SOUTH FLORIDA WATER
MANAGEMENT DISTRICT

NORTH MARTIN COUNTY WELLFIELD WETLANDS IMPACT STUDY

AQUIFER PERFORMANCE TEST

Prepared by:

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NOVEMBER 1989

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2175.0015/3.1.2

JMM James M Montgomery
Consulting Engineers Inc

November 14, 1989

Mr. Scott Burns
South Florida Water Management District
P.O. Box 24680
West Palm Beach, Florida 33416

SUBJECT: Aquifer Performance Test
North Martin County Wellfield
Wetlands Impact Study

Dear Mr. Burns:

James M. Montgomery, Consulting Engineers, Inc. (JMM) is pleased to submit the Aquifer Performance Test (APT) Report. This report documents the results of a 72-hour APT conducted between October 5 and October 9, 1989 on Production Well 7 at the Martin County Wellfield.

While not required under contract, JMM also conducted a 12-hour static monitoring period prior to the test and a 3-hour recovery monitoring period. This information has been included in the report. We will forward to you all of the data in disk form.

Acceptance of the report by the South Florida Water Management District (SFWMD) concludes our contract on the North Martin County Wetland Impact Study. JMM appreciates the assistance of the SFWMD during the implementation of this project and looks forward to working with you in the future.

Sincerely,

Patrick J. Gleason

Patrick J. Gleason, Ph.D.
Principal Hydrogeologist

/jp

cc: Sharon Trost, SFWMD

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EXECUTIVE SUMMARY

An Aquifer Performance Test (APT) was conducted on Production Well 7 in the Martin County Utilities wellfield located west of Jensen Beach. The test was conducted during the period October 5 through October 9, 1989. The test was divided up into a static, pumping, and recovery period. The static period lasted for 12 hours, the pumping period lasted for 72 hours, and the recovery period lasted for 3 hours. The production well was pumped at an average rate of 349 gpm.

Drawdowns were measured in ten wells: the production well, three deep production-zone monitoring wells, three intermediate-level monitoring wells and three wells above the hardpan layer within the adjacent wetland. As a consequence of dry conditions prevailing in the area, wells below the hardpan in the wetland were dry and shallow wells above the hardpan outside of the wetland were also dry.

The aquifer underlying the Martin County Utilities wellfield behaved as a semi-confined aquifer during the test. The Walton, Hantush semi-logarithmic, and Jacob distance drawdown methods were selected to analyze the test data. Based on this analysis, the transmissivity of the site is in the range from 19,000 to 22,000 gpd/ft while the leakance value is approximately 5.0 E-08 1/sec (.032 gpd/ft^3). Based on a production zone thickness of 125 feet, the hydraulic conductivity of the production zone is about 165 gpd/ft^2. The storage coefficient is somewhat reflective of early-time reaction of the aquifer to the imposed stress. Within this context, the storage coefficient is .0004. The specific capacity of the well is determined to be 9.7 gpm/ft.

The drawdown response in the intermediate level wells was muted and of lower magnitude in comparison with the drawdown response of the production-zone monitoring wells. The drawdown in the production-zone monitoring wells was nearly instantaneous in response to pumpage. The intermediate-depth monitoring well responses were within six minutes. The intermediate depth monitoring wells which are located at the top of the production zone showed significantly less drawdown than the production zone monitoring wells. At a distance of 36 feet from the production well, the head differential between the intermediate and production zone monitoring wells was 10.3 feet at the end of the pumping period. At a distance of 136 feet from the production well, the head differential between the intermediate and production zone monitoring wells was 4.9 feet at the end of the pumping period.

During the time of the test, water present in the three wetland monitoring stations (above the hardpan) was perched above the aquifer below as indicated by wells below the hardpan which were dry. Water levels in two wetland monitoring wells began to increase during the test. Although a light misting rain fell briefly during one hour of the test, these increases are likely the result of uncontrolled water leakage from a small hole at the top of production well 7. Water was observed to discharge from the wellhead at a rate of three to four gallons per minute. Prolonged leakage from the wellhead during the routine operation of this well may explain the existence of water in the three wetland monitoring wells.

The results of this test suggest that the hardpan layer underlying that part of the wetland which was monitored in this test is significant in its ability to retard the downward flow of groundwater. Based on this test, it is not possible to establish that other wetlands would behave in the same way. Further investigation should be conducted to determine the degree of hydraulic disconnection between wetlands and the underlying aquifer over a broader area, under normal rainfall conditions, and when surface water is present in the wetlands.

Section 1

SECTION 1

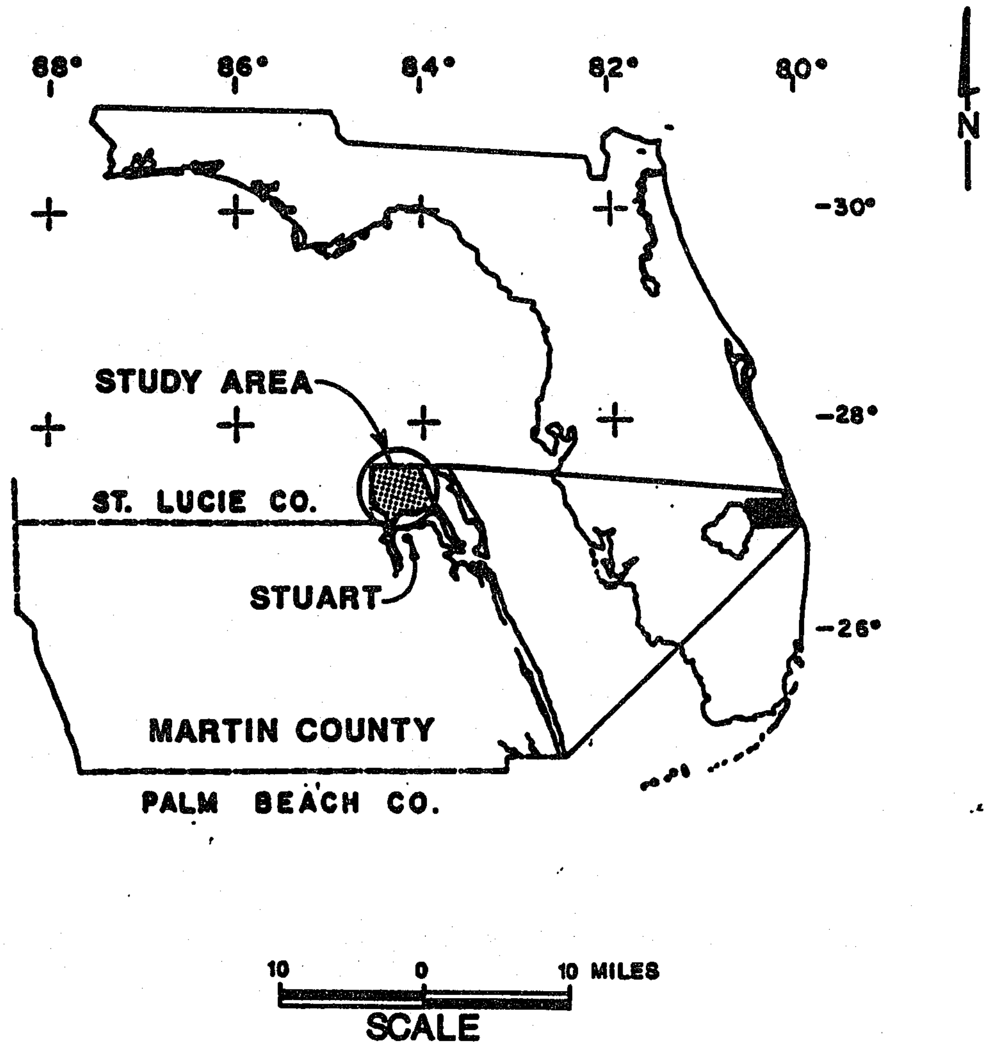
INTRODUCTION

An understanding of the relationship between groundwater withdrawals and wetland impacts is essential for management of groundwater on the Jensen Beach Peninsula. The South Florida Water Management District (SFWMD) has been very concerned that expansion of the Martin County Utilities wellfield may result in draining of small wetlands present around the wellfield. In order to obtain more accurate information on the nature of the aquifer, the aquifer characteristics, and the interrelationship between wetlands and the production zone of the wellfield, the SFWMD contracted with James M. Montgomery, Consulting Engineers, Inc. (JMM) to perform an aquifer performance test (APT) on an existing production well. This report details the manner in which the APT was conducted, the aquifer characteristics determined, and the results of monitoring water levels in a wetland adjacent to the production well.

The goal of the APT was to determine the hydraulic characteristics of the shallow aquifer in the vicinity of the North Martin County Wellfield (NMCW), located on the Jensen Beach Peninsula (Figure 1-1). The objectives of the test were:

- the determination of the transmissivity, coefficient of storage, and permeability of the shallow aquifer;
- the classification of the aquifer regarding confinement; and
- the determination of aquifer test pumpage impact on water levels in the adjacent wetland.

Based on the results of the Phase I report entitled "Evaluation of Impacts of Wellfield Withdrawals on Wetlands in the Vicinity of the North Martin County Wellfield" (JMM, 1988), NMCW production well 7 (PW-7) was selected for use as the pumping well during the APT. The following report summarizes site hydrogeologic conditions, describes the implementation and results of the APT.



STUDY AREA LOCATION MAP

FIGURE 1-1

Section 2

SECTION 2

SITE CONDITIONS

GEOLOGY

The shallow aquifer in the Jensen Beach Peninsula area consists of formations ranging in age from Upper Miocene to Pleistocene. Low permeability clays and marls of the Tamiami and Hawthorn Formations (Miocene) unconformably underlie the shallow aquifer and form its base (Miller, 1980). The elevation of the base of the shallow aquifer in the study area ranges from less than -160 feet to an excess of -180 feet, National Geodetic Vertical Datum of 1929 (NGVD). The Caloosahatchee Marl (Pliocene) consists of a "shelly, sandy limestone" (Stodghill and Stewart, 1984) and may overlie the Tamiami Formation in the Jensen Beach Peninsula area; the continuity and thickness of the Caloosahatchee Marl in Martin County has not been established.

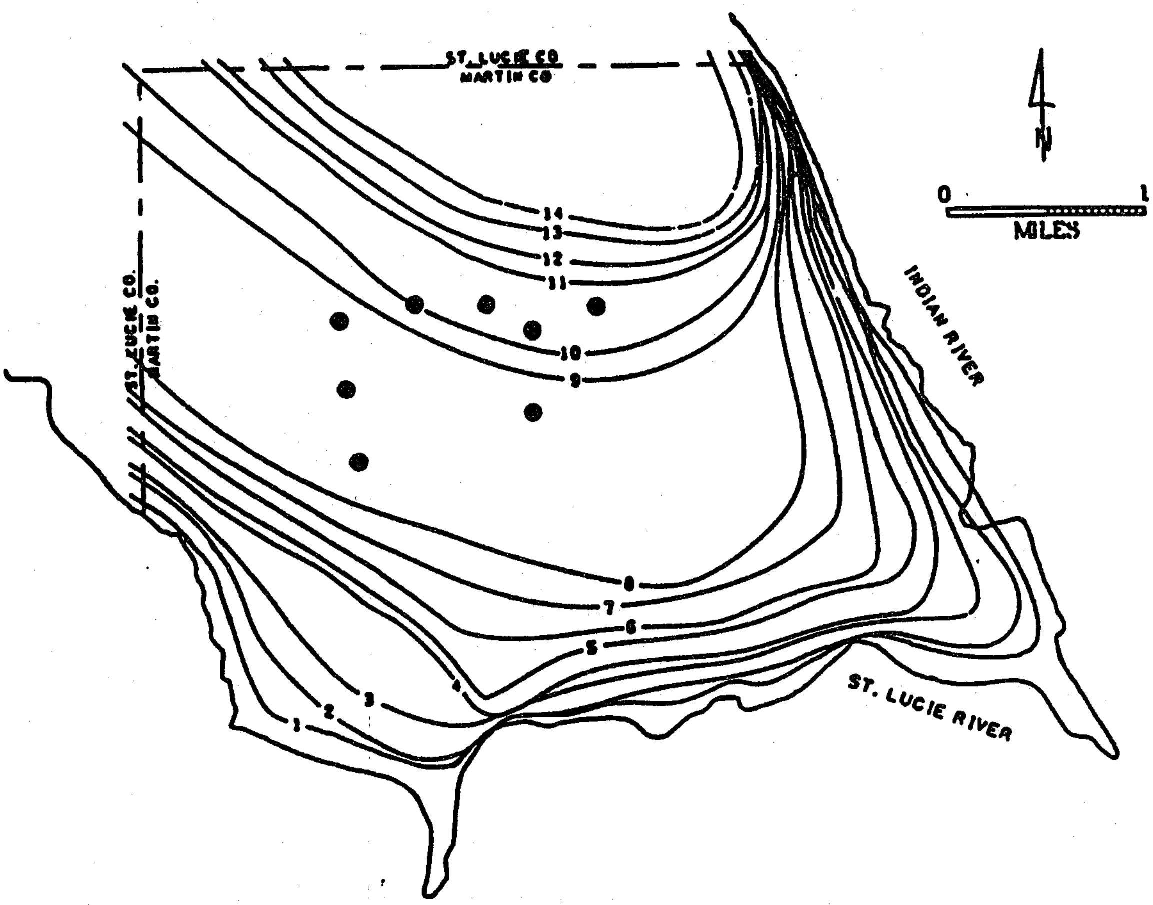
The Fort Thompson Formation (Pleistocene) is composed of shell, marl and limestone as far east as the Atlantic Coastal Ridge where it merges with the Anastasia Formation (Nealon et al., 1987). Lichtler (1960) indicates that the Anastasia and Fort Thompson Formations are contemporaneous. The Anastasia Formation consists of sand, shell beds, and thin discontinuous layers of limestone in Martin County. Soils in the Jensen Beach area are predominantly developed in the Pamlico Sand (Pleistocene) which unconformably overlies the Anastasia and Fort Thompson Formations.

HYDROGEOLOGY

The principal source of fresh water within the Jensen Beach Peninsula area is the shallow aquifer. The general lithology of the shallow aquifer in the Peninsula area can be subdivided into three zones. From the surface to 40 to 60 feet below ground level, the lithology consists of white, gray and brown, predominantly fine- to coarse-grained quartz sand with interspersed shell beds. Underlying the shallow sands is a 10- to 20-foot thick unit of tan and gray, fine to very fine sand with trace amounts of shell and a slight increase in clay. These materials overlie the principal producing zone of the aquifer which ranges from 130 to 150 feet in thickness and consists of limestone and calcarenite interbedded with sand and shell.

Lichtler (1960) evaluated the characteristics of the shallow aquifer in the Stuart wellfield area located south of the NMCW. Lichtler applied the APT analysis method of Hantush and Jacob (1956) to determine the aquifer characteristics. The results of his investigations indicate the transmissivity of the production zone of the aquifer ranges from 16,000 gallons per day per foot (gpd/ft) to 27,000 gpd/ft. The storage coefficient obtained from these analyses is in the confined range and averages roughly 0.0025. Lichtler indicates that the leakance coefficient of the shallow aquifer in the Stuart wellfield area ranges from 0.174 to 0.048 gpd/ft^3.

Inspection of the water table elevations in the study area (Figure 2-1) indicates that regional flow in the shallow aquifer is from the northwest to the southeast (Nealon et al., 1987). Peninsula area groundwater levels are monitored from the Saltwater Intrusion



—4— Water Level Elevations 1-ft. Contour Interval (NGVD)

● North Martin County Wellfield Production Wells

WATER TABLE MAP, NORTH MARTIN COUNTY PENINSULA (1984 MID DRY SEASON) (modified from Nealon et al. 1987)

FIGURE 2-1

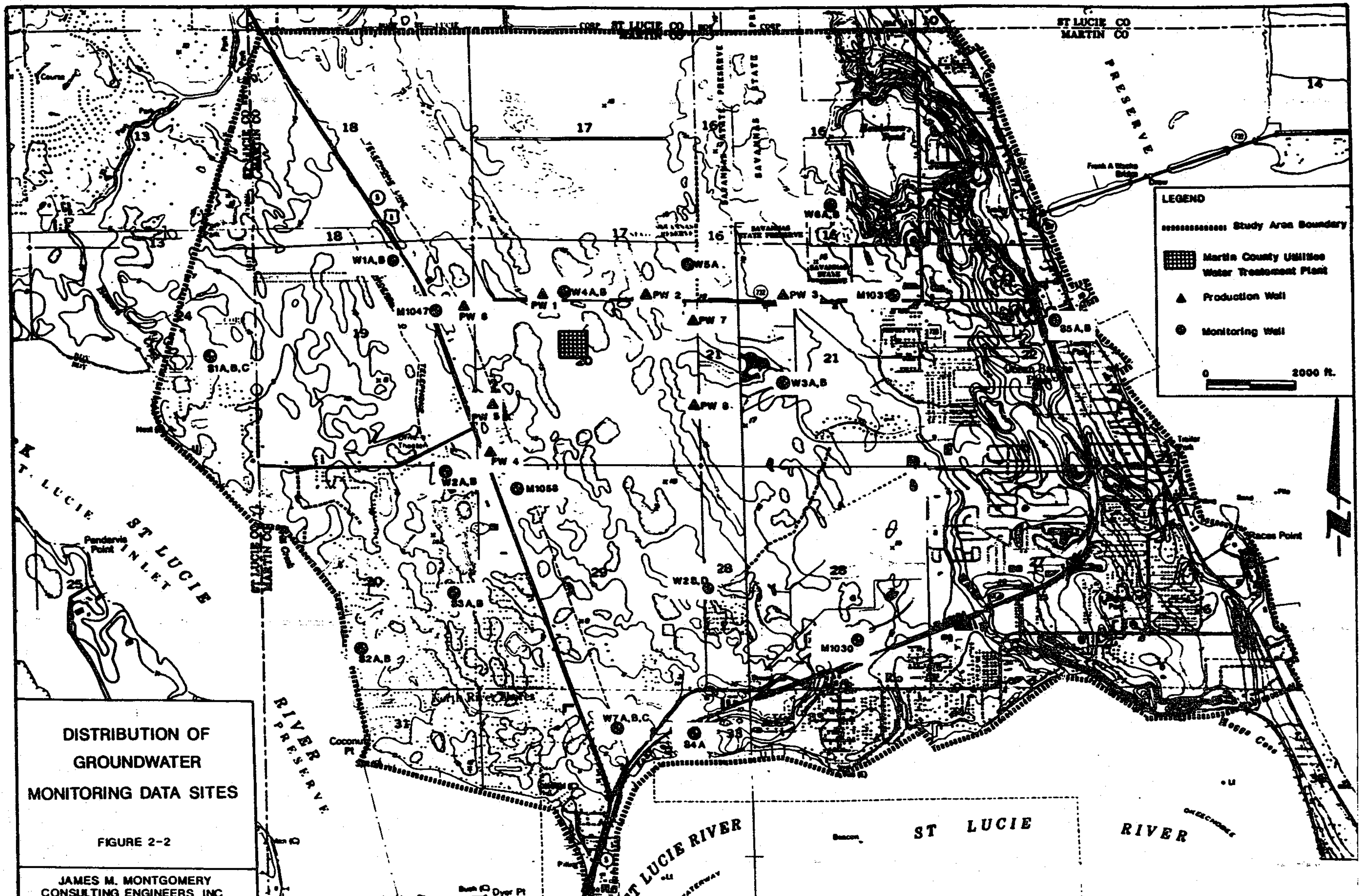
JMM

Monitoring (SWIM) well network (Figure 2-2). A number of these wells are installed in clustered configurations to evaluate vertical head variations in the shallow aquifer. Inspection of the SWIM well data (JMM, 1988) indicates that recharging conditions exist at inland locations as revealed by the decline of heads with depth. In coastal areas, however, shallow aquifer heads increase with depth which indicates that groundwater is discharging in these areas. Water levels in the shallow aquifer in the vicinity of production well 7 are approximately 10 feet relative to NGVD.

The NMCW consists of ten production wells, each having a design capacity of 300 gallons per minute (gpm) (Table 2-1). The wells are completed in the production zone of the shallow aquifer at average cased and total depths of -70 to -110 feet (NGVD), respectively. The ten production wells are located within a 1-mile radius of the NMCW water treatment plant (WTP) (Figure 2-3).

WETLANDS

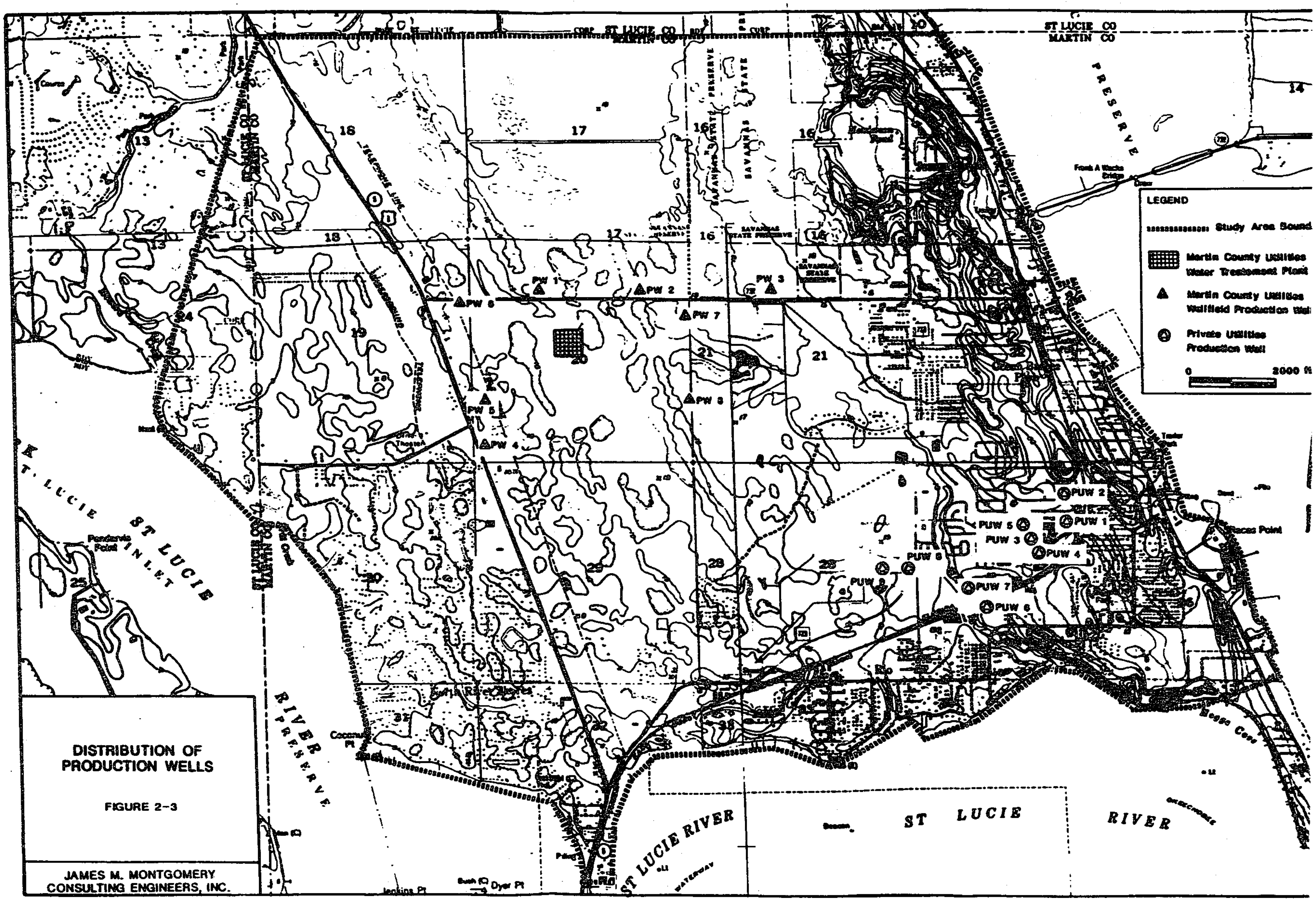
The Jensen Beach Peninsula is characterized by numerous wetland areas. Well PW-7 is located approximately 50 feet northeast of an estimated 2-acre wetland (Figure 2-4). One of the objectives of the APT was to evaluate the impact of pumpage on wetland water levels. Figure 2-5 describes monthly surface water level fluctuations measured at station MS-5 during the period August 1986 to November 1987. Dry conditions are indicated during the summer of 1987 by lack of standing water in the wetland. Ground surface elevations across the wetland range from 14.2 feet (NGVD) at the wetland center to 16 feet (NGVD) along its perimeter.



DISTRIBUTION OF GROUNDWATER MONITORING DATA SITES

FIGURE 2-2

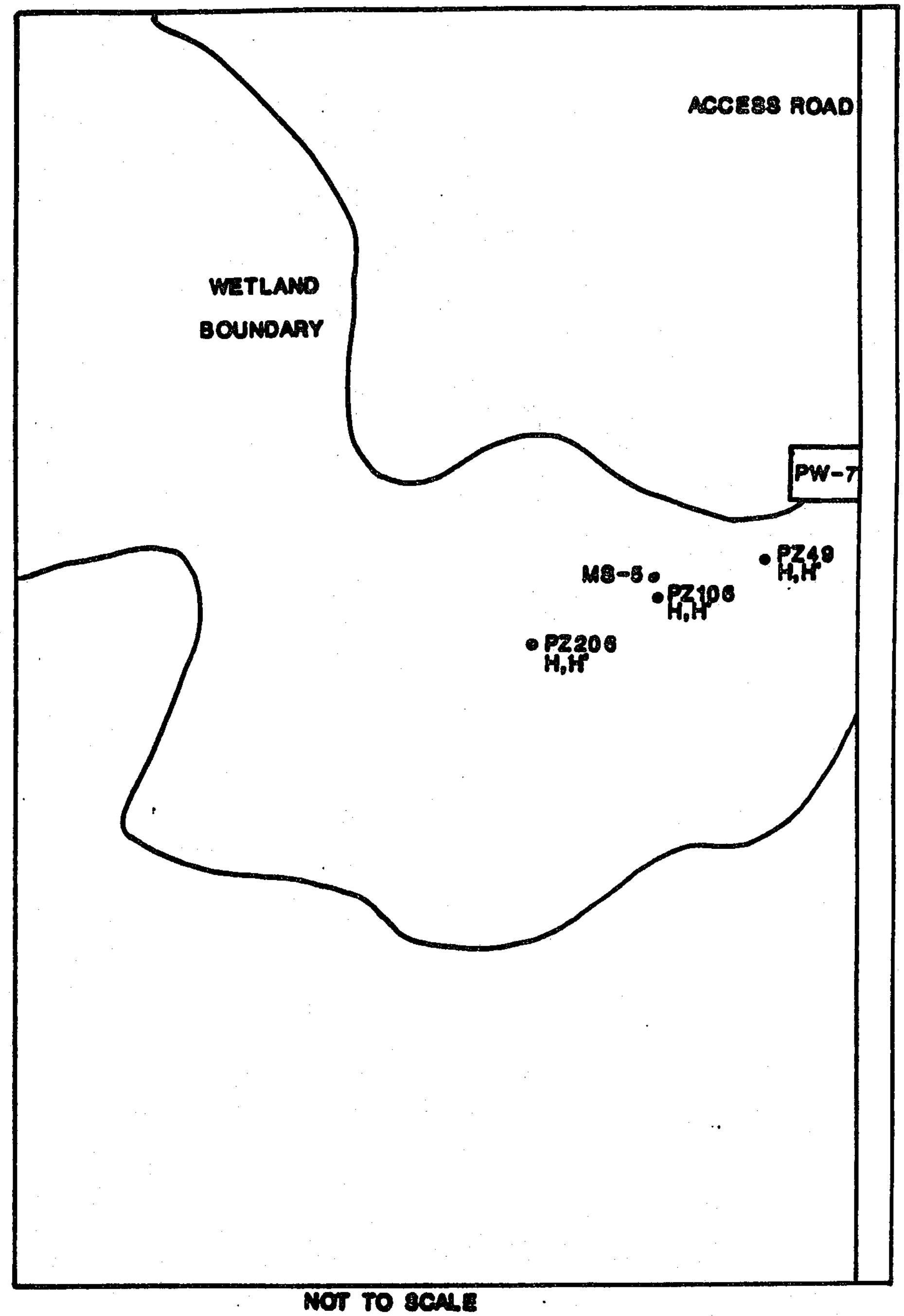
JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.



