3720			293.53	246.65	215127	80
2400	3780			293.74	246.84	215607	80 EC = 360 umhos T = 64°F PH = 7.74
0100	3840			293.98	247.08	216087	80
0200	3920			293.92	247.02	216740	80 EC = 370 umhos T = 64°F PH = 7.73
0300	3960			293.94	247.04	217046	80
0400	4020			294.20	247.30	217536	80 EC = 365 umhos T = 65°F PH = 7.73
0500	4080			294.37	247.47	218069	80
0600	4140			294.51	247.61	218483	80 EC = 350 umhos T = 64°F PH = 7.72
0700	4200			294.59	247.69	218960	80 HEAVY METALS SAMPLES TAKEN AF
0800	4260			294.28	247.38	219445	81 EC = 340 umhos, T = 63°F, PH = 7.76 ADJ. FLOW
0900	4320					219922	80 EC = 340 umhos, T = 64°F, PH = 7.72

WELL NO. _____

TYPE OF PUMPING TEST
PUMPING X RECOVERY DATA
 M.P. FOR WATER LEVELS TO POI STANDING WELL
 DISTANCE FROM PUMPING WELL
 LOCATION Verdi Elementary School

PUMPING / OBSERVATION WELL
 OTHER OBSERVATION WELL(S) _____

PUMP ON: DATE 6-9-86 TIME 0900
 PUMP OFF: DATE 6-12-86 TIME 0900

CLOCK TIME	ELAPSED TIME (minutes)		t/t'	WATER LEVEL MEASUREMENT (feet)		PUMPING RATE (gpm)		REMARKS
	t	t'		46.90	s or (s)		Q	
0800								
0900	4320	0		294.28	247.38			PUMP TURNED OFF @ 0900
0900.30	4320.5	.5	8641	249.85	202.95			18% Recovered
0901	4321	1	4321	245.45	198.55			20% Recovered
0902	4322	2	2161	239.47	192.57			22.2%
0903	4323	3	14411	231.35	184.57			25.4%
0905	4325	5	865	216.88	169.98			31.3%
0907	4327	7	618	205.26	158.36			36%
0909	4329	9	481	196.06	149.16			39.7%
0912	4332	12	361	184.13	137.23			44.5%
0916	4336	16	271	172.54	125.64			49.2%
0920	4340	20	217	163.77	116.87			52.8%
0925	4345	25	173.8	155.29	108.39			56.2%
0930	4350	30	145	148.81	101.91			58.8%
0935	4355	35	124	143.31	96.41			61%
0940	4360	40	109	138.91	92.01			62.8%
0950	4370	50	87	131.65	84.75			65.7%
1000	4380	60	73	126.31	79.41			67.9%
1020	4400	80	55	117.74	70.84			71.4%
1040	4440	100	44	111.86	64.96			73.7%
1100	4460	120	37	107.25	60.35			75.6%
1130	4490	150	30	101.23	54.33			78%
1200	4520	180	25	97.29	50.39			79.6%
1230	4550	210	21.7	93.75	46.85			81.1%
1300	4580	240	19.1	90.84	43.94			82.2%
1330	4610	270	17.1	88.47	41.57			83.2%
1400	4640	300	15.47	86.31	39.41			84%
1450	4700	330	14.24	84.47	37.57			84.8%
1500	4760	360	13.22	82.87	35.97			85.4%
1530	4820	390	12.36	81.49	34.59			86%
1600	4880	420	11.62	80.21	33.31			86.5%
1700	4940	480	10.29	78.19	31.29			87.3%

WELL NO. _____

TYPE OF PUMPING TEST _____

PUMPING/RECOVERY DATA

M.P. FOR WATER LEVELS 13.33 FT. = 1000 GPM

DISTANCE FROM PUMPING WELL

LOCATION 1000 ft. west

PUMPING/OBSERVATION WELL
OTHER OBSERVATION WELL(S) _____

PUMP ON: DATE TIME

PUMP OFF: DATE 6-12-86 TIME 9:00 AM

CLOCK TIME	ELAPSED TIME (minutes)		t/t'	WATER LEVEL MEASUREMENT (feet)		PUMPING RATE (gpm)		REMARKS
	t	t'		46.9	s or s'	Q		
1800	5000	540	9.26	76.34	29.44			88.1% Recovered
1900	5060	600	8.43	74.79	27.89			88.7% Recovered
2000	5120	660	7.76	73.65	26.75			89.2%
2100	5180	720	7.19	72.56	25.66			89.6%
2200	5240	800	6.55	71.57	24.67			90.0%
2300	5300	860	6.16	70.71	23.81			90.4%
2400	5360	920	5.83	69.93	23.03			90.7%
0100	5420	980	5.53	.	.			.
0215	5505	1040	5.29	68.42	21.52			91.3%
0300	5540	1100	5.04	68.06	21.16			91.5%
0415	5600	1175	4.77	67.40	20.50			91.7%
0500	5660	1220	4.64	67.11	20.21			91.8%
0600	5720	1280	4.47	66.59	19.69			92.0%
0700	5780	1340	4.31	66.14	19.24			92.3%
0800	5840	1400	4.17	65.59	18.59			92.4% PLOT every 1/2 hour -
0900	5900	1460	4.04	65.29	18.39			92.6% Recovered
1000	5960	1520	3.92	64.79	17.89			92.8%
1100	6020	1580	3.81	64.49	17.59			92.9%
1200	6080	1640	3.71	64.08	17.18			93.0%
1300	6140	1700	3.61	63.81	16.91			93.2% Recovered
1400	6200	1760	3.52	63.57	16.67			93.3%
1600	6320	1880	3.36	62.99	16.09			93.5%
0830	7310	2870	2.55	59.74	12.84			94.8%
1730	7850	3410	2.30	58.49	11.59			95.3%
1000	8840	4400	2.01	56.76	9.86			96.0%
1730	9290	4850	1.91	56.11	9.21			96.3%
0715	10115	5675	1.78	55.14	8.24			96.7%
0730	11570	7130	1.62	54.08	7.18			97.1%
0730	13010	8570	1.52	52.89	5.99			97.6%
0730	14450	10010	1.44	51.98	5.08			97.9%