DISTRIBUTION OF PRODUCTION WELLS

FIGURE 2-3

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.



PROXIMITY OF WETLAND ADJACENT TO WELL PW-7

FIGURE 2-4

SURFACE WATER MONITORING STATION MS-5
RANDOM DATA
L.S.D. 14.20 ft,NGVD

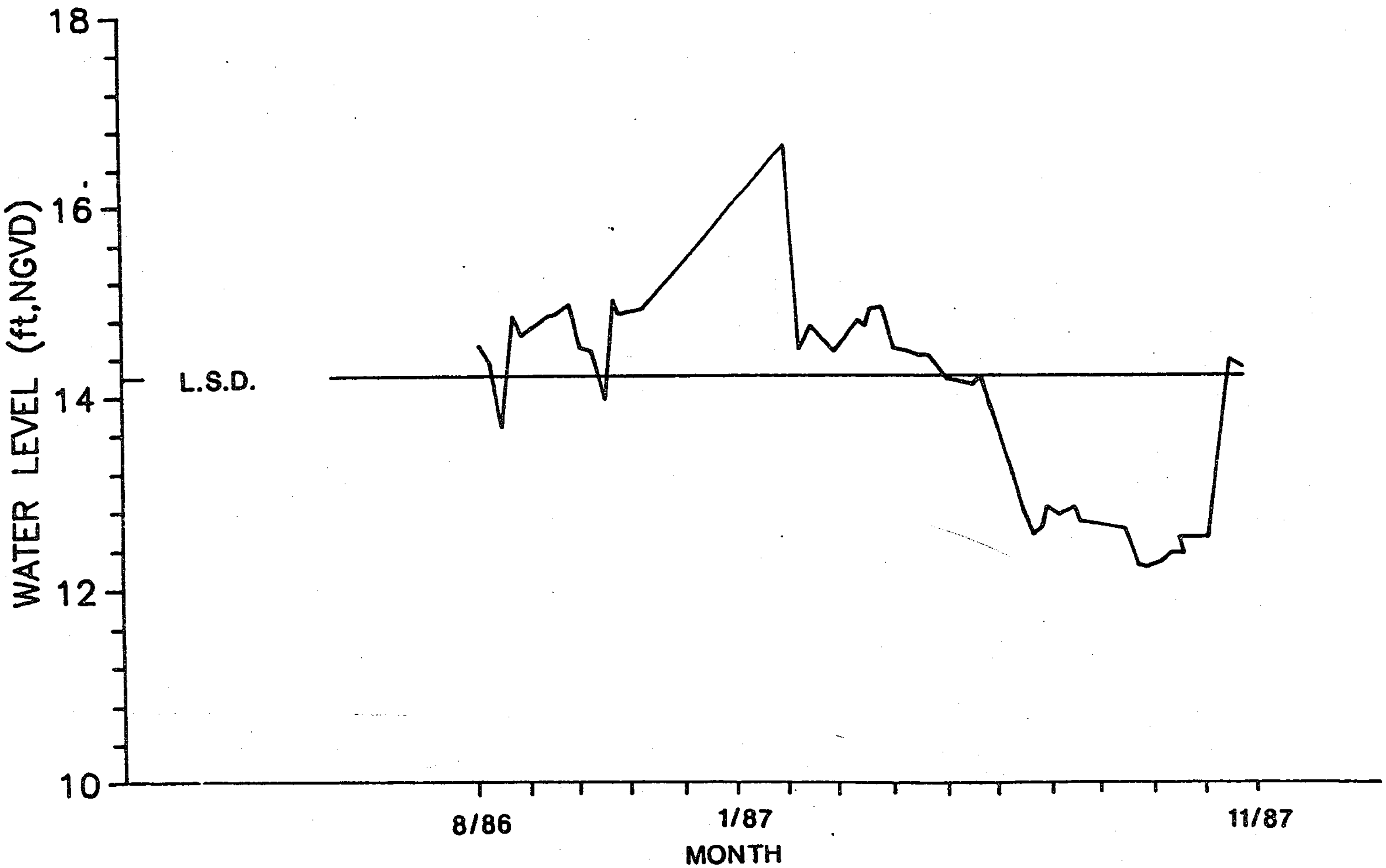


FIGURE 2-5

TABLE 2-1

EXISTING WELLS

Well ID	Existing or Proposed	Diameter (inches)	Cased Depth (feet)	Screened Interval (feet)	Pump Capacity (gpm)	Year Drilled	Latitude	Longitude	Permit No.	Utility
PW-1	Existing	8	70	40	300	1982	27 14 44	80 16 35	43-00102-W	Martin County Utilities Department
PW-2	Existing	8	70	40	300	1982	27 14 44	80 15 23	43-00102-W	Martin County Utilities Department
PW-3	Existing	8	70	40	300	1983	27 14 43	80 14 46	43-00102-W	Martin County Utilities Department
PW-4	Existing	8	80	40	300	1982	27 14 06	80 16 06	43-00102-W	Martin County Utilities Department
PW-5	Existing	8	70	40	300	1983	27 14 18	80 16 05	43-00102-W	Martin County Utilities Department
PW-6	Existing	8	80	40	300	1982	27 14 42	80 16 12	43-00102-W	Martin County Utilities Department
PW-7	Existing	8	71	10 & 30	300	1982	27 14 37	80 15 12	43-00102-W	Martin County Utilities Department
PW-8	Existing	8	70	20 & 20	300	1982	27 14 19	80 15 12	43-00102-W	Martin County Utilities Department
PW-9	Existing	8					27 14 40	80 14 25	43-00102-W	Martin County Utilities Department
PW-10	Existing	8					27 14 27	80 15 48	43-00102-W	Martin County Utilities Department

Section 3

SECTION 3

AQUIFER PERFORMANCE TEST SETUP

PRODUCTION WELL

Production well 7 (PW-7) is located 600 feet south of Commercial Boulevard and approximately 2,300 feet northeast of the WTP. Well PW-7 is completed in the production zone of the shallow aquifer (Figure 3-1). The 8-inch-diameter well is cased to a depth of 71 feet below ground level and is screened through the interval extending from 71 to 111 feet. The well is fitted with a 300 gpm capacity vertical turbine pump with the pump intake set at a depth of 60 feet. When constructed in 1983, the production testing of the well resulted in a specific capacity of 6.8 gallons per minute per foot of drawdown (gpm/ft) which indicates an approximate production zone transmissivity of 12,000 gpd/ft. The well head is equipped with a functional check valve, an in-line flow meter, and a well access portal. The well may be operated manually independent of the plant controls. The log for production well 7 was presented in the Phase 1 report, "Evaluation of Impacts on Wellfield Withdrawals on Wetlands in the Vicinity of the North Martin County Wellfield."

ACCOMMODATION FOR SERVICE AREA DEMANDS

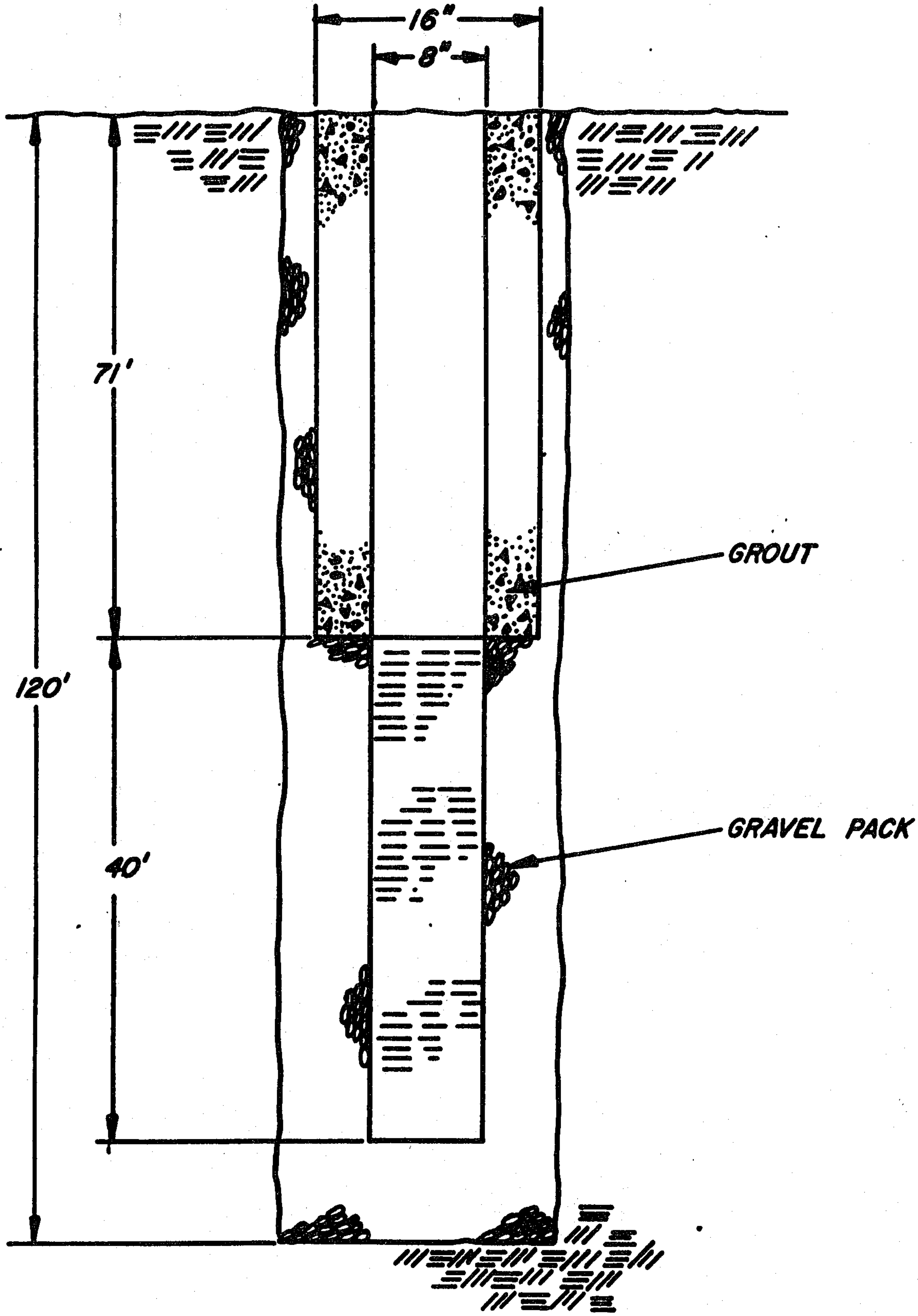
As well PW-7 is a production well in an active wellfield, a significant consideration in the test setup is the minimization of impact to the operation of the NMCW to meet service area demands. However, to ensure that only the impacts to water levels in the vicinity of well PW-7 result from the pumping of well PW-7, withdrawals in the adjacent production wells were stabilized to the extent possible. Throughout the test, well PW-7 was monitored for water level and flow rate.

PIEZOMETER WELLS

Fifteen piezometer wells were constructed in six clusters in the vicinity of PW-7. The location of these wells is shown in Figure 3-2. Well MS-5 was a pre-existing shallow monitor well installed by Martin County. Only nine wells were monitored during the test because seven of the wells were dry (Table 3-1). The nomenclature of the piezometer wells follows the convention that the numeric portion of a well name indicates its distance from PW-7. Additionally, the suffixes "H", "H'", "I", and "D" indicate that the wells monitor water levels above the hardpan soil layer (2 to 5 feet below ground level), at a depth immediately below the hardpan (5 to 9 feet below ground level), at a depth of 50 feet, and at a depth of 110 feet, respectively (Table 3-1). Wells suffixed by "H" (for example, PZ206H) will monitor potential groundwater level fluctuations above the hardpan in response to APT pumpage. Typical piezometer well construction details are provided in Figure 3-3.

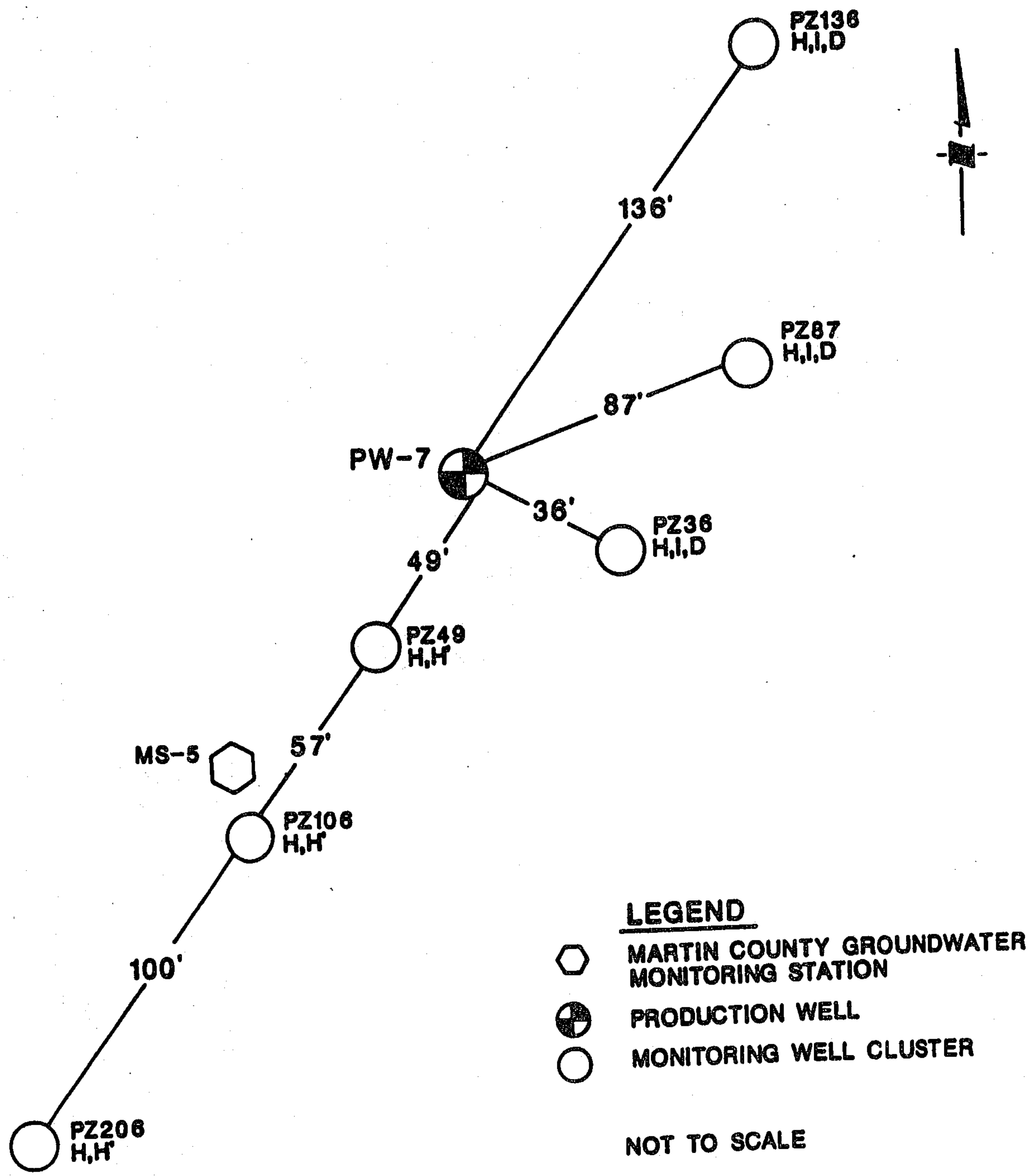
SURFACE WATER MONITORING

No surface water monitoring was conducted because the wetland was dry.



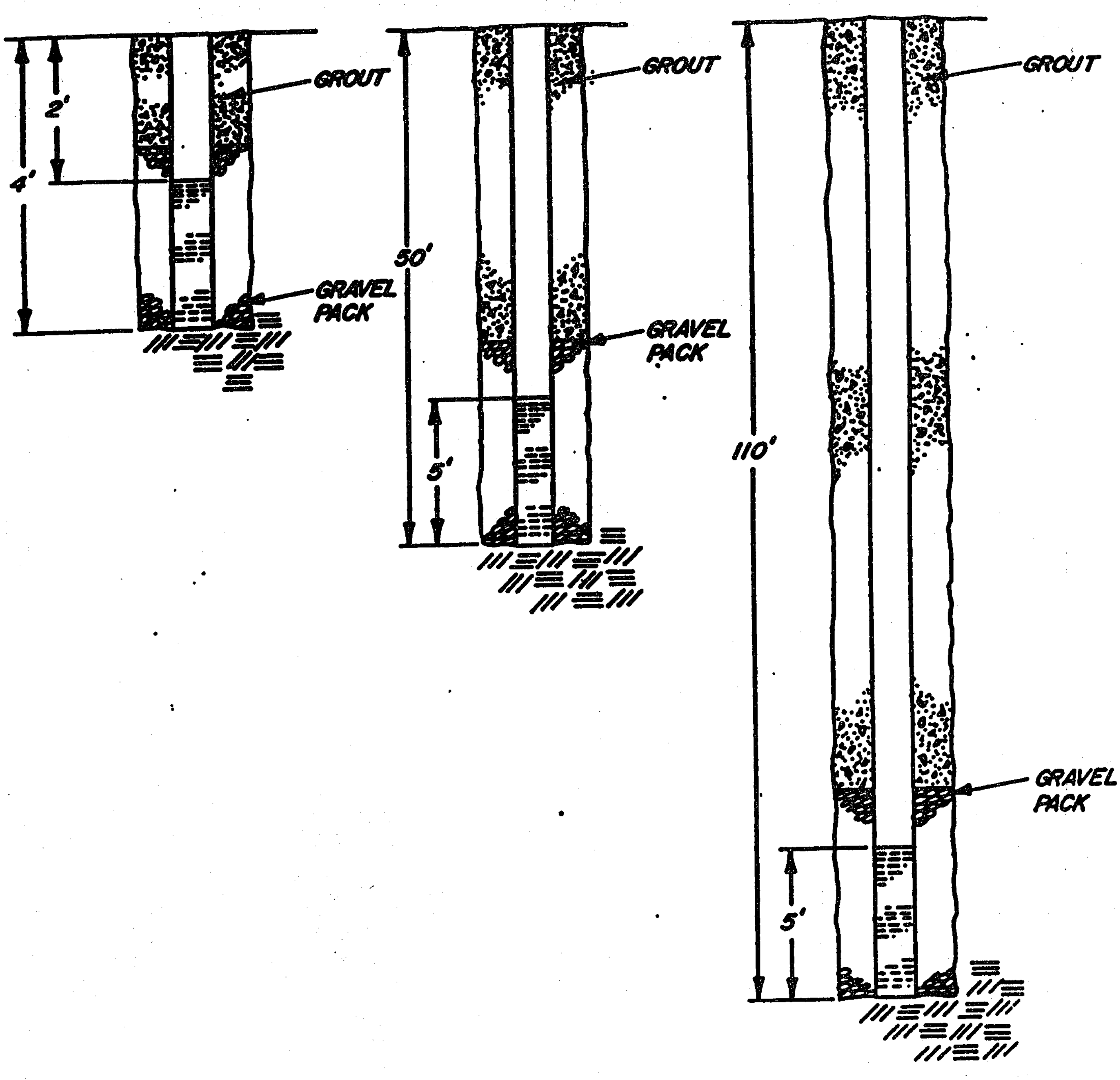
PRODUCTION WELL 7 CONSTRUCTION DIAGRAM

FIGURE 3-1



PIEZOMETER WELL LOCATION DIAGRAM

FIGURE 3-2



TYPICAL PIEZOMETER WELL CLUSTER

FIGURE 3-3

TABLE 3-1

WELL CONSTRUCTION DATA

Well	Type	Diameter (inches)	Cased Depth (feet)	Total Depth (feet)	Open or Screened Interval (feet)	Top of Casing Elevation[a] (feet, NGVD)
PW-7	Production	8	71	120	40	--
PZ136H[b]	Monitoring	2	2.75	3.75	1.0	19.15
PZ136I	Monitoring	2	45	50	5.0	18.92
PZ136D	Monitoring	2	105	110	5.0	18.92
PZ87H[b]	Monitoring	2	2.75	3.75	1.0	18.42
PZ87I	Monitoring	2	45	50	5.0	18.65
PZ87D	Monitoring	2	105	110	5.0	18.46
PZ36H[b]	Monitoring	2	4.0	5.0	1.0	18.70
PZ36I	Monitoring	2	45	50	5.0	18.59
PZ36D	Monitoring	2	105	110	5.0	18.63
PZ49H	Monitoring	2	3.0	4.0	1.0	--
PZ49H'[b]	Monitoring	2	8.17	9.17	1.0	--
PZ106H	Monitoring	2	3.25	4.25	1.0	17.13
PZ106H'[b]	Monitoring	2	6.33	7.33	1.0	17.69
PZ206H[b]	Monitoring	2	0.75	1.75	1.0	16.76
PZ206H'[b]	Monitoring	2	4.33	5.33	1.0	16.68

[a] Corrected elevations. Elevations in the JMM "Aquifer Test Plan", 1989 were resurveyed.

[b] Dry well during test – no data collected.

PRECIPITATION MONITORING STATION

A rainfall gauge is located at the NMC WTP. Daily rainfall data are routinely collected by WTP personnel. Table 3-2 indicates that the North Martin County peninsula was very likely suffering from a drought event. The cumulative yearly deficit from January 1 to October 1, 1989 was 14.9 inches of rainfall at the North Martin County Water Treatment Plant in comparison with average rainfall at the City of Stuart. The rainfall deficit for the month of September was 4.55 inches when compared with Stuart's normal rainfall. Other wetlands observed in the area were totally dry. The North Martin County Water Treatment Plant recorded 0.03 inches of rainfall prior to the test on October 1. A light misting rain fell for 50 minutes at 2,040 minutes into the test at the test site. Rainfall of 0.42 inches was recorded for October 8th at the North Martin County Water Treatment Plant.

TABLE 3-2

COMPARISON OF AVERAGE RAINFALL AT THE CITY OF STUART WITH 1989 RAINFALL AT NORTH MARTIN COUNTY WATER TREATMENT PLANT

Month	Average Rainfall (Stuart)[a]	1989 Rainfall at North Martin County Water Treatment Plant	Monthly Deficit/ Cumulative Yearly Deficit
January	2.58	1.68	-0.90/-0.90
February	2.64	1.18	-1.46/-2.36
March	3.19	4.22	+1.03/-1.33
April	2.68	4.29	+1.61/+0.28
May	4.97	3.14	-1.83/-1.55
June	6.99	1.65	-5.34/-6.89
July	6.46	3.85	-2.61/-9.50
August	5.78	4.93	-0.85/-10.35
September	7.63	3.08	-4.55/-14.90
October	6.78		
November	2.53		
December	2.64		
	54.87		

a NOAA Data, 52-year record.

Section 4

SECTION 4

DATA COLLECTION PROCEDURES

The following parameters were monitored in performance of the aquifer test:

1. Water levels in piezometer wells.
2. Water levels in the pumping well (production well 7).
3. Discharge rate of the pumping well.
4. Cumulative discharge rate for the NMCW.
5. Rainfall.

A total of 10 water level stations were monitored using both automated and manual monitoring techniques (Table 4-1). Other stations including PZ36H, PZ87H, PZ136H, PZ49H', PZ106H' and both PZ206H and PZ206H' were dry and were not monitored. Automatic monitoring was accomplished using an eight-channel In-Situ Hermit 2000 data logging system. Pressure transducer equipment was used in wells PZ136D, PZ87I, PZ87D, PZ36I, and PZ36D, enabling the collection of synchronous water level data from these wells. The operating pressure range of the transducers to be used was variable depending upon anticipated drawdowns. For wells MS-5, PW-7, PZ49H, PZ136I, and PZ106H, water levels was collected manually.

TEST DURATION

The test duration was 87 hours.

STATIC PERIOD

Prior to initialization of pumpage from well PW-7, groundwater and surface water levels from the site were monitored for a period of 12 hours. This data provided an indication of background water level fluctuations to be used if necessary for correction of the pumping period data for background trend.

PUMPING PERIOD

The APT pumping period length was 72 hours. Pumping well discharge was monitored using a flow meter installed in the production well 7 raw water line. Discharge from the production well was monitored frequently, and totalized raw water flow from the NMCW was monitored at 1-hour intervals.

RECOVERY PERIOD

The recovery period duration was 170 minutes.

TABLE 4-1

MONITORING STATIONS DURING APT

Parameter	Station	Method	Monitored By
Water Level	Well PW-7	Tape	JMM
Water Level	Well PZ136I	Water Level Indicator	JMM
Water Level	Well PZ136D	Transducer	JMM
Water Level	Well PZ87I	Transducer	JMM
Water Level	Well PZ87D	Transducer	JMM
Water Level	Well PZ36I	Transducer	JMM
Water Level	Well PZ36D	Transducer	JMM
Water Level	Well PZ49H	Tape	JMM
Water Level	Well PZ106H	Tape	JMM
Water Level	MS-5	Tape	JMM
Rainfall	WTP	Open Receptacle	MCUD

Section 5

SECTION 5

ANALYSIS OF AQUIFER PERFORMANCE TEST

PRESENTATION OF DRAWDOWN DATA

Data collection for the APT was initiated on October 5 and continued through October 9, 1989. Static period data collection from the transducer monitored wells was begun at 23:10:00 hours on October 5th, while manual static period data collection began at approximately 21:45:00 hours on October 5th. Production well 7 was pumped continuously from 11:30:00 hours, October 6th to 11:40:00 hours, October 9th. Approximately 170 minutes of recovery data were collected on October 9th following the termination of pumpage.

Production Well and Water Treatment Plant Discharge

The discharge rate of production well 7 averaged 349 gpm during the APT pumping period (Figure 5-1 and Appendix E). During the initial 15 minutes of pumping, the discharge rate fluctuated from 295 to 405 gpm. The somewhat erratic flows encountered initially resulted from the depletion of well storage and adjustment of the pump head to pressure in the raw water pipeline. Raw water flow fluctuations at the water treatment plant during the APT monitoring period were determined from water treatment plant operating records. Plant flows during the static period ranged from 1.9 to 2.6 mgd and averaged 2.45 mgd (Figure 5–2 and Appendix E). During the pumping period of the test, plant flows varied from 2.0 to 2.7 mgd and averaged 2.5 mgd.

Static, Pumping and Recovery Period Water Level Fluctuations

The water level measurements obtained during the APT monitoring period are expressed as head relative to NGVD for each of the piezometer wells in Figures 5-3 to 5-8. The plots indicate the ambient groundwater level fluctuations at the site prior to pumping together with the impact to water levels produced by the APT. Based on data presented in Miller (1980), the base of the Surficial Aquifer occurs at a depth of approximately 200 feet in the vicinity of the test site. Production well 7 is screened between the depths of 71 and 111 feet and, therefore, partially penetrates the aquifer. Screened between the depths of 105 and 110 feet, piezometer wells PZ36D, PZ87D and PZ136D monitor water level fluctuations within the production zone of the aquifer. Piezometer wells PZ36I, PZ87I and PZ136I are screened between the depths of 45 and 50 feet. Lithologic data from production well 7 indicates that a clayey layer, approximately five feet in thickness, occurs between the depths of 30 and 35 feet. The intermediate depth piezometers, therefore, monitor water level fluctuations within a depth interval shallower than the top of the screened interval of production well 7 but at greater depth than the depth of the clay layer's base.

Water levels in the production zone as determined from wells PZ36D, PZ87D and PZ136D fluctuated by approximately 0.4 feet during the 12 hour static period. Water levels ranged from approximately 4.5 to 4.1 feet in well PZ36D. Fluctuations from 4.3 to 3.9 feet and from 4.4 to 4.0 feet were observed in wells PZ87D and PZ136D, respectively. The fluctuation pattern observed consisted of a gradual increase in water levels from the initial static period value to a maximum value attained during the time interval from 02:00:00 hours to

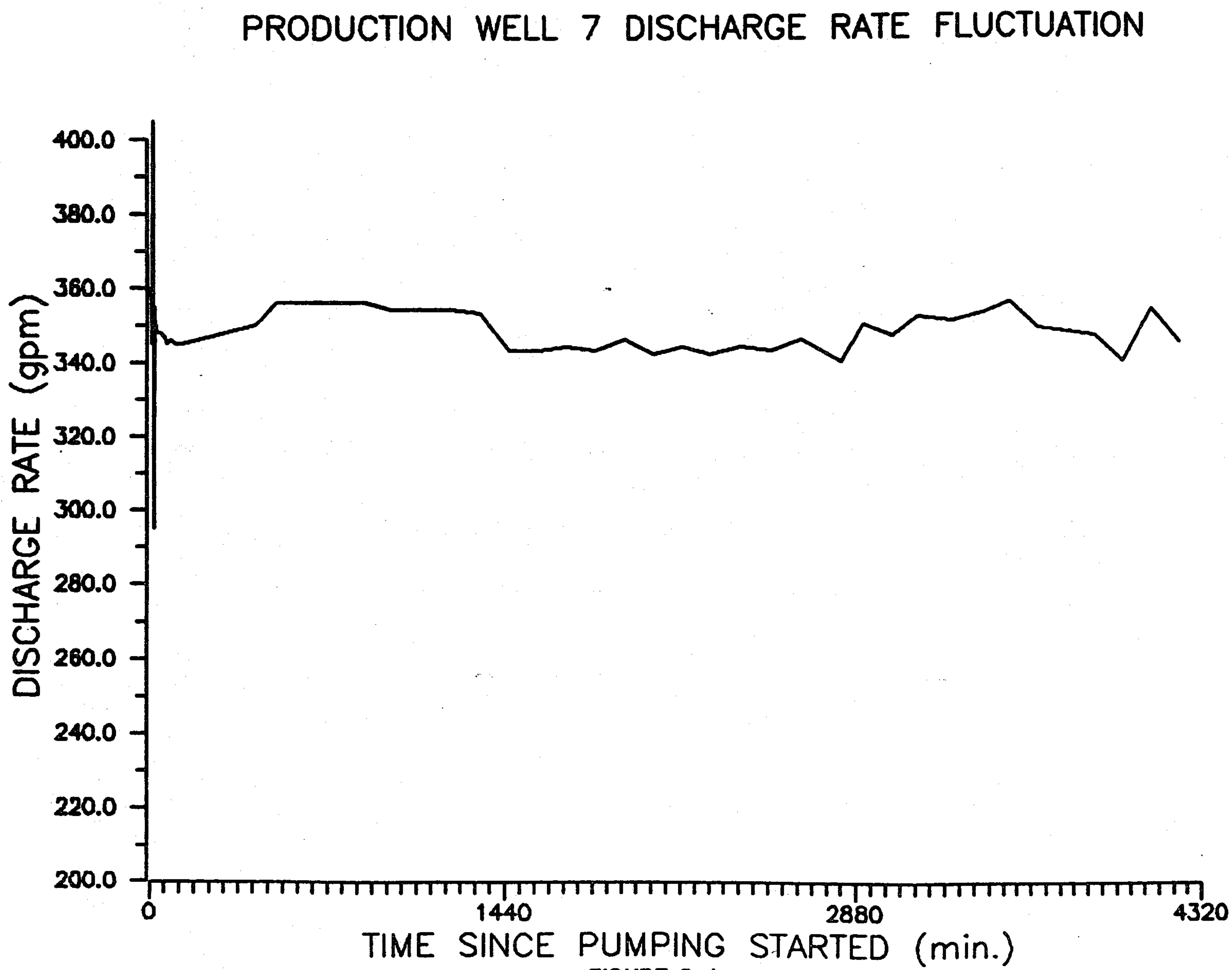

PRODUCTION WELL 7 DISCHARGE RATE FLUCTUATION
DISCHARGE RATE (gpm)
400.0
380.0
360.0
340.0
320.0
300.0
280.0
260.0
240.0
220.0
200.0
0
1440
2880
4320
TIME SINCE PUMPING STARTED (min.)

FIGURE 5-1

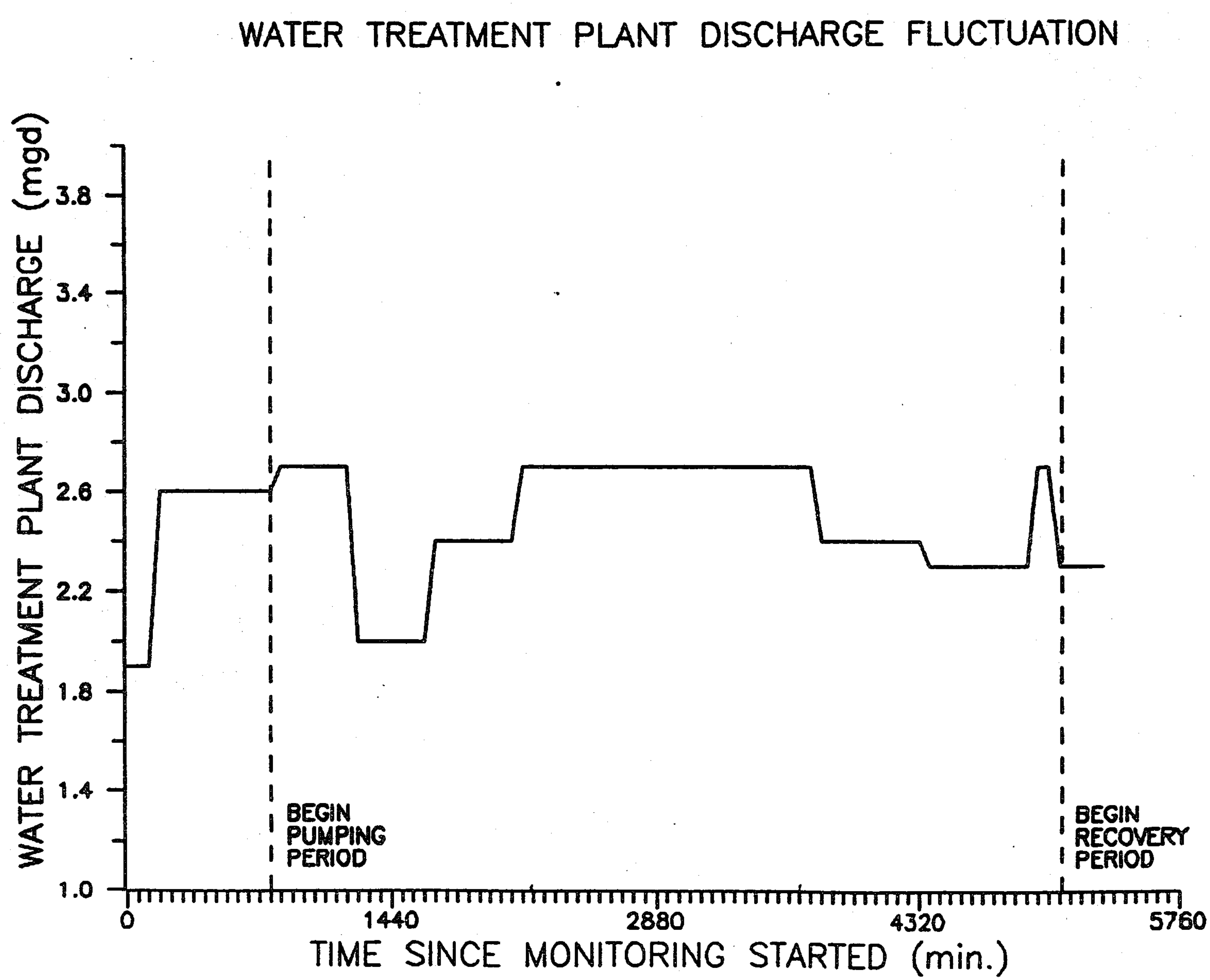

WATER TREATMENT PLANT DISCHARGE FLUCTUATION
WATER TREATMENT PLANT DISCHARGE (mgd)
3.8
3.4
3.0
2.6
2.2
1.8
1.4
1.0
BEGIN PUMPING PERIOD
BEGIN RECOVERY PERIOD
0
1440
2880
4320
5760
TIME SINCE MONITORING STARTED (min.)

FIGURE 5-2

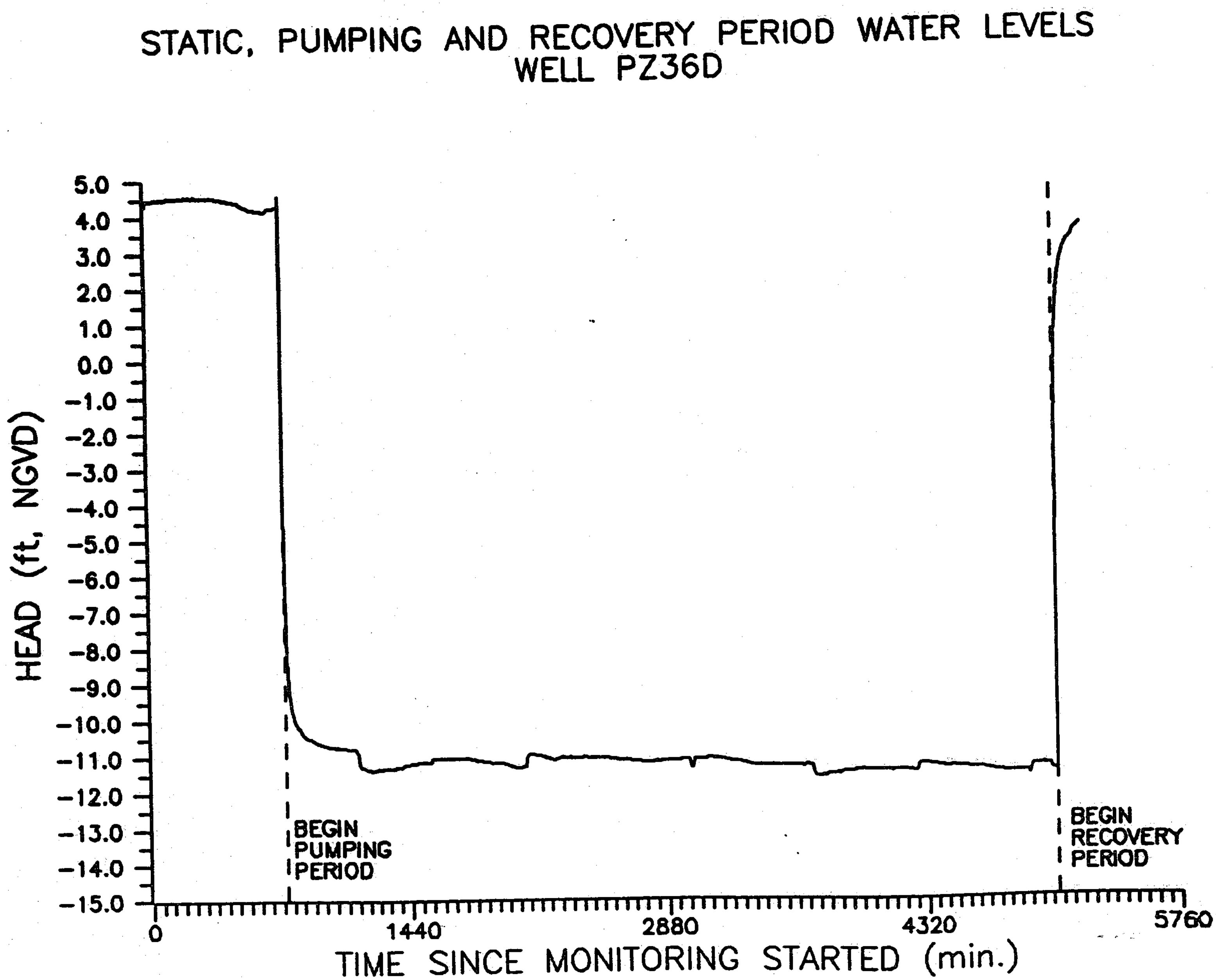

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WELL PZ36D
HEAD (ft, NGVD)
5.0
4.0
3.0
2.0
1.0
0.0
−1.0
−2.0
−3.0
−4.0
−5.0
−6.0
−7.0
−8.0
−9.0
−10.0
−11.0
−12.0
−13.0
−14.0
−15.0
BEGIN PUMPING PERIOD
BEGIN RECOVERY PERIOD
0
1440
2880
4320
5760
TIME SINCE MONITORING STARTED (min.)

FIGURE 5-3

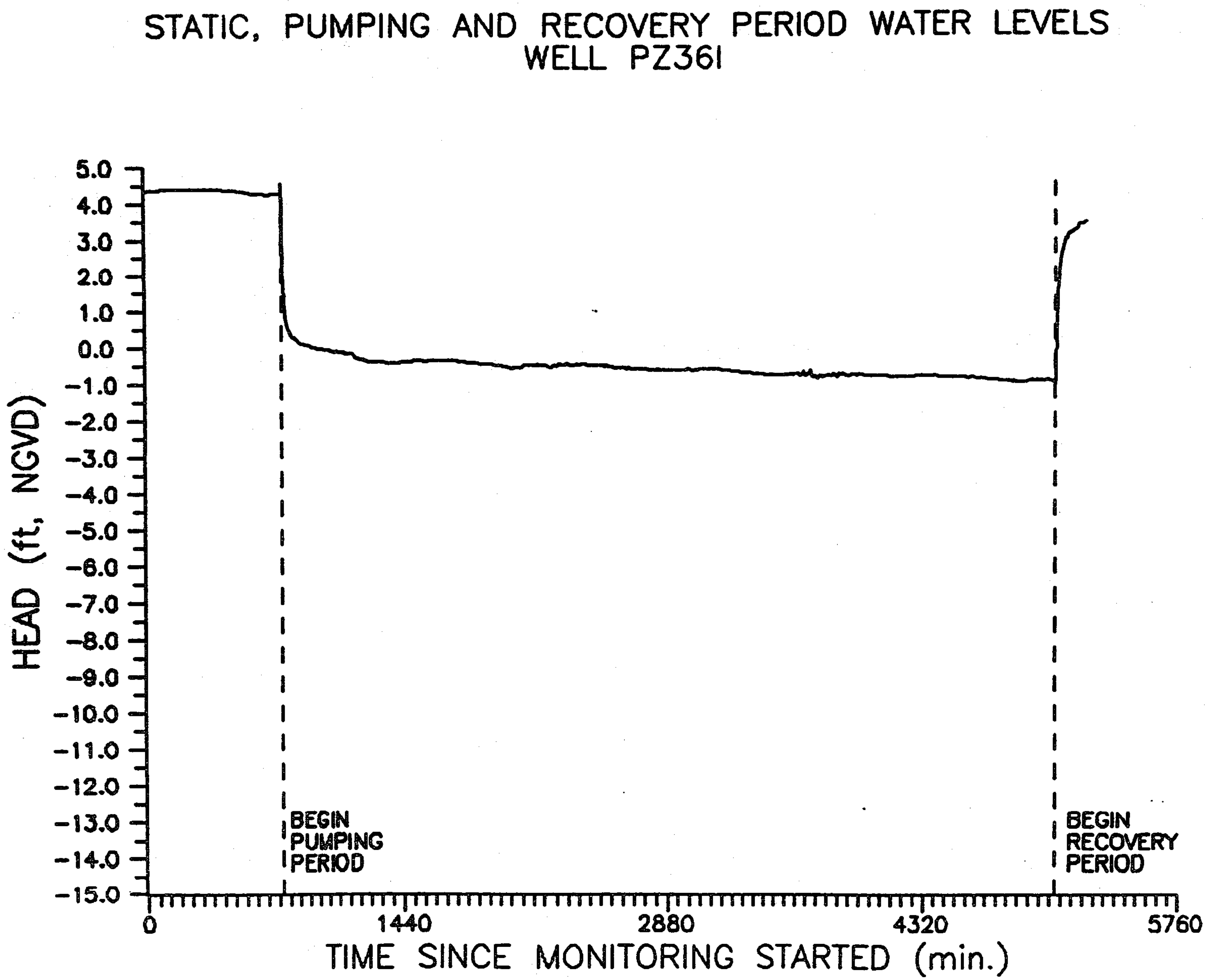

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WELL PZ361
HEAD (ft, NGVD)
5.0
4.0
3.0
2.0
1.0
0.0
−1.0
−2.0
−3.0
−4.0
−5.0
−6.0
−7.0
−8.0
−9.0
−10.0
−11.0
−12.0
−13.0
−14.0
−15.0
BEGIN PUMPING PERIOD
BEGIN RECOVERY PERIOD
0
1440
2880
4320
5760
TIME SINCE MONITORING STARTED (min.)

FIGURE 5-4

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WELL PZ87D

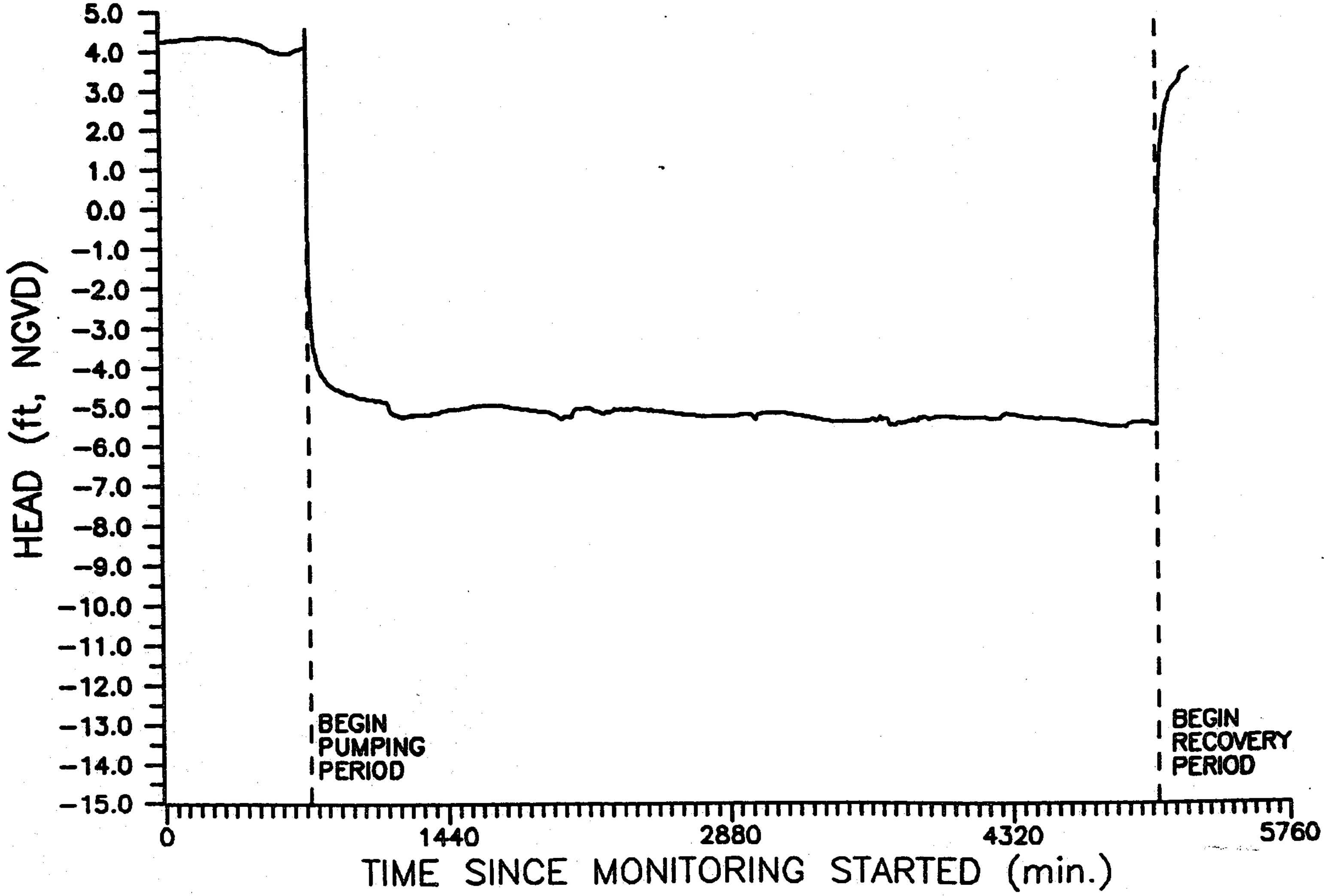


FIGURE 5-5

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WELL PZ871

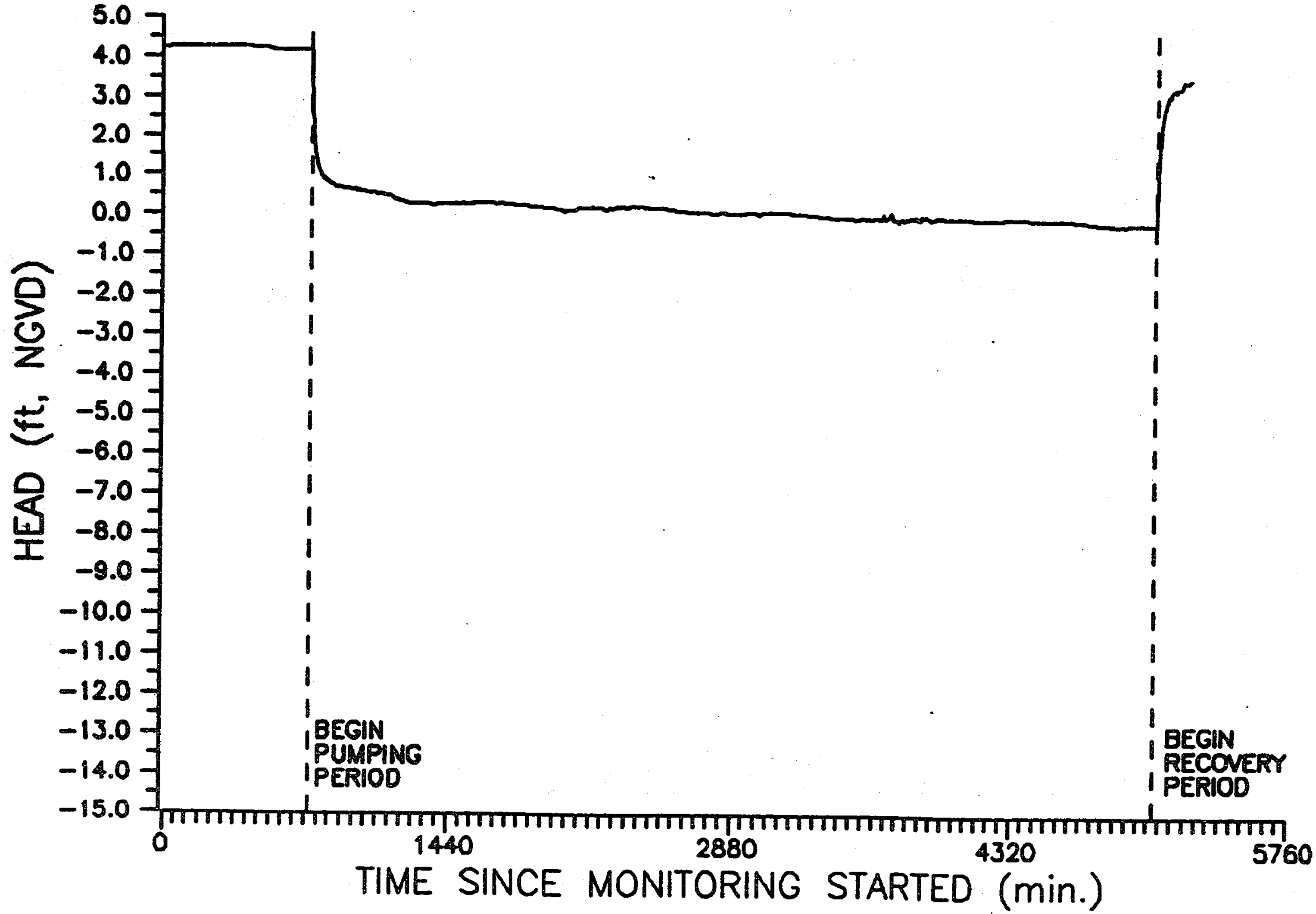


FIGURE 5-6

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WELL PZ136D

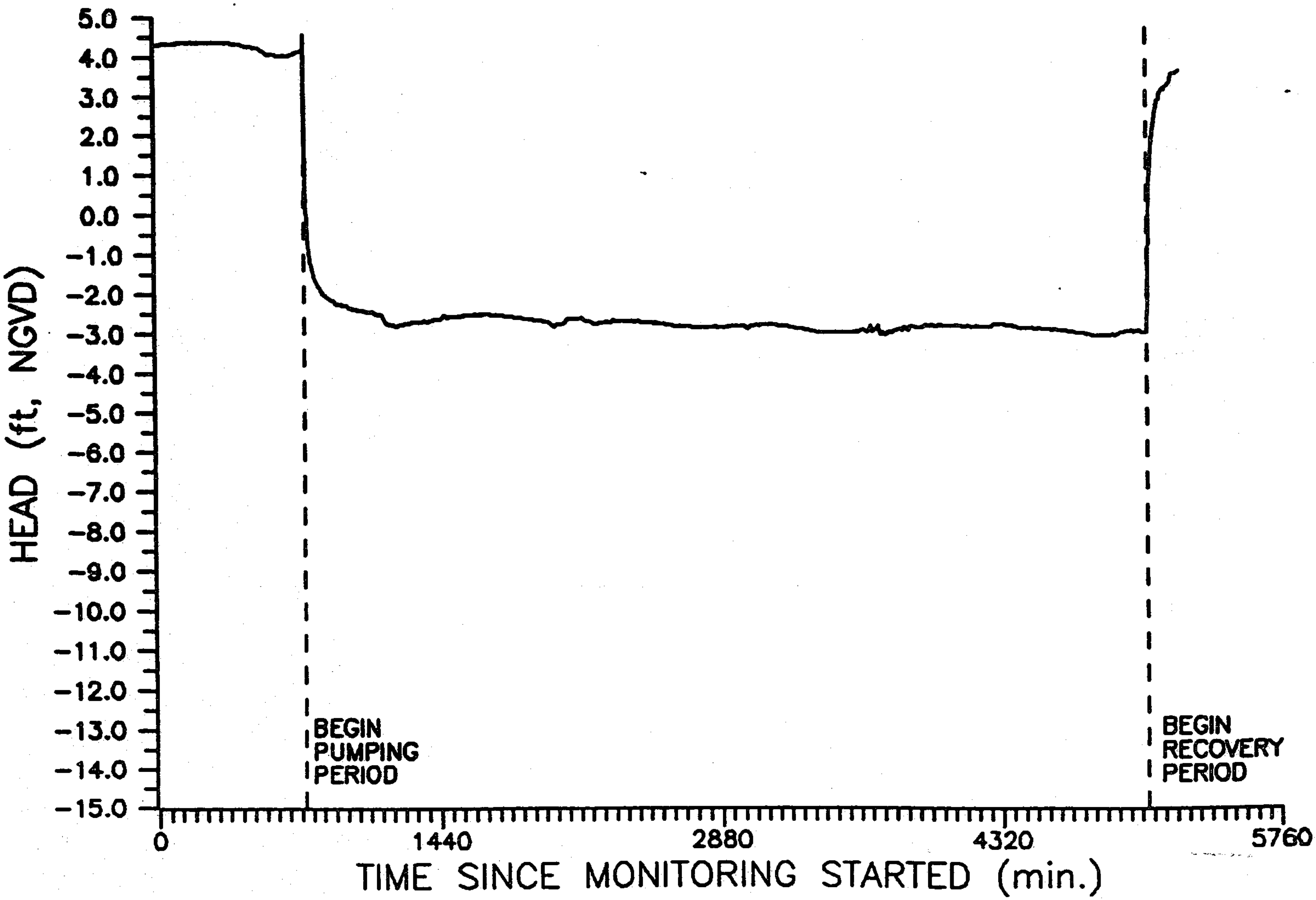


FIGURE 5-7

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WELL PZ136I

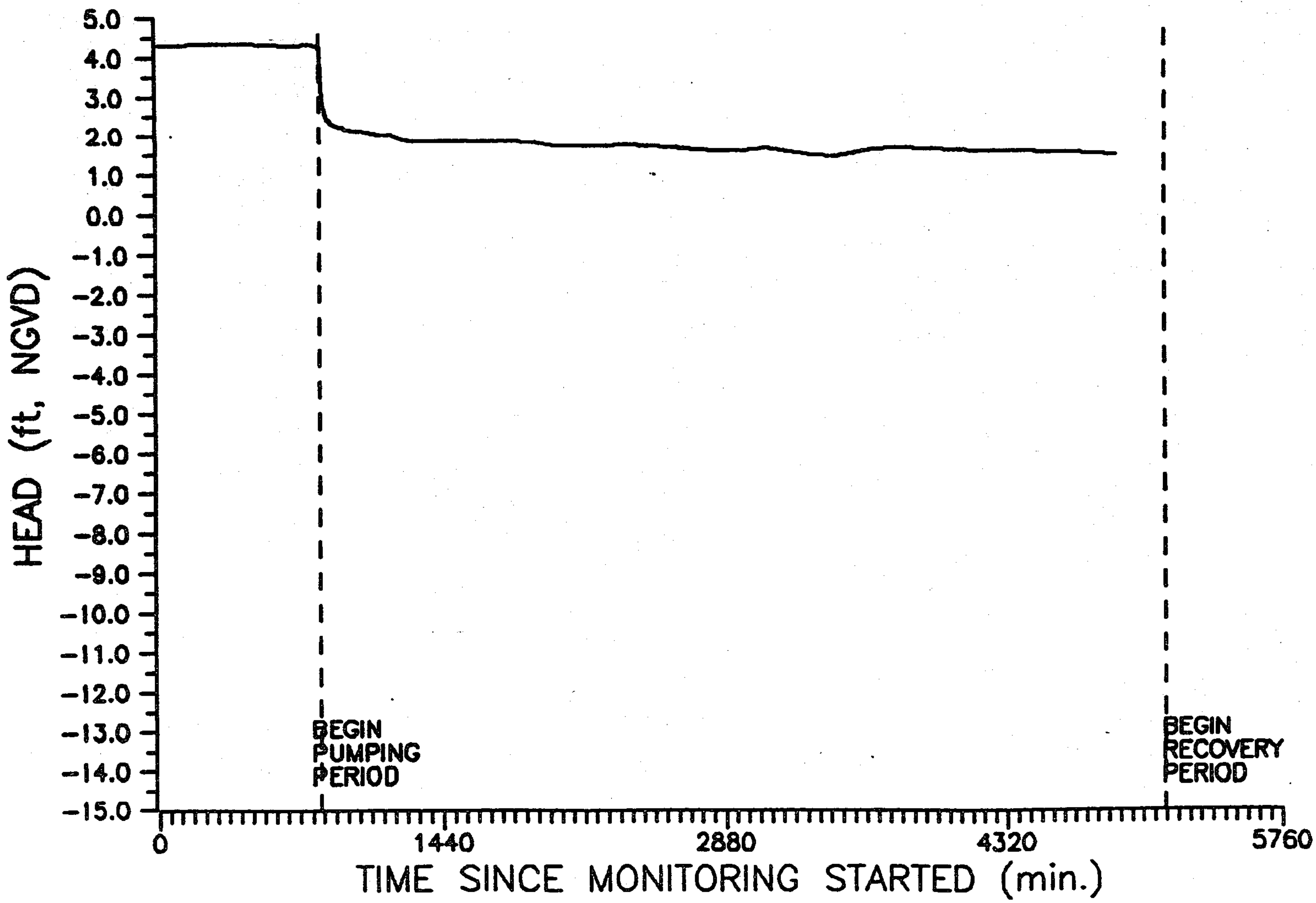


FIGURE 5-8

04:00:00 hours. Water levels then declined to the minimum levels observed which occurred during the time interval from 09:00:00 to 10:00:00. These fluctuations may result from pumping in adjacent areas. Static period water level fluctuations in the intermediate depth monitoring wells PZ36I, PZ87I and PZ136I appear as a somewhat muted representation of the deep monitoring well pattern. Water levels in the intermediate depth wells fluctuated by roughly 0.2 feet and ranged from 4.4 feet to 4.2 feet.

The maximum drawdowns observed in the production zone piezometer wells were 15.8, 10.0 and 7.8 feet for wells PZ36D, PZ87D and PZ136D, respectively. Drawdown in well PZ36I at the end of the 72 hour pumping period was 5.5 feet while drawdowns of 5.4 and 4.9 feet were observed in wells PZ87I and PZ136I, respectively. Expressed as hydraulic head relative to NGVD, the minimum pumping water level in well PZ36D is -11.5 feet while a minimum level of -0.5 feet was observed in well PZ36I. Comparison of the observed heads in wells PZ36I and PZ36D indicates that a downward-directed head differential of 10.3 feet existed at the location of this well cluster at the end of the pumping period. A comparison of heads in wells PZ136D and PZ136I indicates that the differential between the intermediate monitoring zone and the production zone is 4.9 feet at the location of this cluster. The observed increase in drawdown in the aquifer with depth of measurement indicates either the effects of partial penetration of the production well or anisotropy of the production zone though it is most likely a result of both effects. After the termination of pumpage, all wells indicated near recovery to static conditions after 170 minutes.

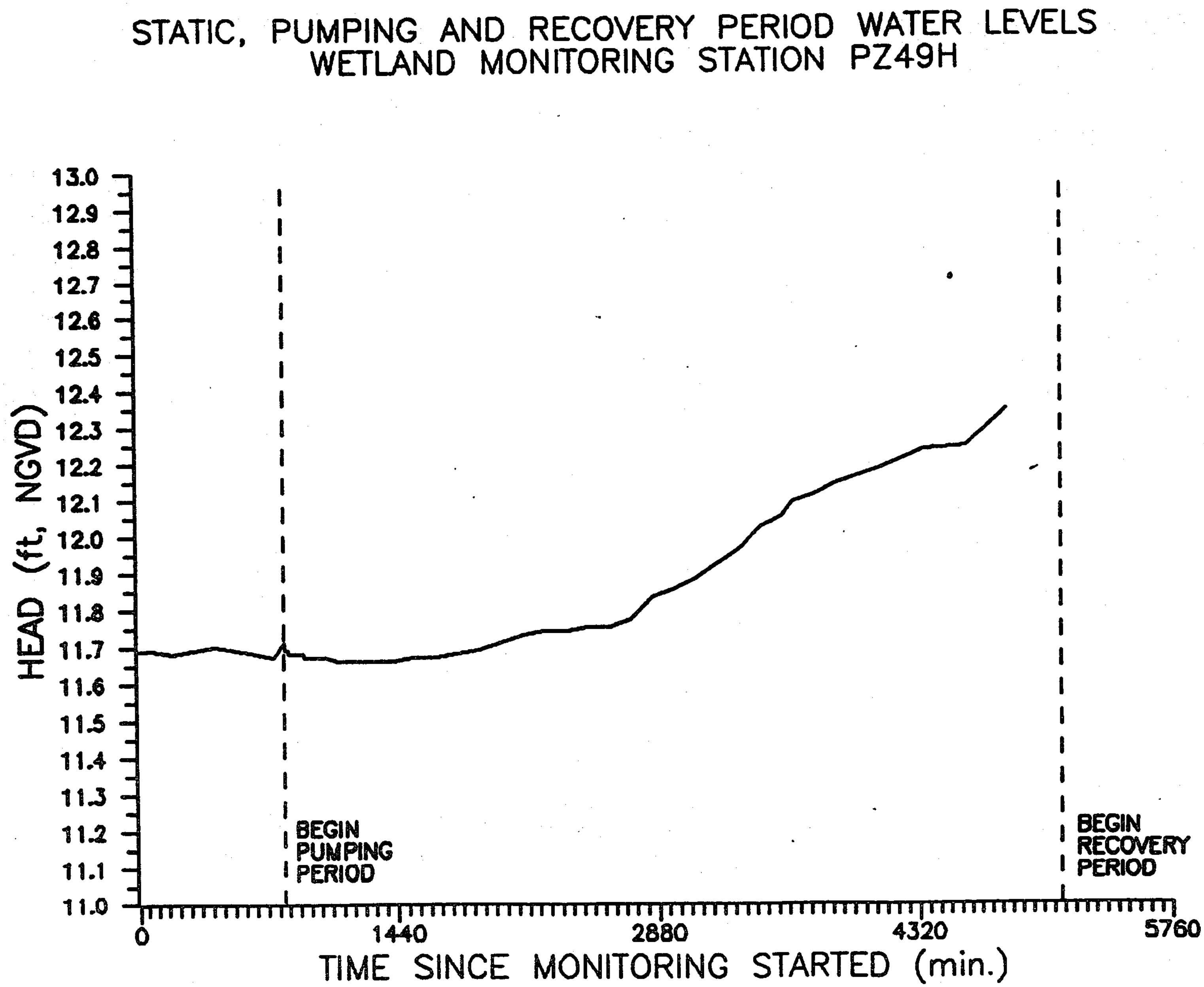
Wetland Monitoring Station Water Level Fluctuations

Monitoring for the APT was initially proposed at 17 stations. Of these stations, seven were installed for the monitoring of above-hardpan water levels. These stations include wells PZ206H, PZ106H, PZ49H, PZ36H, PZ87H, PZ136H, and MS-5. Additionally, three stations including PZ49H', PZ106H' and PZ206H' were proposed for monitoring water level fluctuations below the hardpan layer within the wetland. Sites PZ49H-H', PZ106H-H' and PZ206H-H' provided above and below hardpan monitoring within the wetland area adjacent to production well 7. The thickness of the hardpan layer at these locations is approximately 4.2, 2.1 and 2.6 feet, respectively.

At the time the APT was conducted, the Jensen Beach peninsula and much of south Florida was experiencing drier than normal conditions. In response to the dry conditions, water levels in the wetland area adjacent to production well 7 had declined to below land surface elevation. As shown by Table 3-2, the approximate rainfall deficit was on the order of 14.90 inches from January 1 to October 1, 1989 when compared with normal rainfall for the City of Stuart.

Only 10 stations were actually monitored through the course of the APT. The absence of standing water in above-hardpan wells PZ136H, PZ87H, PZ36H and PZ206H and in below-hardpan wells PZ49H', PZ106H', and PZ206H' resulted in the deletion of these wells from the APT monitoring schedule. The occurrence of measurable standing water in wells PZ49H, PZ106H and MS-5 suggests the existence of a perched water table condition at these locations.

Ambient above-hardpan water level elevations in the wetland area during the static monitoring period ranged from 11.7 feet (NGVD) at station PZ49H to 11.73 feet at station PZ106H and 12.6 feet at station MS-5 (Figure 5-9 through 5-11). After the initiation of



STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WETLAND MONITORING STATION PZ49H
HEAD (ft, NGVD)
13.0
12.9
12.8
12.7
12.6
12.5
12.4
12.3
12.2
12.1
12.0
11.9
11.8
11.7
11.6
11.5
11.4
11.3
11.2
11.1
11.0
BEGIN PUMPING PERIOD
BEGIN RECOVERY PERIOD
0
1440
2880
4320
5760
TIME SINCE MONITORING STARTED (min.)

FIGURE 5-9

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WETLAND MONITORING STATION PZ106H

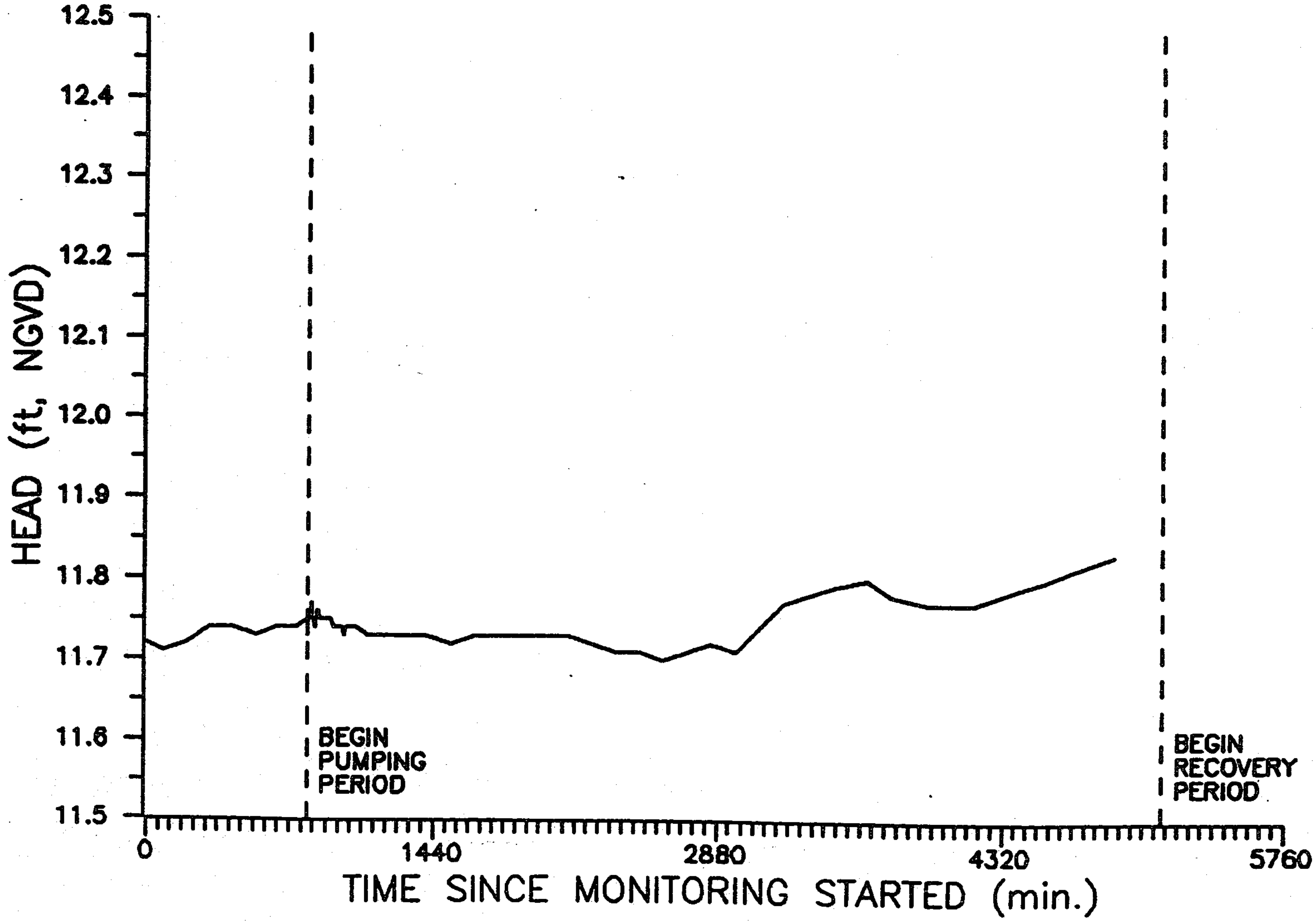


FIGURE 5-10

STATIC, PUMPING AND RECOVERY PERIOD WATER LEVELS
WETLAND MONITORING STATION MS-5

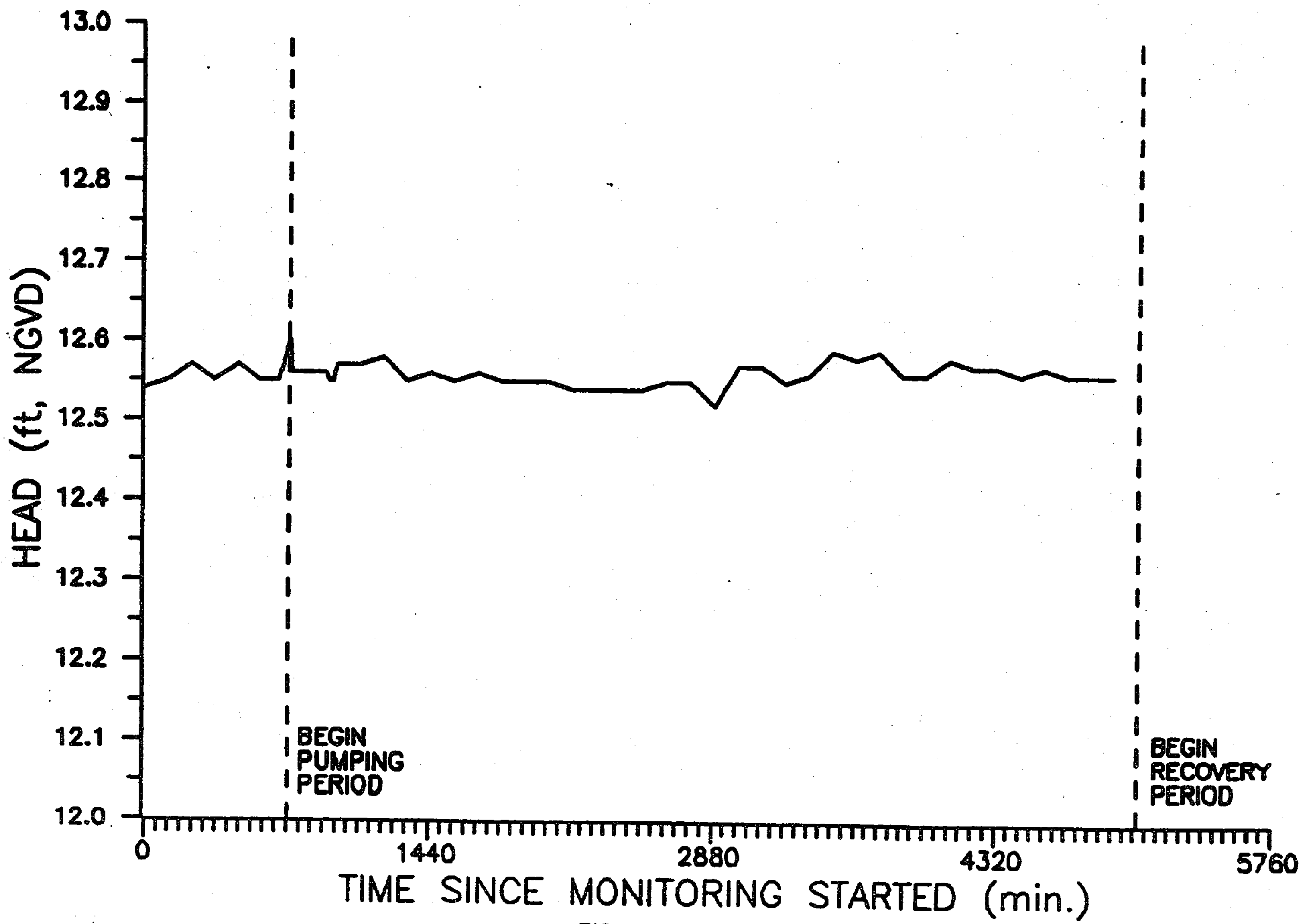


FIGURE 5-11

pumpage from production well 7, water levels fluctuations at the wetland monitoring stations ranged from a 0.05 foot decline registered at PZ49H after approximately 10 hours of pumping (Figure 5-9 and Appendix D) to a 0.05 foot decline at PZ106H after roughly 34 hours of pumping (Figure 5-10 and Appendix D). These declines could possibly be attributable to losses due to evapotranspiration. These declines are not due to pumping because the adjacent H' wells were all dry indicating that the water table was perched.

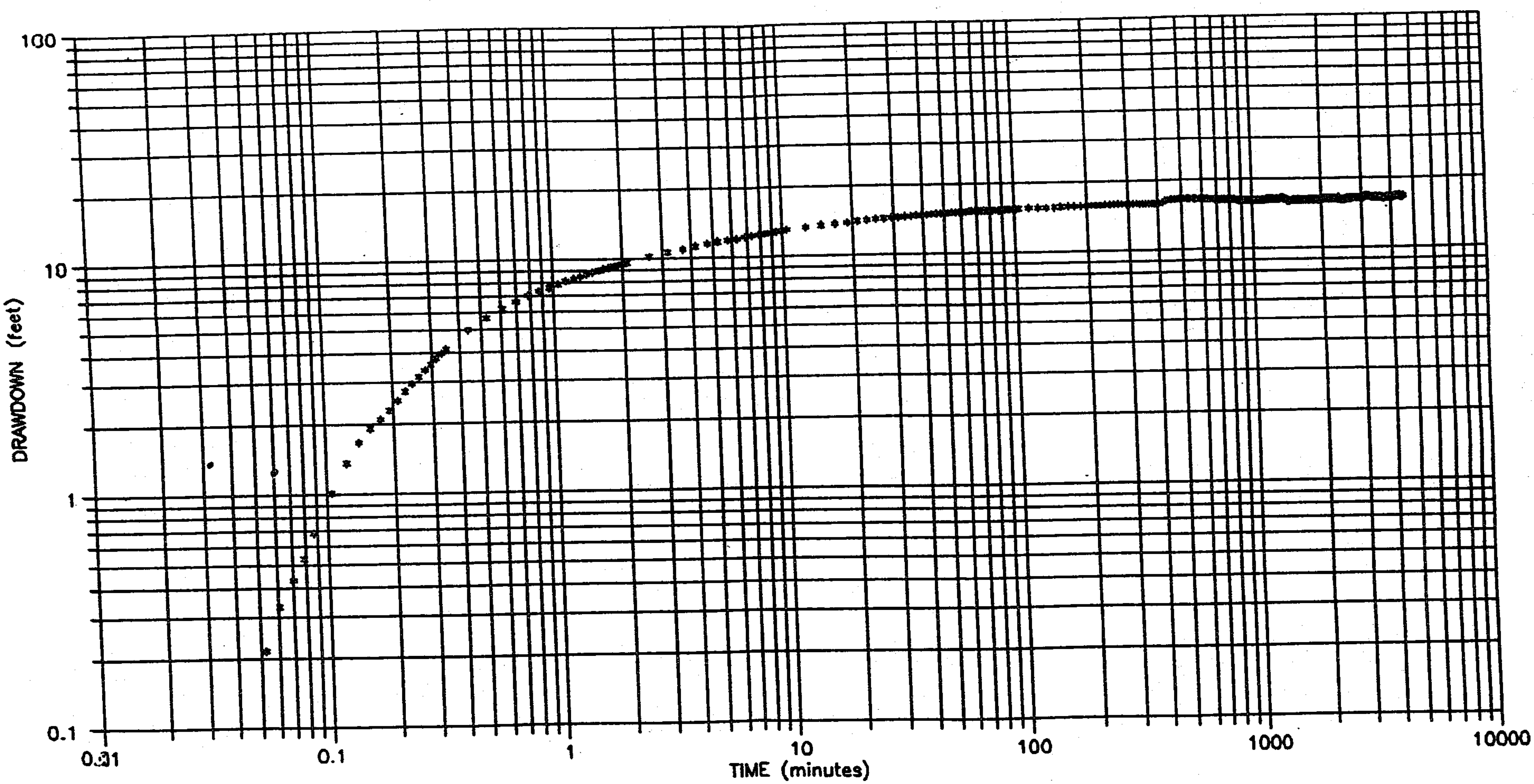
Water levels in well PZ49H and PZ106H begin to increase after the first 10 and 34 hours of pumping, respectively. The continuous increase in water levels observed at these stations resulted in an observed head of 12.35 feet in well PZ49H at the end of the pumping period while water levels attained an elevation of 11.84 feet at well PZ106H at the conclusion of the pumping period. These increases are likely the result of uncontrolled water leakage from the production well 7 wellhead that occurred while pumping this well. Water was observed to discharge from the wellhead during the pumping period at an estimated rate of three to four gallons per minute. The prolonged leakage from the wellhead during routine operation of production well 7 may explain the existence of measurable standing water in wells PZ49H, PZ106H and MS-5 at the time of testing. The rise in water level is not believed to be due to a light rain that fell 2,040 minutes into the test. The magnitude of the rise in water level in PZ49H (0.6 feet), the timing of the rise and the fact that the well closer to the pump (PZ49H) experienced a significant rise as opposed to the well farther away (PZ106H) indicates that the more likely explanation is pump leakage.

ANALYSIS

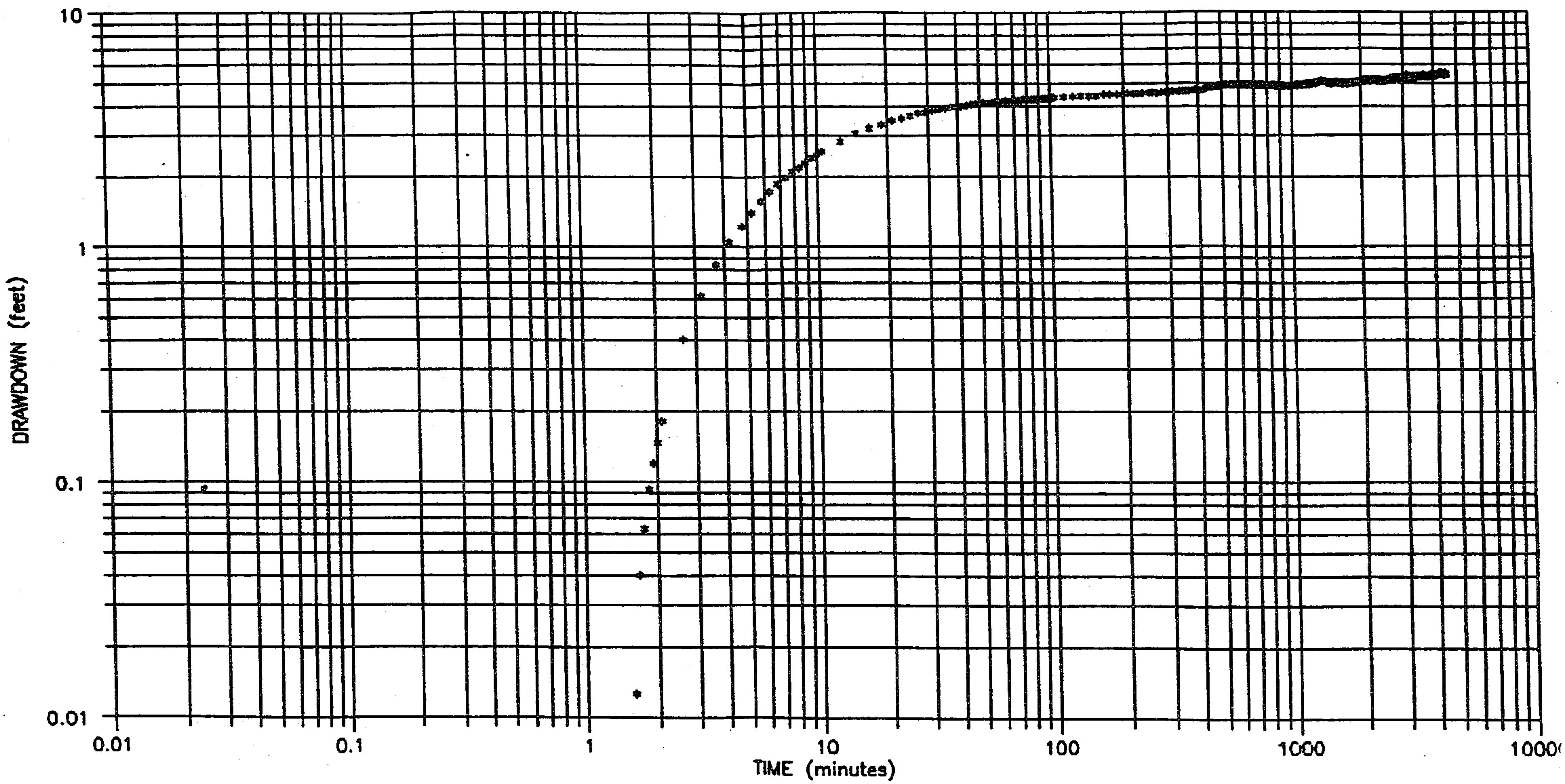
Aquifer Classification

Logarithmic time-drawdown plots for wells PZ36D, PZ36I, PZ87D, PZ87I, PZ136D and PZ136I are presented in Figures 5-12 through 5-17. The drawdown in response to the initiation of pumping is nearly instantaneous in the production zone monitoring wells. The first measurable drawdown in well PZ36D was registered after the first 3 seconds of pumping while a total of 27 seconds elapsed prior to the first occurrence of drawdown in well PZ136D. The intermediate depth monitoring well initial responses to the onset of pumping ranged from 1.5 minutes in well PZ36I to 6 minutes in well PZ136I.

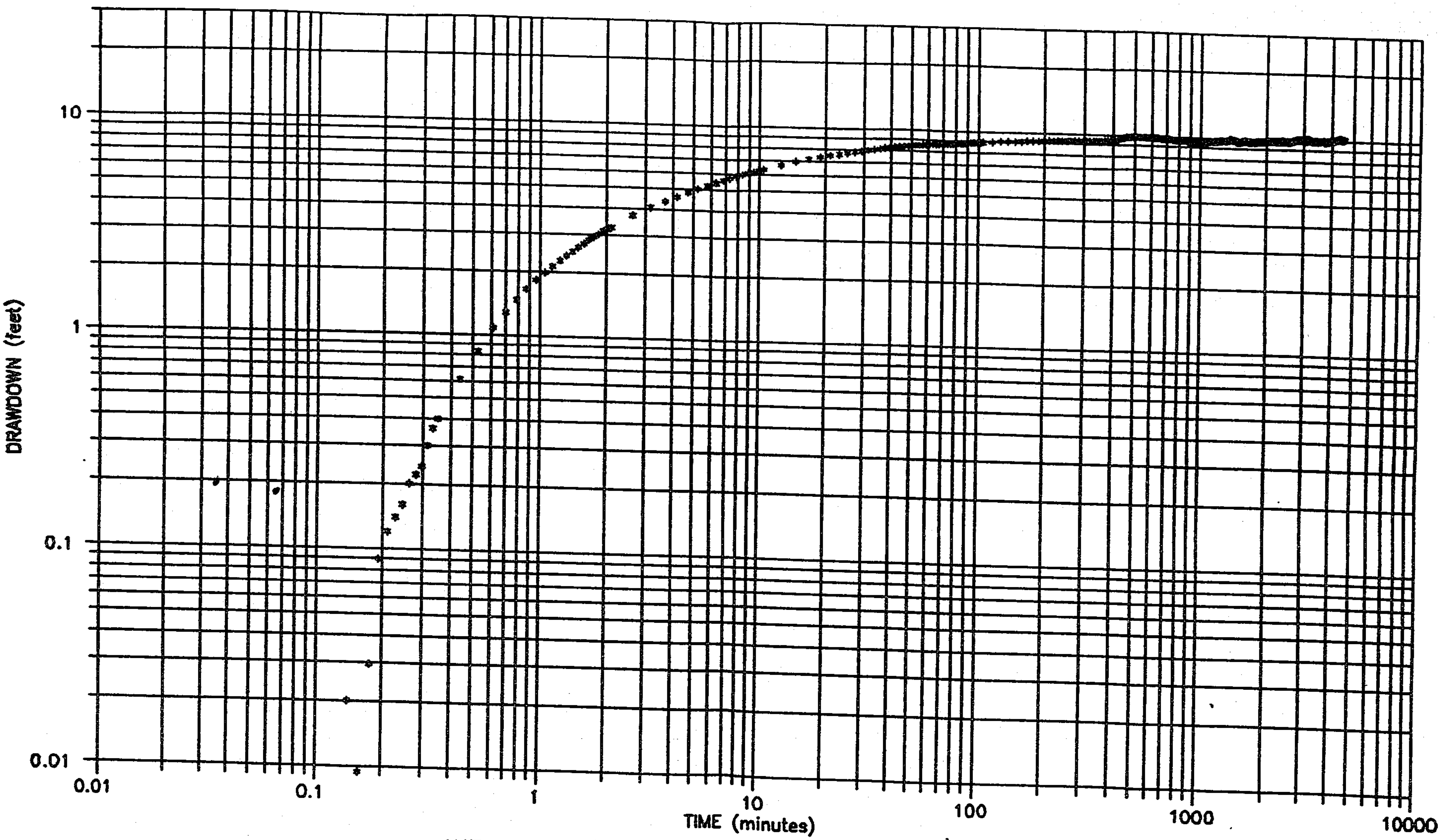
The leveling out of the time-drawdown plots from the production zone piezometer wells suggests that the aquifer may be classified as a semi-confined aquifer within the timeframe of the APT. Inspection of the intermediate depth well plots, however, indicates a continual increase of drawdown throughout the duration of the pumping period. Had the pumping period been extended for a sufficient period of time, it is likely that as drawdown in the intermediate depth wells approached that of the production zone wells, further increases in production zone drawdown would be observed. The occurrence of this pattern of drawdown in the production zone monitoring wells would provide some justification for an unconfined classification for the aquifer. Confirmation of the use of the unconfined designation for the aquifer, however, would require either retesting the aquifer for a longer pumping duration or at a higher pumping rate. Based solely on the evidence available, the semi-confined classification is appropriate.



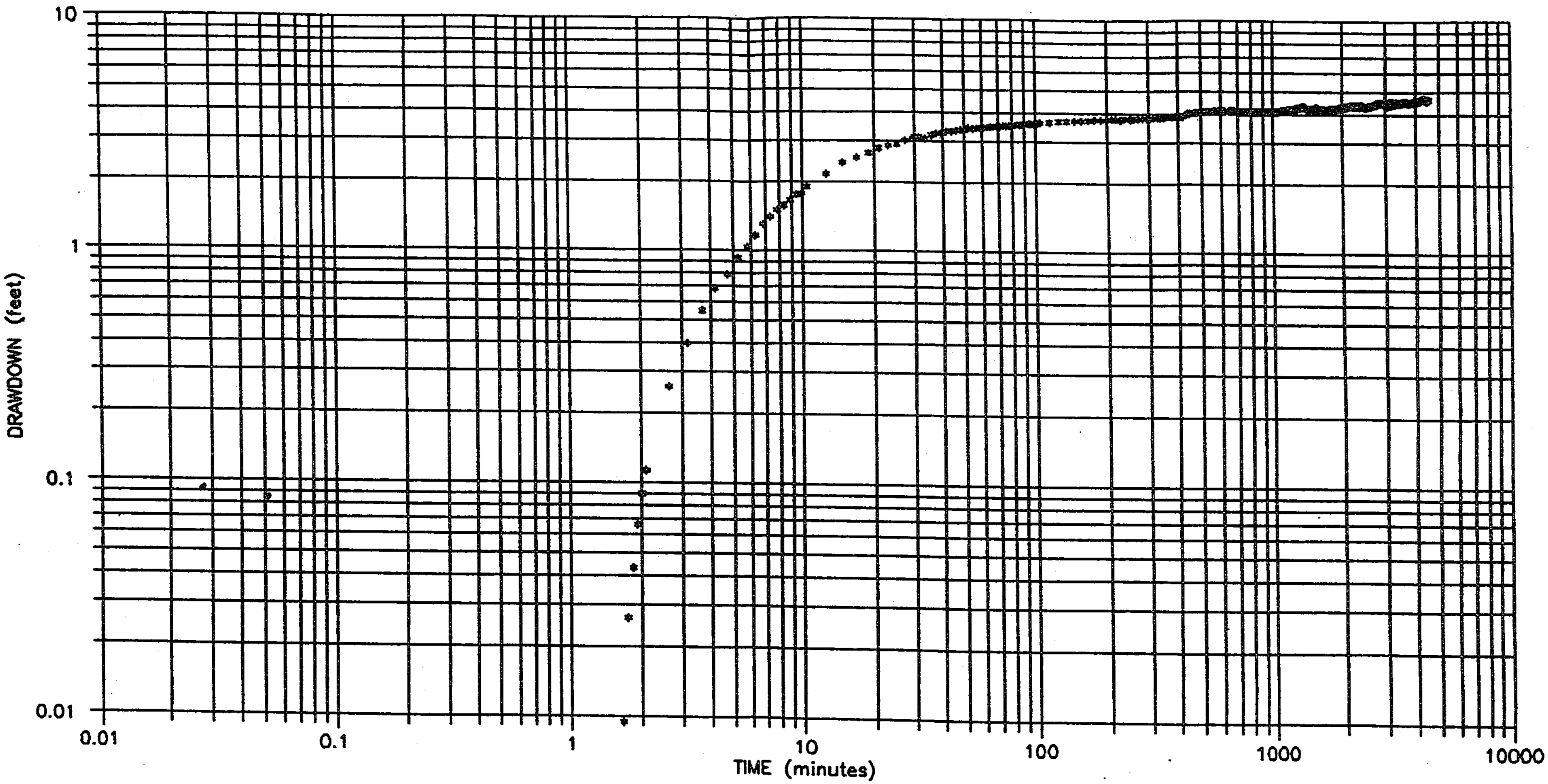
WELL PZ36D TIME – DRAWDOWN PLOT
FIGURE **5-12**



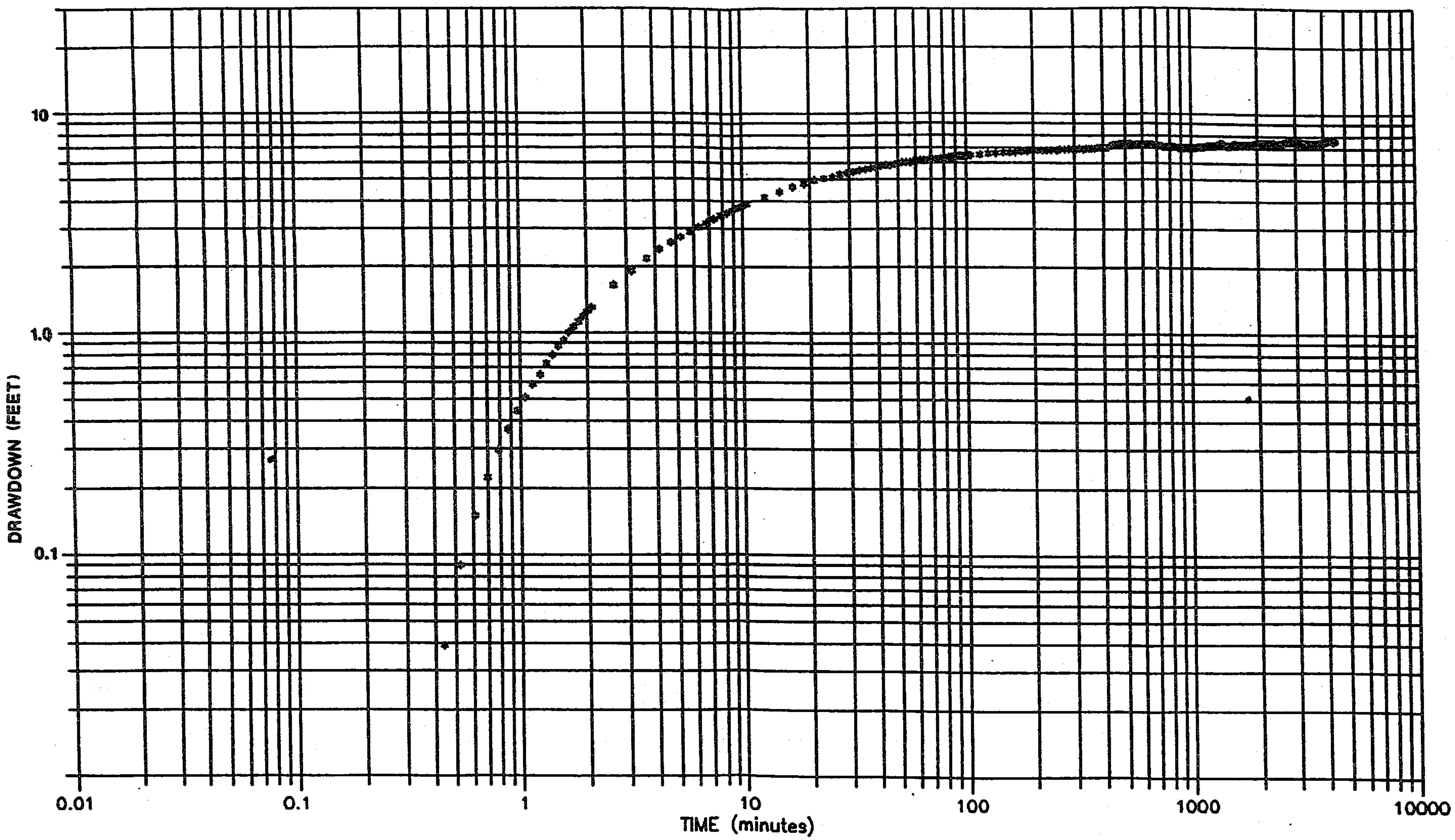
WELL PZ36I TIME – DRAWDOWN PLOT
FIGURE **5-13**



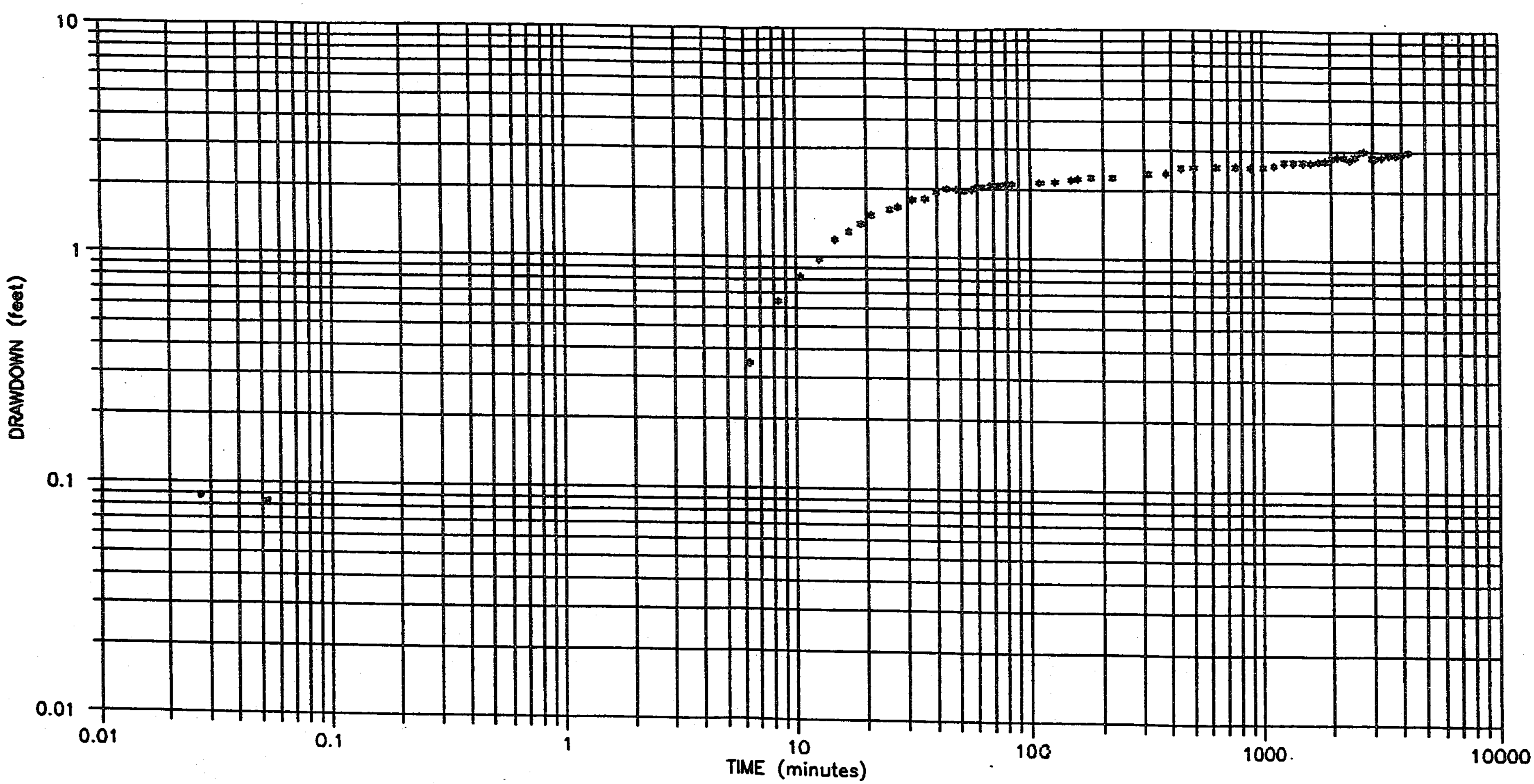
WELL PZ87D TIME – DRAWDOWN PLOT
FIGURE 5-14



WELL PZ87I TIME – DRAWDOWN PLOT
FIGURE 5-15



WELL PZ136D TIME – DRAWDOWN PLOT
FIGURE 5-16



WELL PZ136I TIME – DRAWDOWN PLOT
FIGURE **5-17**

Determination of Aquifer Characteristics

Analysis of the APT data focused on the time-drawdown data collected from production zone monitoring wells PZ36D, PZ87D and PZ136D. The Walton, Hantush semi-logarithmic, and Jacob distance drawdown methods were selected for the analysis of the test data. A description of the Walton and Hantush semi-logarithmic methods are provided in Kruseman and De Ridder (1979). The Jacob distance drawdown method is described in Lohman (1972). The Walton and Hantush semi-logarithmic methods are suitable for conditions of unsteady state flow within a semi-confined aquifer while the Jacob distance drawdown method applies to conditions of confined aquifer unsteady state flow. Computations and calculations for each well analyzed are contained in Appendixes G and H. The Jacob distance drawdown calculations are contained in Appendix F.

Because these methods are based on generalized hydrogeologic models of the aquifer system, they rely on a number of underlying assumptions that include the following:

- the aquifer is infinite in areal extent;
- the aquifer is homogeneous, isotropic and of uniform thickness;
- prior to pumping, the piezometric surface of the aquifer is horizontal;
- pumping is at a constant rate;
- the pumped well penetrates the entire aquifer and thus receives water from the entire thickness of the aquifer by laminar flow;
- flow to the well is in an unsteady state;
- the water removed from storage is discharged instantaneously with decline of head;
- the well diameter is infinitesimal such that storage in the well may be neglected; and
- for the Walton and Hantush semi-logarithmic methods, the aquifer is assumed to be semi-confined. For the Jacob distance drawdown method, the aquifer is assumed to be confined.

The conditions present at the test site are in conflict with most of these assumptions. These assumptions, however, are fundamental to the methods of conventional APT analysis commonly used. Though the methods provide an idealized representation of the actual aquifer configuration, they are nonetheless useful for obtaining estimates of the aquifer parameters.

The Jacob distance drawdown method provides a means for the computation of aquifer transmissivity and storage from simultaneously obtained drawdown measurements from two or more piezometers. Synchronous PZ36D, PZ87D and PZ136D drawdown measurements for time equal to ten minutes from the start of pumping were utilized in the calculation. Results of the distance drawdown analysis indicate a transmissivity of

16,500 gpd/ft and storage coefficient of 0.0004. The calculations for this method are presented in Appendix F and results are shown in Table 5-1.

The Walton (Walton 1962) method of analysis involves matching the observed time-drawdown data to a family of type curves based on the tables of calculated values for the function W(u,r/L) published by Hantush (1956). Comparison of the time-drawdown data for wells PZ36D, PZ87D and PZ136D to the Walton family of curves indicates that the data best fits the Walton curve corresponding to an r/L value equal to 0.2. The method calculated transmissivity values ranging from 23,500 gpd/ft for well PZ87D to 9,500 gpd for well PZ36D. Values for storage coefficient ranged from 0.0004 to 0.003 while values for leakance ranged from 6.5E-08 to 4.6E-07 1/sec. Calculations for the Walton method are presented in Appendix G and results are shown in Table 5-1.

The Hantush semi-logarithmic method involves plotting the time-drawdown data from a single piezometer on semi-logarithmic paper and through either examination or extrapolation of the data plot, determining the steady state drawdown. Steady state drawdown values of 7.15, 9.60 and 15.60 feet were thus determined through extrapolation for wells PZ136D, PZ87D and PZ36D, respectively. The method yielded transmissivity values ranging from 22,000 gpd/ft for well PZ136D to 10,000 gpd/ft for well PZ36D and storage coefficient values on the same order of magnitude as the Jacob distance drawdown method. The values for leakance obtained ranged from 4.8E-08 to 4.6E-07 1/sec. Calculations for this method are presented in Appendix H and results are shown in Table 5-1.

Results from all the analyses are summarized in Table 5-1. The aquifer parameters calculated for well PZ136D are presumed most appropriate for site characterization as drawdowns in this well are un-impacted by partial penetration effects. The transmissivity of the site is therefore in the range from 19,000 to 22,000 gpd/ft while the leakance value of approximately 5.0E-08 1/sec (0.032 gpd/ft^3) is characteristic. Based on a production zone thickness of 125 feet, the hydraulic conductivity of the production zone is 165 gpd/ft^2. The storage coefficient is somewhat reflective of early-time reaction of the aquifer to the imposed stress. Within this context, the storage coefficient of 0.0004 is determined. Additionally, considering that production well 7 was discharged at an average rate of 349 gpm with a recorded drawdown of 36 feet, the specific capacity of the well is determined as 9.7 gpm/ft.

TABLE 5-1

ANALYSES RESULTS

Well(s)	Method	T (gpd/ft)	S	k'/b' (sec^{-1})	k'/b' (gpd/ft^3)
PZ136D	Hantush	22,000	0.0003	4.3E-08	0.028
PZ136D	Walton	19,000	0.0004	6.5E-08	0.042
PZ87D	Hantush	19,500	0.0003	4.8E-08	0.031
PZ87D	Walton	14,800	0.0003	1.9E-07	0.078
PZ36D	Hantush	10,000	0.0002	3.2E-07	0.210
PZ36D	Walton	9,500	0.0003	4.6E-07	0.300
PZ136D PZ87D PZ36D	Jacob Distance Drawdown	16,500	0.0004	---	

Specific Capacity of Production Well 7: 349 gpm/36 feet = 9.7 gpm/feet

SECTION 6

CONCLUSIONS

A 72-hour aquifer performance test was conducted at the Martin County Utilities wellfield in order to generate aquifer characteristics for the surficial aquifer at this location. The test was preceded by a 12-hour static monitoring period and followed by a 3-hour recovery period. During the test the aquifer underlying the Martin County Utilities wellfield behaved as a semi-confined aquifer. Analysis of the test using Walton, Hantush semi-logarithmic, and Jacob distance drawdown methods indicated that the transmissivity of the aquifer site is in the range of 19,000 to 22,000 gpd/ft while the leakance value is approximately 5.0 E-08 1/sec (0.032 gpd/ft^3). Based on a production zone thickness of 125 feet, the hydraulic conductivity of the production zone is 165 gpd/ft^2. The storage coefficient reflects early-time reaction of the aquifer to the imposed pumping stress. Within this context, the storage coefficient is 0.0004. The specific capacity of the well was determined to be 9.7 gpm/ft.

At the time of the test, groundwater present at three wetland monitoring stations was perched above a hardpan layer. The groundwater in the wetland was not hydraulically connected to the aquifer below as indicated by wells below the hardpan which were dry. Water levels in two wetland monitoring wells began to increase during the test. While a light rain fell during the APT, the timing of the rise, the magnitude of the rise, and the fact that the well closer to the pump experienced a significant rise in water level (0.6 feet) indicates that the rise is not due to rainfall. These increases are likely the result of uncontrolled water leakage from a small hole at the top of production well 7. Water was observed to discharge from the wellhead at a rate of 3 to 4 gpm. Prolonged leakage from the wellhead during the routine operation of this well may explain the existence of standing water in the three wetland monitoring wells.

The results of this test suggest that the hardpan layer where present underlying the wetland is significant in its ability to retard the downward flow of groundwater. The results of this test are not conclusive in indicating that this entire wetland is perched, other wetlands are perched, or that the wetlands are perched during both wet and dry season. Further investigation should be carried out to determine the degree of hydraulic disconnection between wetlands and the underlying aquifer.

SECTION 7

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Appendix A

JMM James M. Montgomery
Consulting Engineers Inc.

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PRE-TEST STATIC

SE2000
Environmental Logger
10/13 14:28

Unit# 4 STATIC PERIOD MONITORING

Setups:	INPUT 1	INPUT 2	INPUT 3	INPUT 4	INPUT 6
Type	Level (F)	Level (F)	Level (F)	Level (F)	Level (F)
I.D.	8700	360	870	13600	3600
Reference	0.000	0.000	0.000	0.000	0.000
SG	1.000	1.000	1.000	1.000	1.000
Linearity	0.000	0.000	0.000	0.000	0.000
Scale factor	30.008	10.002	9.983	9.995	49.905
Offset	-0.013	0.007	0.005	-0.014	0.108
Delay mSEC	50.000	50.000	50.000	50.000	50.000

Static Period Step 0 10/05 23:10:00

Elapsed Time (min)	PZ87D INPUT 1 (Dd,ft)	PZ36I INPUT 2 (Dd,ft)	PZ87I INPUT 3 (Dd,ft)	PZ136D INPUT 4 (Dd,ft)	PZ36D INPUT 6 (Dd,ft)
0.000	-0.019	-0.019	0.000	-0.009	-0.126
10.000	-0.019	-0.019	0.000	-0.025	-0.110
20.000	-0.019	-0.019	0.003	-0.028	-0.110
30.000	-0.038	-0.025	-0.003	-0.034	-0.126
40.000	-0.047	-0.028	-0.003	-0.041	-0.126
50.000	-0.047	-0.031	-0.006	-0.044	-0.141
60.000	-0.057	-0.034	-0.006	-0.050	-0.141
70.000	-0.057	-0.038	-0.006	-0.047	-0.141
80.000	-0.066	-0.041	-0.009	-0.053	-0.157
90.000	-0.066	-0.041	-0.009	-0.053	-0.157
100.000	-0.076	-0.041	-0.012	-0.056	-0.157
110.000	-0.076	-0.044	-0.012	-0.063	-0.157
120.000	-0.085	-0.047	-0.018	-0.072	-0.173
130.000	-0.085	-0.050	-0.018	-0.075	-0.173
140.000	-0.095	-0.050	-0.018	-0.082	-0.173
150.000	-0.095	-0.057	-0.022	-0.079	-0.189
160.000	-0.095	-0.057	-0.022	-0.088	-0.189
170.000	-0.095	-0.057	-0.018	-0.079	-0.189
180.000	-0.104	-0.066	-0.031	-0.088	-0.189

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PRE-TEST STATIC

190.000	-0.104	-0.069	-0.034	-0.088	-0.189
200.000	-0.104	-0.066	-0.031	-0.085	-0.189
210.000	-0.104	-0.066	-0.031	-0.085	-0.189
220.000	-0.114	-0.066	-0.031	-0.091	-0.204
230.000	-0.114	-0.063	-0.031	-0.085	-0.189
240.000	-0.104	-0.063	-0.028	-0.085	-0.204
250.000	-0.114	-0.066	-0.034	-0.085	-0.189
260.000	-0.114	-0.063	-0.031	-0.085	-0.189
270.000	-0.114	-0.063	-0.028	-0.079	-0.204
280.000	-0.104	-0.063	-0.028	-0.079	-0.189
290.000	-0.104	-0.063	-0.031	-0.079	-0.189
300.000	-0.104	-0.060	-0.028	-0.075	-0.189
310.000	-0.104	-0.060	-0.031	-0.075	-0.189
320.000	-0.104	-0.053	-0.028	-0.075	-0.189
330.000	-0.104	-0.053	-0.028	-0.072	-0.189
340.000	-0.095	-0.057	-0.028	-0.069	-0.189
350.000	-0.095	-0.053	-0.028	-0.069	-0.189
360.000	-0.095	-0.053	-0.025	-0.069	-0.173
370.000	-0.095	-0.050	-0.025	-0.063	-0.173
380.000	-0.085	-0.050	-0.025	-0.060	-0.173
390.000	-0.085	-0.047	-0.022	-0.050	-0.157
400.000	-0.076	-0.047	-0.025	-0.053	-0.157
410.000	-0.076	-0.044	-0.022	-0.050	-0.157
420.000	-0.057	-0.038	-0.015	-0.037	-0.157
430.000	-0.047	-0.031	-0.012	-0.022	-0.126
440.000	-0.038	-0.025	0.003	-0.009	-0.110
450.000	-0.019	-0.022	0.003	0.006	-0.110
460.000	-0.009	-0.015	0.003	0.012	-0.094
470.000	0.009	-0.012	0.006	0.022	-0.078
480.000	0.019	-0.009	0.012	0.034	-0.078
490.000	0.028	-0.006	0.009	0.041	-0.078
500.000	0.038	-0.003	0.015	0.050	-0.063
510.000	0.038	-0.003	0.012	0.056	-0.063
520.000	0.085	0.003	0.018	0.094	-0.015
530.000	0.123	0.015	0.031	0.132	0.015
540.000	0.161	0.034	0.047	0.164	0.047
550.000	0.190	0.050	0.066	0.183	0.078
560.000	0.209	0.060	0.069	0.205	0.094
570.000	0.228	0.069	0.079	0.221	0.126
580.000	0.237	0.072	0.082	0.234	0.141
590.000	0.256	0.076	0.088	0.237	0.157
600.000	0.266	0.076	0.098	0.259	0.157
610.000	0.275	0.082	0.098	0.259	0.173
620.000	0.285	0.085	0.094	0.259	0.189

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PRE-TEST STATIC

630.000	0.294	0.091	0.098	0.269	0.189
640.000	0.285	0.095	0.094	0.262	0.189
650.000	0.275	0.098	0.098	0.259	0.204
660.000	0.275	0.101	0.091	0.259	0.204
670.000	0.256	0.104	0.098	0.243	0.189
680.000	0.209	0.095	0.072	0.212	0.126
690.000	0.171	0.082	0.079	0.186	0.110

END

Appendix B

JMM James M. Montgomery
Consulting Engineers Inc.

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PUMPING PERIOD

SE2000
Environmental Logger
10/13 14:31

Unit# 4 PUMPING PERIOD MONITORING

Setups:	INPUT 1	INPUT 2	INPUT 3	INPUT 4	INPUT 5
Type	Level (F)	Level (F)	Level (F)	Level (F)	Level (F)
I.D.	8700	360	870	13600	3600
Reference	0.000	0.000	0.000	0.000	0.000
SG	1.000	1.000	1.000	1.000	1.000
Linearity	0.000	0.000	0.000	0.000	0.000
Scale factor	30.008	10.002	9.983	9.995	49.905
Offset	-0.013	0.007	0.005	-0.014	0.108
Delay mSEC	50.000	50.000	50.000	50.000	50.000

Pumping Period Step 0 10/06 11:30:01

Elapsed Time (min)	PZ87D INPUT 1 (Dd,ft)	PZ36I INPUT 2 (Dd,ft)	PZ87I INPUT 3 (Dd,ft)	PZ136D INPUT 4 (Dd,ft)	PZ36D INPUT 5 (Dd,ft)
0.0000	-0.047	-0.009	-0.012	-0.050	0.000
0.0083	-0.038	-0.009	-0.012	-0.050	-0.015
0.0166	-0.047	-0.006	-0.015	-0.050	-0.015
0.0250	-0.038	-0.009	-0.012	-0.050	-0.015
0.0333	-0.038	-0.006	-0.012	-0.050	-0.015
0.0416	-0.038	-0.009	-0.012	-0.053	0.063
0.0500	-0.114	-0.006	-0.012	-0.047	0.204
0.0583	-0.095	-0.006	-0.015	-0.053	0.315
0.0666	-0.085	-0.006	-0.012	-0.047	0.409
0.0750	0.019	-0.006	-0.012	-0.050	0.504
0.0833	-0.076	-0.006	-0.015	-0.047	0.646
0.1000	-0.047	-0.009	-0.012	-0.047	0.961
0.1166	-0.076	-0.009	-0.012	-0.050	1.292
0.1333	0.019	-0.009	-0.015	-0.047	1.575
0.1500	0.009	-0.006	-0.015	-0.047	1.812
0.1666	0.028	-0.009	-0.012	-0.044	1.985
0.1833	0.085	-0.012	-0.015	-0.037	2.158
0.2000	0.114	-0.012	-0.015	-0.037	2.379
0.2166	0.133	-0.012	-0.018	-0.037	2.600

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PUMPING PERIOD

0.2333	0.152	-0.015	-0.018	-0.037	2.804
0.2500	0.190	-0.015	-0.018	-0.031	2.993
0.2666	0.209	-0.015	-0.018	-0.025	3.198
0.2833	0.228	-0.015	-0.025	-0.022	3.387
0.3000	0.285	-0.019	-0.025	-0.012	3.592
0.3166	0.342	-0.019	-0.025	-0.006	3.766
0.3333	0.380	-0.025	-0.028	-0.003	3.923
0.4166	0.579	-0.031	-0.041	0.037	4.743
0.5000	0.788	-0.041	-0.053	0.085	5.373
0.5833	1.026	-0.053	-0.063	0.142	5.877
0.6666	1.216	-0.060	-0.075	0.212	6.303
0.7500	1.387	-0.063	-0.082	0.281	6.665
0.8333	1.558	-0.069	-0.085	0.348	6.980
0.9166	1.729	-0.076	-0.085	0.421	7.216
1.0000	1.872	-0.076	-0.082	0.484	7.453
1.0833	2.005	-0.066	-0.075	0.554	7.689
1.1666	2.138	-0.057	-0.066	0.614	7.878
1.2500	2.262	-0.044	-0.050	0.690	8.052
1.3333	2.366	-0.028	-0.037	0.753	8.209
1.4166	2.480	-0.006	-0.025	0.823	8.367
1.5000	2.585	0.012	-0.006	0.876	8.509
1.5833	2.690	0.038	0.009	0.952	8.619
1.6666	2.775	0.060	0.025	1.003	8.745
1.7500	2.861	0.088	0.041	1.063	8.855
1.8333	2.965	0.114	0.063	1.123	8.950
1.9166	3.022	0.139	0.085	1.180	9.029
2.0000	3.089	0.171	0.107	1.231	9.139
2.5000	3.536	0.380	0.246	1.554	9.706
3.0000	3.868	0.586	0.376	1.810	10.116
3.5000	4.134	0.798	0.521	2.048	10.400
4.0000	4.372	0.991	0.651	2.254	10.667
4.5000	4.600	1.165	0.749	2.425	10.920
5.0000	4.790	1.330	0.882	2.586	11.109
5.5000	4.961	1.482	0.989	2.735	11.282
6.0000	5.123	1.625	1.106	2.881	11.392
6.5000	5.275	1.755	1.233	3.017	11.597
7.0000	5.399	1.872	1.331	3.131	11.723
7.5000	5.532	1.986	1.423	3.251	11.849
8.0000	5.627	2.065	1.492	3.346	11.928
8.5000	5.731	2.173	1.574	3.444	12.054
9.0000	5.826	2.271	1.657	3.530	12.149
9.5000	5.912	2.350	1.679	3.602	12.227
10.0000	6.007	2.433	1.799	3.678	12.322
12.0000	6.302	2.680	2.036	3.954	12.590

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PUMPING PERIOD

14.0000	6.568	2.902	2.283	4.198	12.826
16.0000	6.748	3.060	2.409	4.397	13.015
18.0000	6.910	3.177	2.517	4.559	13.173
20.0000	7.081	3.310	2.646	4.714	13.315
22.0000	7.167	3.371	2.710	4.812	13.393
24.0000	7.281	3.456	2.760	4.891	13.520
26.0000	7.395	3.538	2.868	5.015	13.598
28.0000	7.471	3.573	2.915	5.097	13.661
30.0000	7.547	3.614	2.963	5.160	13.740
32.0000	7.613	3.675	2.909	5.242	13.819
34.0000	7.661	3.706	3.023	5.299	13.866
36.0000	7.737	3.754	3.076	5.369	13.929
38.0000	7.775	3.754	3.083	5.394	13.961
40.0000	7.832	3.786	3.136	5.455	14.008
42.0000	7.870	3.801	3.149	5.502	14.040
44.0000	7.908	3.836	3.162	5.537	14.087
46.0000	7.946	3.868	3.190	5.581	14.118
48.0000	7.975	3.871	3.190	5.610	14.150
50.0000	8.032	3.915	3.253	5.676	14.197
52.0000	8.041	3.909	3.228	5.689	14.213
54.0000	8.070	3.922	3.253	5.711	14.244
56.0000	8.108	3.953	3.260	5.743	14.292
58.0000	8.136	3.957	3.269	5.774	14.307
60.0000	8.155	3.979	3.282	5.797	14.323
62.0000	8.184	3.992	3.307	5.822	14.355
64.0000	8.184	3.985	3.285	5.825	14.355
66.0000	8.222	4.007	3.320	5.873	14.386
68.0000	8.212	3.995	3.295	5.857	14.386
70.0000	8.250	4.014	3.336	5.888	14.402
72.0000	8.260	4.007	3.336	5.904	14.418
74.0000	8.269	4.033	3.323	5.929	14.449
76.0000	8.298	4.007	3.345	5.939	14.465
78.0000	8.307	4.042	3.351	5.948	14.465
80.0000	8.336	4.042	3.386	5.977	14.481
82.0000	8.345	4.055	3.377	5.996	14.449
84.0000	8.345	4.064	3.370	6.015	14.449
86.0000	8.364	4.061	3.370	6.018	14.512
88.0000	8.393	4.080	3.383	6.037	14.544
90.0000	8.412	4.093	3.405	6.059	14.560
92.0000	8.412	4.106	3.402	6.069	14.575
94.0000	8.431	4.106	3.418	6.081	14.591
96.0000	8.431	4.096	3.399	6.097	14.591
98.0000	8.450	4.128	3.421	6.104	14.607
100.0000	8.469	4.131	3.440	6.119	14.623

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PUMPING PERIOD

110.0000	8.507	4.153	3.453	6.164	14.670
120.0000	8.573	4.178	3.491	6.221	14.717
130.0000	8.592	4.201	3.494	6.249	14.749
140.0000	8.611	4.188	3.503	6.275	14.764
150.0000	8.621	4.201	3.503	6.290	14.796
160.0000	8.668	4.251	3.529	6.325	14.827
170.0000	8.678	4.254	3.538	6.357	14.859
180.0000	8.697	4.258	3.541	6.360	14.875
190.0000	8.706	4.261	3.544	6.379	14.890
200.0000	8.744	4.292	3.570	6.408	14.922
210.0000	8.754	4.283	3.567	6.411	14.922
220.0000	8.744	4.286	3.548	6.423	14.938
230.0000	8.802	4.315	3.598	6.465	14.953
240.0000	8.802	4.331	3.579	6.465	14.969
250.0000	8.821	4.324	3.595	6.496	14.985
260.0000	8.840	4.324	3.611	6.512	14.985
270.0000	8.849	4.350	3.620	6.515	15.001
280.0000	8.859	4.365	3.627	6.541	15.016
290.0000	8.868	4.369	3.636	6.541	15.001
300.0000	8.878	4.391	3.646	6.550	15.016
310.0000	8.878	4.375	3.642	6.541	15.016
320.0000	8.887	4.391	3.655	6.560	15.032
330.0000	8.897	4.397	3.668	6.572	15.032
340.0000	8.906	4.407	3.674	6.575	15.048
350.0000	8.916	4.410	3.674	6.588	15.048
360.0000	8.925	4.419	3.680	6.617	15.064
370.0000	8.935	4.426	3.690	6.626	15.064
380.0000	8.944	4.429	3.696	6.629	15.064
390.0000	8.954	4.432	3.699	6.636	15.080
400.0000	8.963	4.441	3.709	6.651	15.174
410.0000	9.163	4.524	3.766	6.778	15.489
420.0000	9.229	4.559	3.801	6.841	15.552
430.0000	9.267	4.578	3.819	6.870	15.568
440.0000	9.286	4.587	3.832	6.892	15.584
450.0000	9.305	4.603	3.845	6.914	15.615
460.0000	9.315	4.609	3.854	6.924	15.615
470.0000	9.334	4.622	3.867	6.939	15.631
480.0000	9.353	4.644	3.886	6.946	15.663
490.0000	9.334	4.660	3.902	6.924	15.647
500.0000	9.334	4.660	3.905	6.908	15.631
510.0000	9.324	4.663	3.908	6.901	15.615
520.0000	9.305	4.663	3.902	6.879	15.600
530.0000	9.315	4.666	3.908	6.876	15.615
540.0000	9.305	4.673	3.911	6.873	15.615

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PUMPING PERIOD

550.0000	9.296	4.676	3.911	6.863	15.600
560.0000	9.296	4.679	3.914	6.854	15.600
570.0000	9.296	4.676	3.914	6.854	15.584
580.0000	9.286	4.682	3.918	6.851	15.584
590.0000	9.286	4.685	3.921	6.848	15.584
600.0000	9.286	4.689	3.921	6.838	15.584
610.0000	9.286	4.689	3.924	6.841	15.584
620.0000	9.277	4.692	3.927	6.822	15.568
630.0000	9.258	4.692	3.924	6.829	15.552
640.0000	9.267	4.689	3.921	6.825	15.552
650.0000	9.258	4.689	3.921	6.816	15.536
660.0000	9.239	4.685	3.914	6.800	15.521
670.0000	9.220	4.670	3.905	6.781	15.489
680.0000	9.201	4.663	3.899	6.772	15.489
690.0000	9.191	4.660	3.899	6.765	15.473
700.0000	9.182	4.660	3.902	6.762	15.458
710.0000	9.172	4.657	3.892	6.730	15.458
720.0000	9.163	4.654	3.889	6.686	15.442
730.0000	9.163	4.666	3.892	6.724	15.442
740.0000	9.153	4.650	3.892	6.727	15.426
750.0000	9.144	4.650	3.889	6.721	15.426
760.0000	9.144	4.647	3.889	6.724	15.426
770.0000	9.144	4.650	3.886	6.715	15.426
780.0000	9.134	4.650	3.889	6.715	15.426
790.0000	9.134	4.650	3.889	6.705	15.410
800.0000	9.125	4.654	3.892	6.708	15.410
810.0000	9.134	4.657	3.895	6.705	15.410
820.0000	9.096	4.647	3.889	6.686	15.332
830.0000	9.077	4.635	3.880	6.667	15.316
840.0000	9.068	4.635	3.873	6.667	15.316
850.0000	9.077	4.631	3.870	6.661	15.316
860.0000	9.068	4.628	3.870	6.658	15.316
870.0000	9.068	4.631	3.870	6.664	15.316
880.0000	9.058	4.635	3.876	6.655	15.316
890.0000	9.058	4.635	3.876	6.658	15.316
900.0000	9.068	4.638	3.880	6.667	15.316
910.0000	9.068	4.641	3.880	6.645	15.316
920.0000	9.068	4.644	3.883	6.661	15.316
930.0000	9.068	4.647	3.886	6.648	15.316
940.0000	9.068	4.647	3.889	6.645	15.316
950.0000	9.068	4.647	3.889	6.645	15.316
960.0000	9.068	4.647	3.886	6.661	15.316
970.0000	9.068	4.650	3.886	6.661	15.316
980.0000	9.068	4.650	3.889	6.658	15.316

990.0000	9.068	4.657	3.895	6.667	15.316
1000.0000	9.077	4.660	3.899	6.667	15.316
1010.0000	9.087	4.666	3.902	6.677	15.332
1020.0000	9.087	4.673	3.908	6.686	15.332
1030.0000	9.106	4.679	3.918	6.696	15.347
1040.0000	9.115	4.689	3.924	6.705	15.363
1050.0000	9.115	4.692	3.927	6.712	15.363
1060.0000	9.115	4.692	3.927	6.712	15.379
1070.0000	9.134	4.698	3.933	6.724	15.379
1080.0000	9.144	4.701	3.936	6.727	15.379
1090.0000	9.144	4.711	3.943	6.737	15.395
1100.0000	9.153	4.714	3.949	6.746	15.410
1110.0000	9.163	4.723	3.955	6.753	15.410
1120.0000	9.172	4.723	3.955	6.756	15.426
1130.0000	9.182	4.730	3.962	6.762	15.426
1140.0000	9.182	4.736	3.974	6.768	15.442
1150.0000	9.191	4.736	3.981	6.781	15.442
1160.0000	9.201	4.739	3.984	6.784	15.458
1170.0000	9.210	4.746	3.987	6.791	15.458
1180.0000	9.210	4.749	3.990	6.794	15.458
1190.0000	9.220	4.752	3.993	6.797	15.458
1200.0000	9.220	4.761	4.000	6.800	15.458
1210.0000	9.220	4.758	4.000	6.803	15.458
1220.0000	9.229	4.768	4.006	6.810	15.473
1230.0000	9.258	4.784	4.022	6.832	15.489
1240.0000	9.277	4.796	4.035	6.848	15.505
1250.0000	9.296	4.812	4.047	6.854	15.505
1260.0000	9.324	4.818	4.047	6.889	15.536
1270.0000	9.362	4.831	4.060	6.924	15.568
1280.0000	9.391	4.841	4.072	6.949	15.584
1290.0000	9.410	4.856	4.098	6.968	15.600
1300.0000	9.362	4.847	4.076	6.924	15.584
1310.0000	9.362	4.850	4.082	6.917	15.584
1320.0000	9.362	4.844	4.076	6.908	15.584
1330.0000	9.362	4.847	4.085	6.911	15.568
1340.0000	9.353	4.837	4.069	6.886	15.568
1350.0000	9.220	4.809	4.050	6.819	15.269
1360.0000	9.172	4.765	4.009	6.775	15.221
1370.0000	9.153	4.758	4.003	6.765	15.221
1380.0000	9.163	4.768	4.016	6.775	15.221
1390.0000	9.144	4.752	3.997	6.759	15.221
1400.0000	9.144	4.765	4.009	6.765	15.237
1410.0000	9.134	4.755	3.990	6.762	15.237
1420.0000	9.163	4.761	4.003	6.784	15.253

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PUMPING PERIOD

1430.0000	9.125	4.733	3.978	6.753	15.253
1440.0000	9.172	4.777	4.019	6.819	15.269
1450.0000	9.191	4.777	4.009	6.832	15.300
1460.0000	9.210	4.771	4.006	6.838	15.316
1470.0000	9.210	4.774	4.006	6.851	15.332
1480.0000	9.220	4.774	3.997	6.848	15.347
1490.0000	9.258	4.796	4.038	6.898	15.363
1500.0000	9.286	4.828	4.057	6.924	15.379
1510.0000	9.267	4.793	4.038	6.917	15.347
1520.0000	9.229	4.787	4.012	6.876	15.347
1530.0000	9.239	4.796	4.035	6.886	15.332
1540.0000	9.220	4.784	4.012	6.867	15.332
1550.0000	9.210	4.749	4.016	6.860	15.300
1560.0000	9.172	4.765	3.987	6.838	15.316
1570.0000	9.191	4.780	4.012	6.860	15.332
1580.0000	9.182	4.752	3.978	6.857	15.316
1590.0000	9.163	4.708	3.968	6.819	15.300
1600.0000	9.182	4.771	3.990	6.832	15.332
1610.0000	9.201	4.752	4.005	6.838	15.332
1620.0000	9.172	4.752	3.968	6.829	15.332
1630.0000	9.182	4.755	3.978	6.832	15.332
1640.0000	9.182	4.755	3.974	6.835	15.332
1650.0000	9.182	4.746	3.984	6.838	15.316
1660.0000	9.172	4.752	3.978	6.832	15.316
1670.0000	9.172	4.730	3.974	6.825	15.300
1680.0000	9.172	4.736	3.971	6.832	15.300
1690.0000	9.182	4.749	3.987	6.838	15.316
1700.0000	9.191	4.774	4.003	6.867	15.316
1710.0000	9.182	4.765	3.987	6.851	15.316
1720.0000	9.201	4.765	4.003	6.854	15.316
1730.0000	9.210	4.765	4.006	6.863	15.316
1740.0000	9.201	4.777	4.012	6.867	15.316
1750.0000	9.201	4.774	4.000	6.860	15.316
1760.0000	9.210	4.768	4.003	6.863	15.316
1770.0000	9.210	4.777	4.009	6.876	15.316
1780.0000	9.220	4.777	4.012	6.873	15.316
1790.0000	9.220	4.780	4.012	6.879	15.332
1800.0000	9.229	4.793	4.022	6.892	15.332
1810.0000	9.220	4.787	4.022	6.889	15.332
1820.0000	9.239	4.799	4.035	6.892	15.347
1830.0000	9.248	4.809	4.041	6.901	15.347
1840.0000	9.258	4.815	4.047	6.911	15.363
1850.0000	9.258	4.822	4.053	6.920	15.363
1860.0000	9.267	4.825	4.057	6.924	15.363

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PUMPING PERIOD

1870.0000	9.277	4.828	4.063	6.933	15.379
1880.0000	9.286	4.834	4.066	6.933	15.379
1890.0000	9.286	4.831	4.066	6.943	15.379
1900.0000	9.305	4.834	4.069	6.958	15.395
1910.0000	9.315	4.844	4.079	6.971	15.395
1920.0000	9.315	4.853	4.088	6.971	15.395
1930.0000	9.324	4.850	4.091	6.971	15.395
1940.0000	9.334	4.856	4.091	6.971	15.395
1950.0000	9.334	4.860	4.098	6.981	15.410
1960.0000	9.334	4.863	4.098	6.984	15.410
1970.0000	9.334	4.866	4.098	6.984	15.410
1980.0000	9.353	4.872	4.107	6.984	15.410
1990.0000	9.353	4.875	4.114	6.990	15.426
2000.0000	9.353	4.872	4.107	7.000	15.426
2010.0000	9.362	4.879	4.114	7.000	15.442
2020.0000	9.362	4.879	4.114	7.000	15.442
2030.0000	9.362	4.885	4.120	6.993	15.442
2040.0000	9.372	4.894	4.126	7.009	15.442
2050.0000	9.372	4.901	4.138	7.012	15.442
2060.0000	9.372	4.898	4.129	7.012	15.458
2070.0000	9.372	4.898	4.129	7.012	15.442
2080.0000	9.353	4.888	4.120	7.009	15.442
2090.0000	9.353	4.885	4.117	7.006	15.426
2100.0000	9.353	4.891	4.120	7.003	15.442
2110.0000	9.353	4.888	4.117	7.003	15.442
2120.0000	9.353	4.894	4.126	6.990	15.426
2130.0000	9.343	4.888	4.123	6.993	15.426
2140.0000	9.353	4.901	4.129	7.003	15.426
2150.0000	9.353	4.894	4.123	6.996	15.426
2160.0000	9.353	4.894	4.123	6.993	15.426
2170.0000	9.353	4.894	4.126	7.000	15.426
2180.0000	9.353	4.904	4.133	6.990	15.426
2190.0000	9.343	4.907	4.133	7.000	15.426
2200.0000	9.334	4.898	4.129	6.977	15.410
2210.0000	9.334	4.894	4.126	6.981	15.410
2220.0000	9.324	4.888	4.117	6.981	15.410
2230.0000	9.324	4.888	4.114	6.977	15.395
2240.0000	9.324	4.891	4.120	6.974	15.395
2250.0000	9.315	4.885	4.114	6.968	15.395
2260.0000	9.315	4.882	4.107	6.968	15.395
2270.0000	9.410	4.917	4.139	6.962	15.379
2280.0000	9.438	4.942	4.164	7.028	15.615
2290.0000	9.324	4.898	4.133	7.047	15.631
2300.0000	9.315	4.888	4.120	6.981	15.395

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PUMPING PERIOD

2310.0000	9.305	4.888	4.117	6.965	15.379
2320.0000	9.305	4.885	4.117	6.949	15.379
2330.0000	9.305	4.879	4.114	6.958	15.379
2340.0000	9.305	4.875	4.110	6.949	15.379
2350.0000	9.296	4.875	4.110	6.955	15.379
2360.0000	9.296	4.872	4.107	6.949	15.363
2370.0000	9.286	4.872	4.107	6.949	15.363
2380.0000	9.296	4.875	4.110	6.946	15.363
2390.0000	9.286	4.875	4.107	6.946	15.363
2400.0000	9.296	4.875	4.110	6.949	15.379
2410.0000	9.296	4.879	4.110	6.946	15.363
2420.0000	9.305	4.879	4.114	6.955	15.379
2430.0000	9.305	4.885	4.117	6.962	15.379
2440.0000	9.315	4.891	4.123	6.968	15.395
2450.0000	9.324	4.894	4.126	6.968	15.395
2460.0000	9.324	4.898	4.129	6.981	15.410
2470.0000	9.334	4.904	4.133	6.974	15.410
2480.0000	9.343	4.910	4.136	6.990	15.426
2490.0000	9.353	4.917	4.142	6.993	15.442
2500.0000	9.362	4.923	4.148	7.009	15.442
2510.0000	9.372	4.929	4.155	7.015	15.458
2520.0000	9.381	4.939	4.161	7.028	15.458
2530.0000	9.381	4.945	4.167	7.038	15.458
2540.0000	9.391	4.948	4.170	7.038	15.458
2550.0000	9.391	4.951	4.174	7.044	15.473
2560.0000	9.410	4.955	4.177	7.050	15.489
2570.0000	9.419	4.964	4.186	7.066	15.489
2580.0000	9.429	4.970	4.193	7.079	15.521
2590.0000	9.438	4.977	4.199	7.091	15.521
2600.0000	9.457	4.983	4.202	7.098	15.536
2610.0000	9.467	4.986	4.208	7.110	15.536
2620.0000	9.476	4.993	4.215	7.123	15.552
2630.0000	9.486	4.996	4.218	7.126	15.552
2640.0000	9.495	5.002	4.224	7.133	15.552
2650.0000	9.495	5.005	4.227	7.136	15.552
2660.0000	9.505	5.005	4.227	7.136	15.552
2670.0000	9.514	5.012	4.234	7.148	15.568
2680.0000	9.524	5.018	4.240	7.148	15.568
2690.0000	9.524	5.028	4.246	7.152	15.568
2700.0000	9.524	5.031	4.250	7.152	15.568
2710.0000	9.533	5.034	4.250	7.155	15.568
2720.0000	9.533	5.028	4.253	7.158	15.568
2730.0000	9.533	5.028	4.253	7.148	15.568
2740.0000	9.533	5.024	4.253	7.152	15.552

MARTIN COUNTY AQUIFER PERFORMANCE TEST. PUMPING PERIOD

2750.0000	9.524	5.024	4.246	7.152	15.568
2760.0000	9.524	5.028	4.256	7.158	15.552
2770.0000	9.533	5.031	4.256	7.152	15.552
2780.0000	9.524	5.037	4.259	7.148	15.552
2790.0000	9.514	5.031	4.253	7.139	15.568
2800.0000	9.524	5.028	4.250	7.129	15.568
2810.0000	9.514	5.024	4.246	7.126	15.568
2820.0000	9.524	5.034	4.269	7.133	15.552
2830.0000	9.505	5.031	4.253	7.129	15.568
2840.0000	9.486	5.018	4.265	7.101	15.552
2850.0000	9.505	5.024	4.259	7.133	15.568
2860.0000	9.476	5.018	4.240	7.088	15.552
2870.0000	9.467	5.012	4.224	7.088	15.552
2880.0000	9.467	5.009	4.237	7.101	15.552
2890.0000	9.514	5.059	4.275	7.133	15.584
2900.0000	9.495	5.043	4.256	7.117	15.568
2910.0000	9.391	4.939	4.129	6.987	15.521
2920.0000	9.495	5.053	4.269	7.136	15.568
2930.0000	9.467	5.024	4.231	7.088	15.568
2940.0000	9.448	5.009	4.218	7.066	15.552
2950.0000	9.438	4.904	4.117	6.981	15.741
2960.0000	9.609	5.116	4.287	7.199	15.852
2970.0000	9.581	5.053	4.265	7.158	15.852
2980.0000	9.609	5.113	4.284	7.202	15.867
2990.0000	9.628	5.126	4.325	7.218	15.867
3000.0000	9.571	5.059	4.265	7.142	15.820
3010.0000	9.571	5.078	4.269	7.155	15.836
3020.0000	9.590	5.088	4.303	7.164	15.836
3030.0000	9.552	5.053	4.269	7.104	15.804
3040.0000	9.543	5.062	4.256	7.098	15.804
3050.0000	9.505	5.050	4.227	7.082	15.789
3060.0000	9.505	5.053	4.246	7.076	15.789
3070.0000	9.524	5.085	4.272	7.101	15.789
3080.0000	9.448	5.012	4.205	7.015	15.741
3090.0000	9.505	5.085	4.269	7.085	15.773
3100.0000	9.524	5.088	4.303	7.101	15.757
3110.0000	9.429	5.009	4.215	7.003	15.726
3120.0000	9.438	5.024	4.227	7.015	15.726
3130.0000	9.410	4.996	4.202	6.996	15.710
3140.0000	9.429	5.037	4.243	7.034	15.726
3150.0000	9.438	5.053	4.259	7.038	15.710
3160.0000	9.476	5.078	4.294	7.053	15.726
3170.0000	9.467	5.072	4.278	7.044	15.710
3180.0000	9.438	5.040	4.259	7.009	15.694

3190.0000	9.429	5.037	4.243	6.984	15.678
3200.0000	9.429	5.043	4.253	6.993	15.678
3210.0000	9.429	5.053	4.269	7.000	15.678
3220.0000	9.419	5.021	4.246	6.984	15.663
3230.0000	9.429	5.043	4.259	6.993	15.678
3240.0000	9.429	5.047	4.269	7.000	15.678
3250.0000	9.429	5.053	4.269	6.993	15.678
3260.0000	9.429	5.053	4.269	6.990	15.694
3270.0000	9.438	5.066	4.275	7.003	15.694
3280.0000	9.429	5.062	4.272	6.993	15.694
3290.0000	9.438	5.062	4.269	6.993	15.694
3300.0000	9.438	5.078	4.281	7.003	15.694
3310.0000	9.438	5.069	4.275	6.993	15.694
3320.0000	9.438	5.069	4.278	7.000	15.694
3330.0000	9.438	5.072	4.278	7.006	15.694
3340.0000	9.438	5.072	4.278	7.009	15.694
3350.0000	9.448	5.072	4.278	7.012	15.694
3360.0000	9.457	5.078	4.287	7.015	15.694
3370.0000	9.448	5.078	4.284	7.019	15.694
3380.0000	9.467	5.081	4.291	7.025	15.710
3390.0000	9.467	5.088	4.294	7.025	15.694
3400.0000	9.457	5.088	4.294	7.022	15.694
3410.0000	9.467	5.091	4.294	7.019	15.694
3420.0000	9.467	5.088	4.294	7.025	15.694
3430.0000	9.467	5.091	4.294	7.025	15.694
3440.0000	9.467	5.091	4.297	7.028	15.694
3450.0000	9.467	5.097	4.300	7.022	15.694
3460.0000	9.476	5.100	4.300	7.028	15.694
3470.0000	9.476	5.104	4.306	7.031	15.694
3480.0000	9.476	5.107	4.306	7.034	15.710
3490.0000	9.476	5.107	4.306	7.028	15.694
3500.0000	9.476	5.113	4.313	7.031	15.710
3510.0000	9.476	5.113	4.313	7.031	15.710
3520.0000	9.486	5.116	4.316	7.034	15.710
3530.0000	9.410	5.097	4.303	6.996	15.536
3540.0000	9.381	5.072	4.281	6.968	15.505
3550.0000	9.372	5.062	4.272	6.962	15.505
3560.0000	9.372	5.062	4.272	6.962	15.505
3570.0000	9.381	5.066	4.275	6.968	15.521
3580.0000	9.381	5.066	4.272	6.977	15.505
3590.0000	9.400	5.062	4.269	6.974	15.521
3600.0000	9.400	5.066	4.272	7.000	15.536
3610.0000	9.410	5.066	4.272	7.009	15.552
3620.0000	9.419	5.075	4.281	7.019	15.552

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PUMPING PERIOD

3630.0000	9.429	5.078	4.284	7.019	15.568
3640.0000	9.438	5.081	4.284	7.041	15.584
3650.0000	9.438	5.085	4.287	7.044	15.584
3660.0000	9.448	5.081	4.287	7.047	15.584
3670.0000	9.457	5.088	4.291	7.057	15.600
3680.0000	9.457	5.094	4.297	7.072	15.615
3690.0000	9.467	5.094	4.297	7.079	15.615
3700.0000	9.476	5.097	4.300	7.079	15.615
3710.0000	9.476	5.104	4.303	7.069	15.615
3720.0000	9.476	5.104	4.303	7.088	15.600
3730.0000	9.467	5.097	4.300	7.076	15.600
3740.0000	9.476	5.104	4.303	7.085	15.615
3750.0000	9.486	5.104	4.303	7.098	15.615
3760.0000	9.476	5.107	4.306	7.098	15.615
3770.0000	9.476	5.107	4.306	7.082	15.615
3780.0000	9.486	5.107	4.306	7.085	15.615
3790.0000	9.486	5.110	4.306	7.104	15.631
3800.0000	9.486	5.113	4.313	7.101	15.631
3810.0000	9.486	5.113	4.318	7.104	15.631
3820.0000	9.495	5.116	4.316	7.117	15.647
3830.0000	9.505	5.123	4.319	7.120	15.647
3840.0000	9.505	5.123	4.322	7.126	15.647
3850.0000	9.505	5.116	4.319	7.123	15.647
3860.0000	9.505	5.116	4.316	7.120	15.647
3870.0000	9.505	5.116	4.316	7.126	15.647
3880.0000	9.514	5.119	4.316	7.129	15.647
3890.0000	9.524	5.119	4.319	7.133	15.663
3900.0000	9.524	5.129	4.329	7.142	15.663
3910.0000	9.533	5.132	4.332	7.155	15.678
3920.0000	9.543	5.138	4.335	7.161	15.678
3930.0000	9.552	5.142	4.341	7.167	15.694
3940.0000	9.562	5.148	4.348	7.174	15.710
3950.0000	9.571	5.154	4.354	7.186	15.710
3960.0000	9.581	5.161	4.354	7.193	15.726
3970.0000	9.590	5.164	4.360	7.196	15.741
3980.0000	9.600	5.173	4.370	7.212	15.741
3990.0000	9.600	5.180	4.373	7.221	15.741
4000.0000	9.609	5.180	4.379	7.218	15.741
4010.0000	9.619	5.186	4.382	7.228	15.757
4020.0000	9.628	5.195	4.401	7.237	15.773
4030.0000	9.647	5.202	4.408	7.256	15.789
4040.0000	9.657	5.211	4.417	7.262	15.789
4050.0000	9.657	5.208	4.414	7.262	15.789
4060.0000	9.657	5.211	4.417	7.266	15.804

MARTIN COUNTY AQUIFER PERFORMANCE TEST, PUMPING PERIOD

4070.0000	9.666	5.214	4.420	7.269	15.804
4080.0000	9.686	5.214	4.420	7.278	15.804
4090.0000	9.686	5.243	4.427	7.278	15.804
4100.0000	9.695	5.218	4.420	7.278	15.804
4110.0000	9.695	5.224	4.427	7.281	15.804
4120.0000	9.695	5.227	4.433	7.281	15.804
4130.0000	9.695	5.237	4.446	7.288	15.804
4140.0000	9.695	5.233	4.436	7.281	15.789
4150.0000	9.686	5.221	4.423	7.259	15.789
4160.0000	9.676	5.224	4.427	7.262	15.789
4170.0000	9.724	5.230	4.436	7.278	15.899
4180.0000	9.619	5.205	4.414	7.228	15.647
4190.0000	9.619	5.195	4.408	7.221	15.631
4200.0000	9.590	5.180	4.392	7.202	15.615
4210.0000	9.600	5.192	4.408	7.199	15.615
4220.0000	9.600	5.192	4.404	7.190	15.615
4230.0000	9.590	5.186	4.398	7.190	15.615
4240.0000	9.600	5.192	4.404	7.186	15.615
4250.0000	9.562	5.151	4.360	7.139	15.600
4260.0000	9.600	5.192	4.414	7.193	15.615
4270.0000	9.581	5.189	4.389	7.177	15.615
4280.0000	9.590	5.186	4.395	7.167	15.615
4290.0000	9.581	5.180	4.411	7.155	15.615
4300.0000	9.647	5.214	4.423	7.215	15.757
4310.0000	9.628	5.211	4.404	7.193	15.757
4320.0000	9.647	5.224	4.417	7.212	15.773
4330.0000	9.647	5.151	4.423	7.221	15.773

END

Appendix C

MARTIN COUNTY AQUIFER PERFORMANCE TEST. RECOVERY PERIOD

SE2000
Environmental Logger
10/13 14:45

Unit# 4 RECOVERY MONITORING PERIOD

Setups:	INPUT 1	INPUT 2	INPUT 3	INPUT 4	INPUT 5
Type	Level (F)	Level (F)	Level (F)	Level (F)	Level (F)
I.D.	8700	360	870	13600	3600
Reference	0.000	0.000	0.000	0.000	0.000
SG	1.000	1.000	1.000	1.000	1.000
Linearity	0.000	0.000	0.000	0.000	0.000
Scale factor	30.008	10.002	9.983	9.995	49.905
Offset	-0.013	0.007	0.005	-0.014	0.108
Delay mSEC	50.000	50.000	50.000	50.000	50.000

Recovery Period Step 1 10/09 11:45:00

Elapsed Time (min)	PZ87D INPUT 1 (Dd,ft)	PZ36I INPUT 2 (Dd,ft)	PZ87I INPUT 3 (Dd,ft)	PZ136D INPUT 4 (Dd,ft)	PZ36D INPUT 5 (Dd,ft)
0.0000	9.619	5.205	4.404	7.199	15.710
0.0083	9.628	5.205	4.404	7.196	15.710
0.0166	9.619	5.208	4.408	7.196	15.710
0.0250	9.619	5.208	4.408	7.199	15.694
0.0333	9.619	5.208	4.404	7.196	15.631
0.0416	9.619	5.211	4.408	7.199	15.552
0.0500	9.609	5.211	4.408	7.199	15.442
0.0583	9.619	5.211	4.408	7.199	15.300
0.0666	9.619	5.214	4.408	7.202	15.111
0.0750	9.619	5.214	4.408	7.199	14.906
0.0833	9.600	5.214	4.411	7.199	14.686
0.1000	9.609	5.214	4.411	7.196	14.229
0.1166	9.543	5.218	4.411	7.196	13.803
0.1333	9.533	5.221	4.414	7.199	13.456
0.1500	9.524	5.221	4.414	7.196	13.157
0.1666	9.543	5.224	4.417	7.193	12.905
0.1833	9.505	5.227	4.417	7.196	12.669
0.2000	9.457	5.230	4.420	7.193	12.432
0.2166	9.419	5.233	4.420	7.186	12.227

MARTIN COUNTY AQUIFER PERFORMANCE TEST, RECOVERY PERIOD

0.2333	9.381	5.233	4.420	7.183	12.007
0.2500	9.334	5.240	4.427	7.180	11.802
0.2666	9.286	5.243	4.430	7.174	11.613
0.2833	9.248	5.246	4.430	7.167	11.424
0.3000	9.201	5.249	4.430	7.164	11.266
0.3166	9.153	5.252	4.436	7.158	11.124
0.3333	9.106	5.256	4.439	7.148	10.967
0.4166	8.868	5.265	4.449	7.101	10.447
0.5000	8.649	5.278	4.455	7.047	10.053
0.5833	8.459	5.284	4.461	6.984	9.753
0.6666	8.279	5.287	4.461	6.914	9.470
0.7500	8.108	5.284	4.458	6.851	9.249
0.8333	7.975	5.284	4.458	6.787	9.029
0.9166	7.832	5.278	4.455	6.724	8.840
1.0000	7.708	5.271	4.449	6.658	8.650
1.0833	7.604	5.262	4.442	6.604	8.493
1.1666	7.490	5.252	4.436	6.544	8.367
1.2500	7.385	5.237	4.423	6.484	8.162
1.3333	7.271	5.116	4.414	6.430	8.067
1.4166	7.205	5.224	4.404	6.376	7.941
1.5000	7.129	5.195	4.389	6.319	7.831
1.5833	7.043	5.176	4.376	6.265	7.721
1.6666	6.967	5.154	4.360	6.211	7.610
1.7500	6.872	5.129	4.338	6.161	7.516
1.8333	6.805	5.110	4.322	6.110	7.421
1.9166	6.748	5.085	4.303	6.059	7.343
2.0000	6.672	5.062	4.281	6.012	7.248
2.5000	6.311	4.913	4.183	5.749	6.807
3.0000	5.997	4.755	4.044	5.521	6.429
3.5000	5.750	4.609	3.927	5.318	6.113
4.0000	5.522	4.451	3.804	5.135	5.861
4.5000	5.332	4.308	3.699	4.954	5.656
5.0000	5.132	4.144	3.570	4.777	5.420
5.5000	4.942	3.976	3.418	4.597	5.231
6.0000	4.781	3.824	3.317	4.457	5.058
6.5000	4.648	3.725	3.231	4.353	4.916
7.0000	4.534	3.614	3.159	4.264	4.790
7.5000	4.420	3.513	3.089	4.163	4.664
8.0000	4.315	3.409	2.997	4.065	4.538
8.5000	4.201	3.313	2.928	3.976	4.412
9.0000	4.125	3.231	2.874	3.910	4.317
9.5000	4.011	3.152	2.833	3.846	4.223
10.0000	3.973	3.095	2.785	3.780	4.128
12.0000	3.631	2.797	2.498	3.435	3.813

MARTIN COUNTY AQUIFER PERFORMANCE TEST. RECOVERY PERIOD

14.0000	3.307	2.528	2.283	3.181	3.529
16.0000	3.127	2.322	2.090	2.944	3.293
18.0000	2.908	2.176	1.947	2.741	3.088
20.0000	2.737	2.059	1.837	2.592	2.930
22.0000	2.671	1.996	1.796	2.523	2.804
24.0000	2.613	1.970	1.786	2.472	2.694
26.0000	2.480	1.872	1.691	2.352	2.552
28.0000	2.366	1.802	1.619	2.228	2.458
30.0000	2.281	1.764	1.565	2.152	2.363
32.0000	2.176	1.685	1.508	2.067	2.269
34.0000	2.100	1.615	1.448	1.975	2.158
36.0000	2.043	1.584	1.426	1.924	2.111
38.0000	1.977	1.558	1.378	1.855	2.048
40.0000	1.910	1.533	1.343	1.788	1.985
42.0000	1.863	1.482	1.315	1.734	1.938
44.0000	1.806	1.444	1.274	1.662	1.890
46.0000	1.748	1.425	1.239	1.630	1.843
48.0000	1.720	1.406	1.242	1.602	1.796
50.0000	1.663	1.362	1.207	1.535	1.749
52.0000	1.558	1.273	1.106	1.421	1.670
54.0000	1.530	1.264	1.097	1.399	1.654
56.0000	1.520	1.257	1.113	1.370	1.607
58.0000	1.501	1.267	1.113	1.370	1.591
60.0000	1.482	1.254	1.119	1.370	1.528
62.0000	1.473	1.251	1.128	1.370	1.496
64.0000	1.435	1.241	1.106	1.355	1.465
66.0000	1.416	1.241	1.103	1.339	1.465
68.0000	1.378	1.210	1.071	1.288	1.449
70.0000	1.311	1.143	1.002	1.184	1.386
72.0000	1.283	1.127	0.989	1.165	1.370
74.0000	1.264	1.121	0.986	1.146	1.355
76.0000	1.245	1.118	0.980	1.136	1.339
78.0000	1.216	1.115	0.970	1.114	1.307
80.0000	1.207	1.102	0.970	1.104	1.292
82.0000	1.207	1.105	0.973	1.104	1.276
84.0000	1.188	1.096	0.967	1.082	1.244
86.0000	1.169	1.093	0.964	1.085	1.229
88.0000	1.178	1.102	0.980	1.089	1.229
90.0000	1.140	1.086	0.939	1.044	1.197
92.0000	1.159	1.105	0.989	1.098	1.181
94.0000	1.159	1.102	0.996	1.092	1.166
96.0000	1.112	1.083	0.951	1.044	1.134
98.0000	1.083	1.055	0.923	1.000	1.134
100.0000	1.083	1.045	0.926	0.997	1.134

MARTIN COUNTY AQUIFER PERFORMANCE TEST. RECOVERY PERIOD

110.0000	1.045	1.039	0.923	0.968	1.071
120.0000	0.988	1.010	0.901	0.914	1.024
130.0000	0.817	0.861	0.749	0.702	0.913
140.0000	0.788	0.868	0.762	0.706	0.835
150.0000	0.750	0.849	0.752	0.690	0.803
160.0000	0.722	0.839	0.739	0.677	0.772
170.0000	0.684	0.807	0.717	0.636	0.709

END

Appendix D

MARTIN COUNTY AQUIFER PERFORMANCE TEST

WELL PZ106H ELEVATION= 17.13

DATE	CLOCK TIME	TIME PUMPING	TOTAL ELAPSED TIME	HEAD (feet NGVD)	DTW
10/5	2202		0	11.72	5.41
	2325		83	11.71	5.42
10/6	121		199	11.72	5.41
	318		316	11.74	5.39
	516		434	11.74	5.39
	716		554	11.73	5.40
	858		656	11.74	5.39
	1038		756	11.74	5.39
	1130	0	808	11.75	5.38
		2	810	11.73	5.40
		4	812	11.75	5.38
		6	814	11.76	5.37
		8	816	11.75	5.38
		10	818	11.76	5.37
		12	820	11.76	5.37
		14	822	11.76	5.37
		16	824	11.75	5.38
		18	826	11.77	5.36
		20	828	11.77	5.36
		22	830	11.77	5.36
		24	832	11.75	5.38
		26	834	11.75	5.38
		28	836	11.75	5.38
		30	838	11.75	5.38
		32	840	11.75	5.38
		34	842	11.75	5.38
		36	844	11.75	5.38
		38	846	11.74	5.39
		40	848	11.75	5.38
		42	850	11.74	5.39
		44	852	11.74	5.39
		46	854	11.76	5.37
		48	856	11.76	5.37
		50	858	11.76	5.37
		52	860	11.76	5.37
		54	862	11.76	5.37
		56	864	11.75	5.38
		58	866	11.76	5.37
		60	868	11.75	5.38

65	873	11.75	5.38
70	878	11.75	5.38
75	883	11.75	5.38
80	888	11.75	5.38
85	893	11.75	5.38
90	898	11.75	5.38
95	903	11.75	5.38
100	908	11.75	5.38
105	913	11.75	5.38
110	918	11.75	5.38
115	923	11.75	5.38
120	928	11.75	5.38
130	938	11.74	5.39
140	948	11.74	5.39
150	958	11.74	5.39
160	968	11.74	5.39
170	978	11.74	5.39
180	988	11.73	5.40
190	998	11.74	5.39
200	1008	11.74	5.39
210	1018	11.74	5.39
220	1028	11.74	5.39
230	1038	11.74	5.39
240	1048	11.74	5.39
300	1108	11.73	5.40
360	1168	11.73	5.40
420	1228	11.73	5.40
480	1288	11.73	5.40
600	1408	11.73	5.40
720	1528	11.72	5.41
840	1648	11.73	5.40
960	1768	11.73	5.40
1080	1888	11.73	5.40
1200	2008	11.73	5.40
1320	2128	11.73	5.40
1440	2248	11.72	5.41
1560	2368	11.71	5.42
1680	2488	11.71	5.42
1800	2608	11.70	5.43
1920	2728	11.71	5.42
2040	2848	11.72	5.41
2160	2968	11.71	5.42
2280	3088	11.74	5.39
2400	3208	11.77	5.36
2520	3328	11.78	5.35
2640	3448	11.79	5.34

MARTIN COUNTY AQUIFER PERFORMANCE TEST

2820	3628	11.80	5.33
2940	3748	11.78	5.35
3120	3928	11.77	5.36
3360	4168	11.77	5.36
3600	4408	11.79	5.34
3840	4648	11.81	5.32
4080	4888	11.83	5.30
4320	5128		

MARTIN COUNTY AQUIFER PERFORMANCE TEST

WELL PZ136I ELEVATION= 19.15

DATE	CLOCK TIME	TIME PUMPING	TOTAL ELAPSED TIME	HEAD (feet. NGVD)	s	DTW
10/5	2148		0	4.55		14.60
	2323		95	4.56		14.59
10/6	108		200	4.57		14.58
	306		318	4.59		14.56
	503		435	4.58		14.57
	709		561	4.53		14.62
	907		679	4.51		14.64
	1049		781	4.55		14.60
	1130	0	822	4.49	0.00	14.66
		2	824	4.49	0.00	
		4	826	4.49	0.00	
		6	828	4.16	0.33	
		8	830	3.88	0.61	
		10	832	3.71	0.78	
		12	834	3.56	0.93	
		14	836	3.36	1.13	
		16	838	3.27	1.22	
		18	840	3.17	1.32	
		20	842	3.04	1.45	
		24	846	2.95	1.54	
		26	848	2.91	1.58	
		30	852	2.79	1.70	
		34	856	2.78	1.71	
		38	860	2.67	1.82	
		42	864	2.60	1.89	
		46	868	2.61	1.88	
		50	872	2.64	1.85	
		54	876	2.61	1.88	
		56	878	2.57	1.92	
	4	60	882	2.56	1.93	
	5	65	887	2.54	1.95	
	5	70	892	2.52	1.97	
	5	75	897	2.50	1.99	
	5	80	902	2.49	2.00	
	25	105	927	2.45	2.04	
	15	120	942	2.43	2.06	
	20	140	962	2.38	2.11	

MARTIN COUNTY AQUIFER PERFORMANCE TEST

PW-7 DISCHARGE FLUCTUATION

ELAPSED TIME (min.)	DISCHARGE (gpm)	DISCHARGE VOLUME (gal.)	: FROM TOTALIZER METER
0		31275.700	
4	360	31277.140	360
7	357	31278.210	357
9	345	31278.900	345
11	355	31279.610	355
13	355	31280.320	355
15	405	31281.130	405
17	295	31281.720	295
19	355	31282.430	355
21	350	31283.130	350
23.25	351	31283.920	351
30	348	31286.270	348
46	348	31291.830	348
55	347	31294.950	347
62	347	31297.380	347
72	345	31300.830	345
87	346	31306.020	346
106	345	31312.580	345
132	345	31321.540	345
174	345	31336.022	345
240	386	31361.500	386
361	321	31400.392	321
429	350	31424.165	350
511	356	31453.365	356
628	356	31495.028	356
746	356	31537.080	356
869	356	31580.817	356
981	354	31620.507	354
1102	354	31663.370	354
1220	354	31705.146	354
1340	353	31747.464	353
1462	343	31789.354	343
1580	343	31829.853	343
1695	344	31869.362	344
1815	343	31910.481	343
1940	346	31953.765	346
2056	342	31993.445	342
2175	344	32034.337	344
2290	342	32073.658	342
2412	344	32115.595	344

MARTIN COUNTY AQUIFER PERFORMANCE TEST

2542	343	32160.240	343
2660	346	32201.093	346
2823	340	32256.567	340
2913	350	32288.065	350
3032	347	32329.395	347
3134	352	32365.270	352
3272	351	32413.675	351
3393	353	32456.446	353
3511	356	32498.499	356
3630	349	32539.978	349
3750	348	32581.697	348
3872	347	32624.015	347
3991	340	32664.438	340
4110	354	32706.608	354
4230	345	32747.954	345

MARTIN COUNTY AQUIFER PERFORMANCE TEST

WATER TREATMENT PLANT RAW WATER FLOWS

DATE	CLOCK TIME (hour)	ELAPSED TIME (min.)	FLOW (mgd)
10/5	2200	0	1.9
	2300	60	1.9
10/6	0000	120	1.9
	0100	180	2.6
	0200	240	2.6
	0300	300	2.6
	0400	360	2.6
	0500	420	2.6
	0600	480	2.6
	0700	540	2.6
	0800	600	2.6
	0900	660	2.6
	1000	720	2.6
	1100	780	2.6
	1200	840	2.7
	1300	900	2.7
	1400	960	2.7
	1500	1020	2.7
	1600	1080	2.7
	1700	1140	2.7
	1800	1200	2.7
	1900	1260	2.0
	2000	1320	2.0
	2100	1380	2.0
	2200	1440	2.0
	2300	1500	2.0
10/7	0000	1560	2.0
	0100	1620	2.0
	0200	1680	2.4
	0300	1740	2.4
	0400	1800	2.4
	0500	1860	2.4
	0600	1920	2.4
	0700	1980	2.4
	0800	2040	2.4
	0900	2100	2.4
	1000	2160	2.7
	1100	2220	2.7
	1200	2280	2.7

MARTIN COUNTY AQUIFER PERFORMANCE TEST

	1300	2340	2.7
	1400	2400	2.7
	1500	2460	2.7
	1600	2520	2.7
	1700	2580	2.7
	1800	2640	2.7
	1900	2700	2.7
	2000	2760	2.7
	2100	2820	2.7
	2200	2880	2.7
	2300	2940	2.7
10/8	0000	3000	2.7
	0100	3060	2.7
	0200	3120	2.7
	0300	3180	2.7
	0400	3240	2.7
	0500	3300	2.7
	0600	3360	2.7
	0700	3420	2.7
	0800	3480	2.7
	0900	3540	2.7
	1000	3600	2.7
	1100	3660	2.7
	1200	3720	2.7
	1300	3780	2.4
	1400	3840	2.4
	1500	3900	2.4
	1600	3960	2.4
	1700	4020	2.4
	1800	4080	2.4
	1900	4140	2.4
	2000	4200	2.4
	2100	4260	2.4
	2200	4320	2.4
	2300	4380	2.3
10/9	0000	4440	2.3
	0100	4500	2.3
	0200	4560	2.3
	0300	4620	2.3
	0400	4680	2.3
	0500	4740	2.3
	0600	4800	2.3
	0700	4860	2.3
	0800	4920	2.3
	0900	4980	2.7
	1000	5040	2.7

MARTIN COUNTY AQUIFER PERFORMANCE TEST

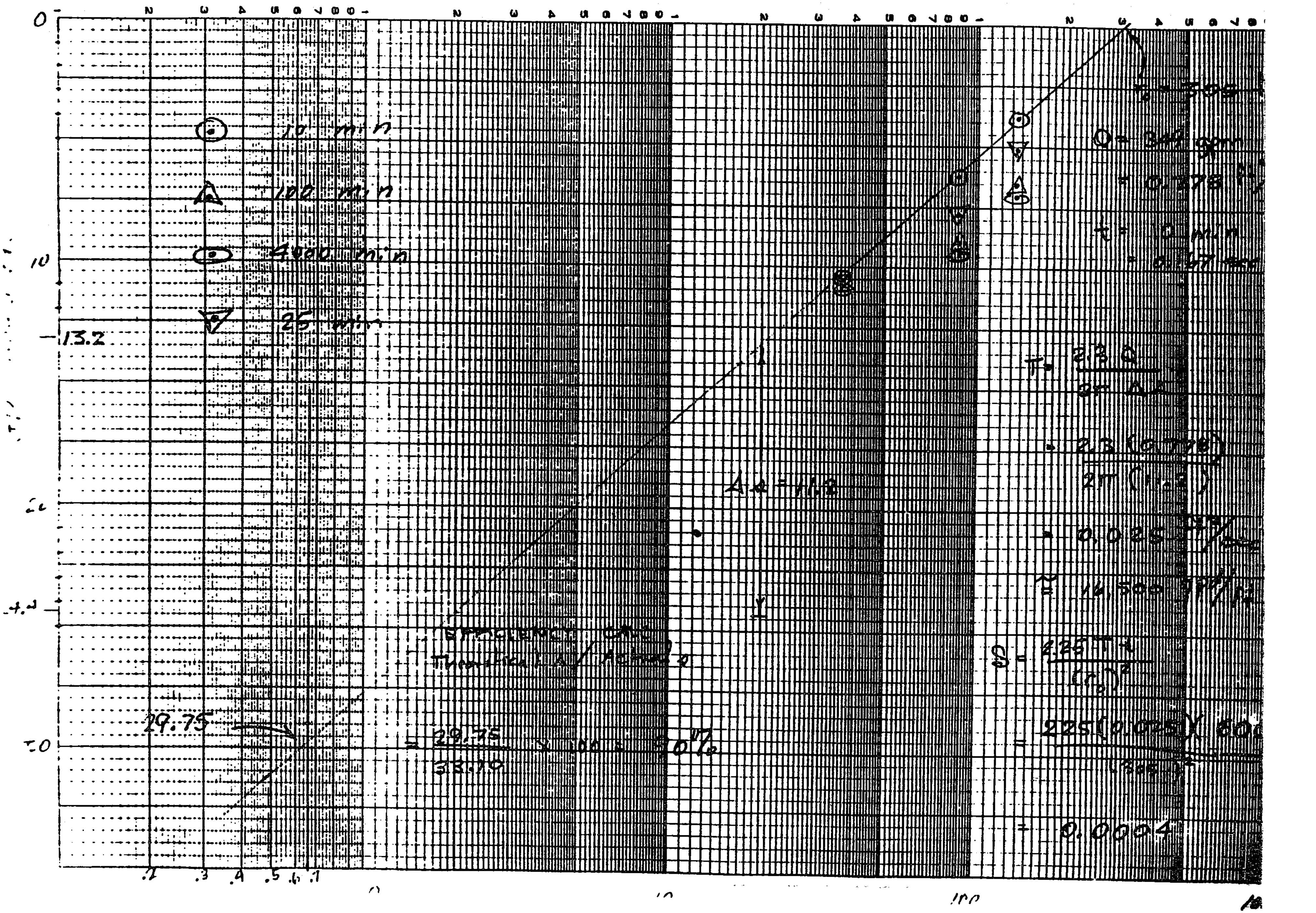
1100	5100	2.3
1200	5280	2.3
1300	5340	2.3

Appendix F

JMM James M Montgomery
Consulting Engineers Inc.

NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

DIETZGEN CORPORATION
MADE IN U.S.A.



Appendix G

WELL PZ36D

Walton Method

$r/L = 0.2$

match point $u = 1.0$ $s = 4.2$ ft

$w(u,r/L) = 1.0$ $t = 0.091$ min

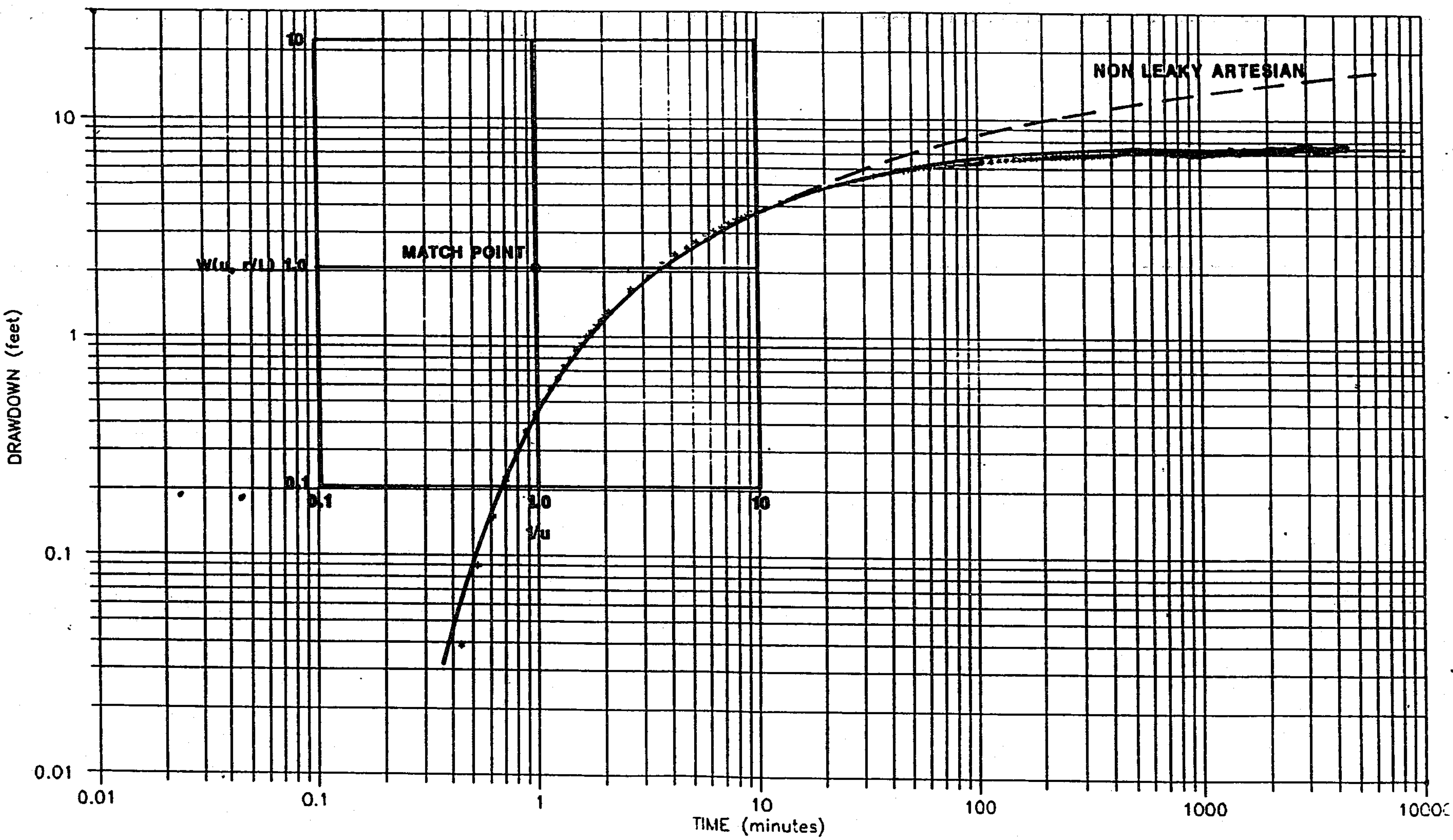
$T = Q/4\pi s \; W(u,r/L) = ((0.778 \text{ ft}^3 \text{ per sec})/(4\pi(4.2 \text{ ft}))(1.0)) = 0.015 \text{ ft}^2/\text{sec}$

≈9,500 gpd/ft

$S = (4Ttu)/r^2 = (4(0.015)(5.46)(1.0))/(36)^2 = 0.0003$

$L = \sqrt{Tb'/k'}$ $r/L = 0.2$ $L = 180$

$k'/b' = T/L^2 = 0.015/(180)^2 = 4.6E\text{-}07 \text{ sec}^{-1}$



LOG-LOG PLOT OF DRAWDOWN VS. TIME FOR WELL PZ87D WITH A COMPARISON TO WALTON LEAKY CURVE, r/L = 0.2 (Q = 349 GPM)

WELL PZ87D

Walton Method

$r/L = 0.2$

match point = $u = 1.0$ $\quad s = 2.7$ ft
$W(u,r/L) = 1.0$ $\quad t = 0.42$ min

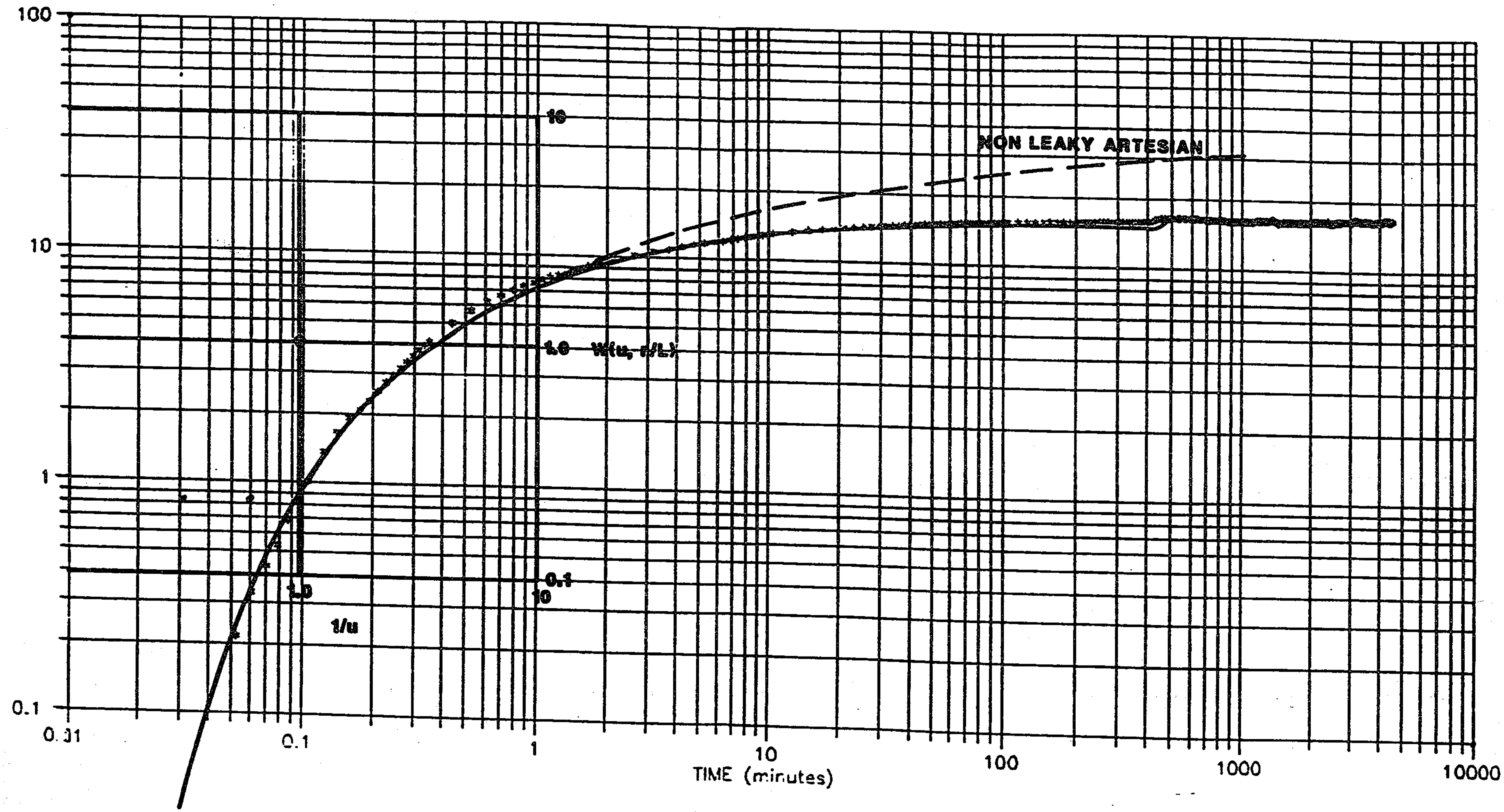
$T = Q/(4\pi s)\ W(u,r/L)$

$= ((0.778)/4\pi(2.7))\,(1.0) = 0.023\ ft^2/sec \approx 14{,}800$ gpd/ft

$S = (4Ttu)/r^2 = (4\,(0.023)\,(25.2)\,(1.0))/(87)^2 = 0.0003$

$L = \sqrt{Tb'/k'}$ $\quad r/L = 0.2$ $\quad L = 435$ ft

$k'/b' = T/L^2 = 1.2E\text{-}07\ sec^{-1}$



LOG-LOG PLOT OF DRAWDOWN VS. TIME FOR WELL PZ36D WITH A COMPARISON TO WALTON LEAKY CURVE, r/L = 0.2 (Q = 395 GPM)

WELL PZ136D

Walton Method

$T = Q/4\pi s \; W(u, r/L)$ $u = r^2 s/4tT$ $L = \sqrt{Tb'/k'}$

$r/L = 0.2$ $s = 2.1$ ft $W(u,r/L) = 1.0$

$t = 1.0$ min $u = 1.0$

$Q = 349$ gpm $= 0.778$ ft^3/sec

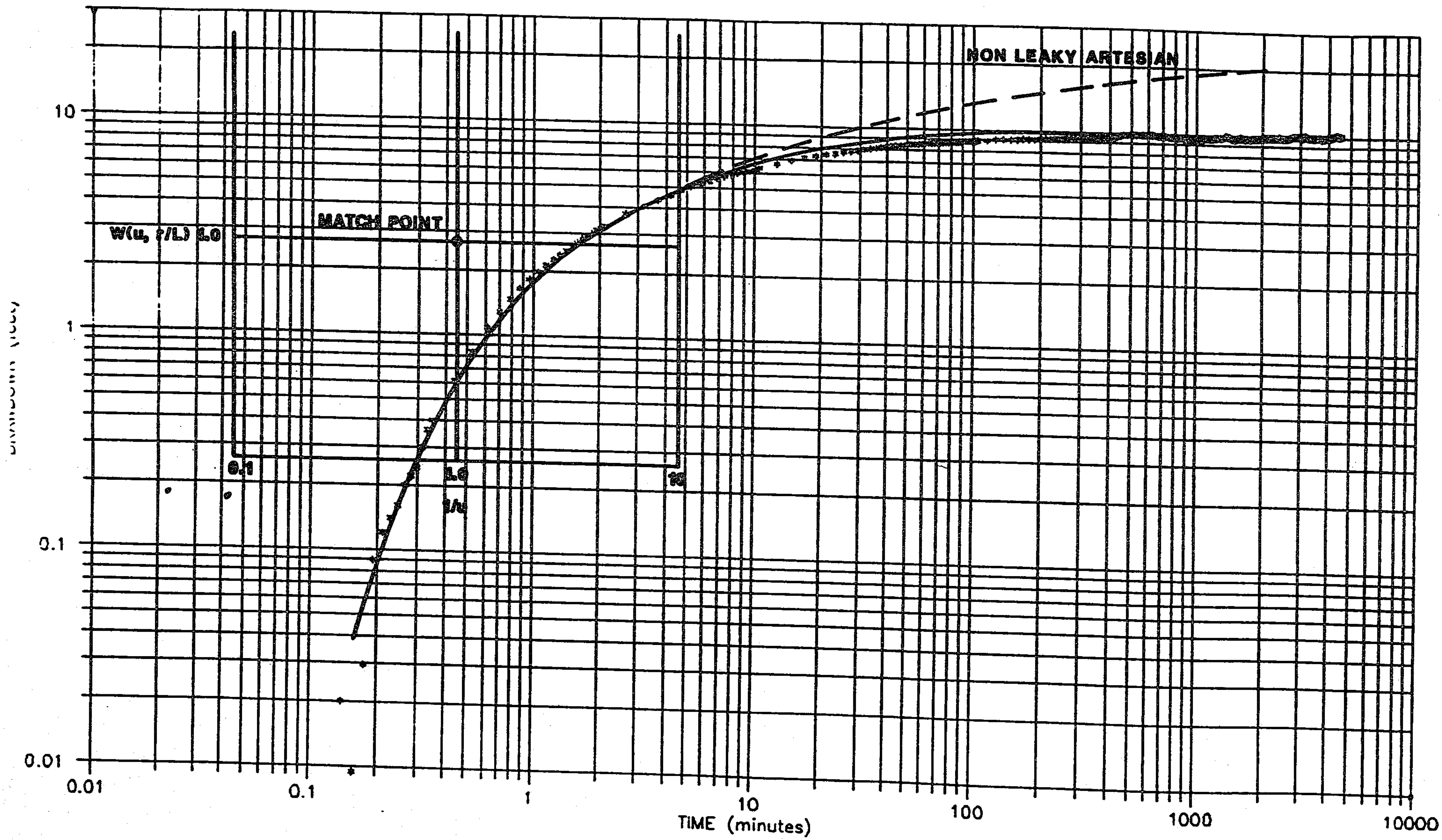
$T = (0.778/(4\pi(2.1))(1.0)) = 0.03$ $ft^2/sec = 19{,}000$ gpd/ft

$S = (4tTu)/r^2 = (4(60)(0.03)(1.0))/(136)^2 = 0.0004$

$r/L = 0.2$ $r = 136$ ft $L = 680$ ft

$L = \sqrt{1Tb'/k'}$ $L^2/T = b'/k'$ $k'/b' = T/L^2$

$k'/b' = 6.5E\text{-}08 \; sec^{-1}$



LOG-LOG PLOT OF DRAWDOWN VS. TIME FOR WELL PZ136D WITH A COMPARISON TO WALTON LEAKY CURVE, r/L = 0.2 (Q = 349 GPM)

Appendix H

JMM James M. Montgomery
Consulting Engineers Inc.

WELL PZ136D

Hantush Straight-Line Method

sm = 7.15 ft

sp = (1/2)sm = 3.575 ft

tp = (from plot) = 9 min

Δsp = (-3.65 + 7.21) = 3.56

Find r/L using 2.30 (sp/Δsp) = $e^{r/L}k_0$ (r/L)

2.30 (3.575/3.56) = 2.3096

$e^{r/L}k_0$ (r/L) = 2.3096

r/L = 0.16

Find L r/L = 0.16 r = 136 ft L = 850 ft

Find T Δsp = (2.30Q/4πT) ($e^{-r/L}$) Q = 0.778 ft²/sec

T = (2.30Q/4$\pi\Delta$sp) ($e^{-r/L}$) = (2.30 (0.778)/4π (3.56)) $e^{-(0.16)}$

= (2.30 (0.778) (0.852))/4π (3.56)

= 0.034 ft²/sec

= 22,000 gpd/ft

Find S using up = (r^2S)/(4Ttp) = r/2L =

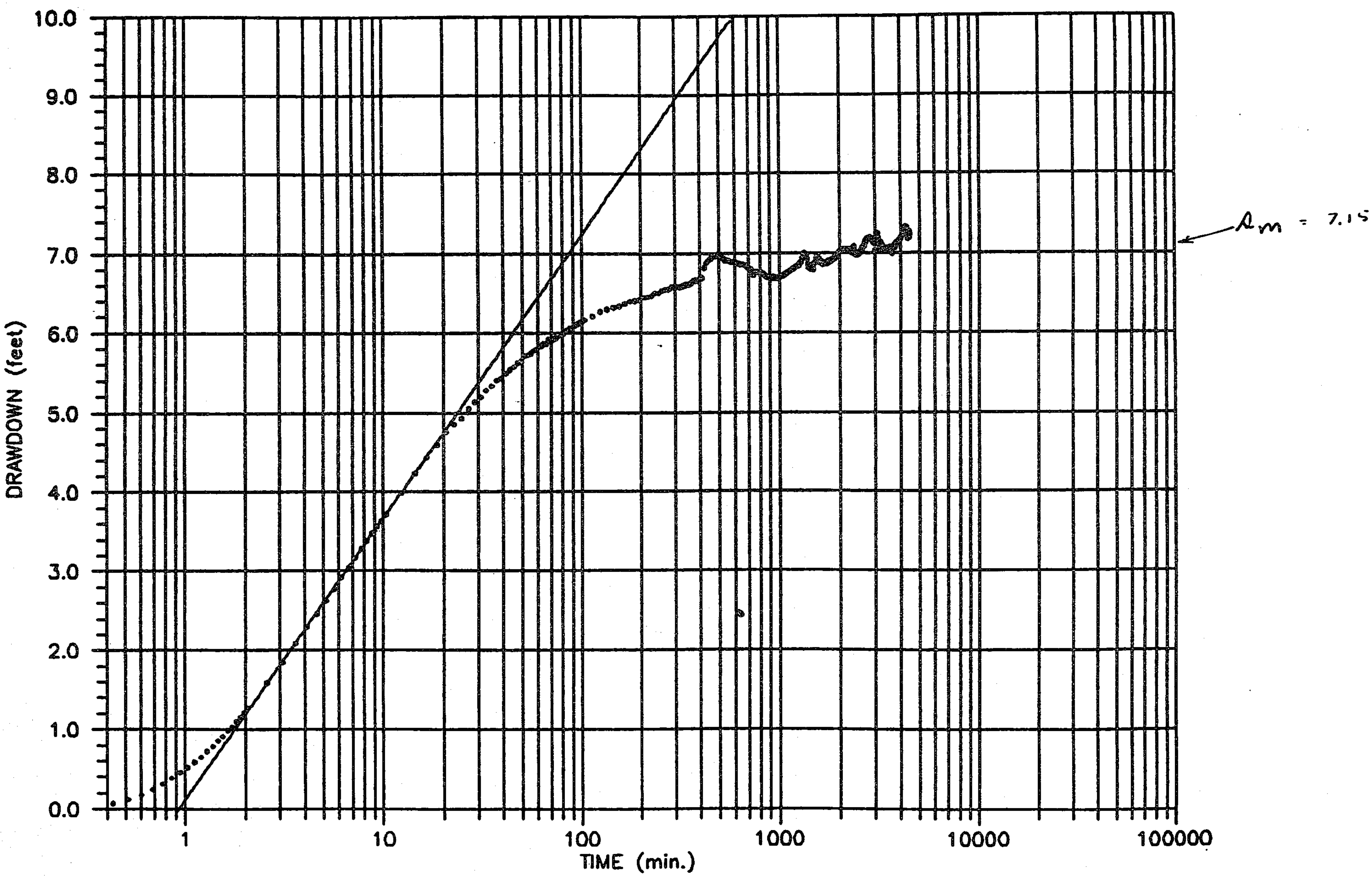
up = r/(2L) = 136 ft/(2 (850))ft S = (4Ttpup)/r^2 = (4 (0.032) (540) (0.08))/$(136)^2$

up = 0.08

S = 0.0003

Find c = b'/k' L = $\sqrt{Tb'/k'}$

k'/b' = T/L^2 = (0.034 ft²/sec)/$(890\ ft)^2$ = 4.3E-08 sec^{-1}



TIME — DRAWDOWN SEMI-LOG PLOT FOR WELL PZ136D

WELL PZ87D

Hantush Semi-Log Method

$sm = 9.6$ ft

$sp = (1/2)\, sm = 4.8$

$tp = 5$ min

$\Delta sp = (-6 + 10.2) = 4.2$ ft

Find r/L using $2.30\,(sp/\Delta sp) = e^{r/L}\, k_0\,(r/L)$

$2.30\,(4.8/4.2) = 2.6286$

$e^{r/L}\, k_0\,(r/L) = 2.6286$

$r/L = 0.111$

Find L $r/L = 0.11$ $r = 87$ ft $L = 791$ ft

Find T $\Delta sp = ((2.30\, Q)/(4\pi T))\, e^{-r/L}$

$T = ((2.30\, Q(/(4\pi\, \Delta sp))\, e^{-r/L} = (2.30\,(0.78)/4\pi(4.2))\, e^{(-0.11)}$

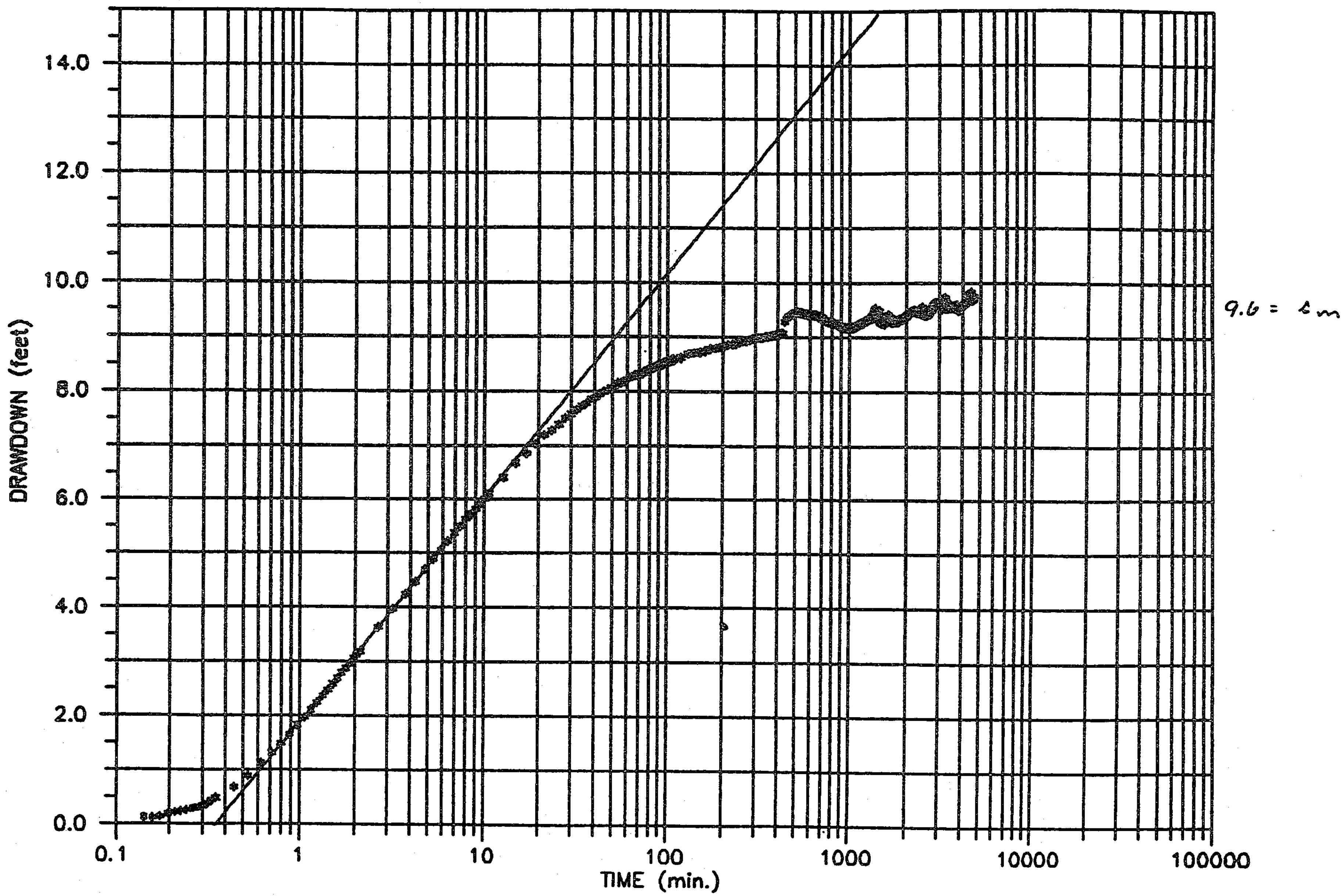
$T = 0.030$ ft²/sec $\approx$ 19,500 gpd/ft

Find S using $up = (r^2S)/(4Ttp) = r/(2L)$ $up = 87/(2(791)) = 0.055$

$S = (4Ttpup)/r^2 = (4(0.03)\,(300)\,(0.055))/(87)^2 = 0.0003$

Find c; $c = b'/k'$ $L = \sqrt{Tb'/k'}$

$k'/b' = T/L^2 = (0.030\ ft^2/sec)/(791\ ft)^2 = 4.8E\text{-}08\ sec^{-1}$



TIME - DRAWDOWN SEMI-LOG PLOT FOR WELL PZ87D

WELL PZ36D

Hantush Semi-Log Method

sm = 15.6 ft

sp = (1/2) sm = 7.8 ft

tp = 1.0 min

Δsp = (-7.6 + 15.4) = 7.8 ft

Find r/L using $2.30\,(sp/\Delta sp) = e^{r/L}\,k_0\,(r/L)$

$e^{r/L}\,k_0\,(r/L) = 2.30$

$r/L = 0.16$

Find L $r/L = 0.16$ $r = 36$ ft $L = 225$ ft

Find T $\Delta sp = (2.30d/(4\pi T))\,e^{-r/L}$ $T = (2.30\,(0.778)\,(0.852))/(4\pi(7.8))$

$T = 0.016\ ft^2/sec$

$\approx$10,000 gpd/ft

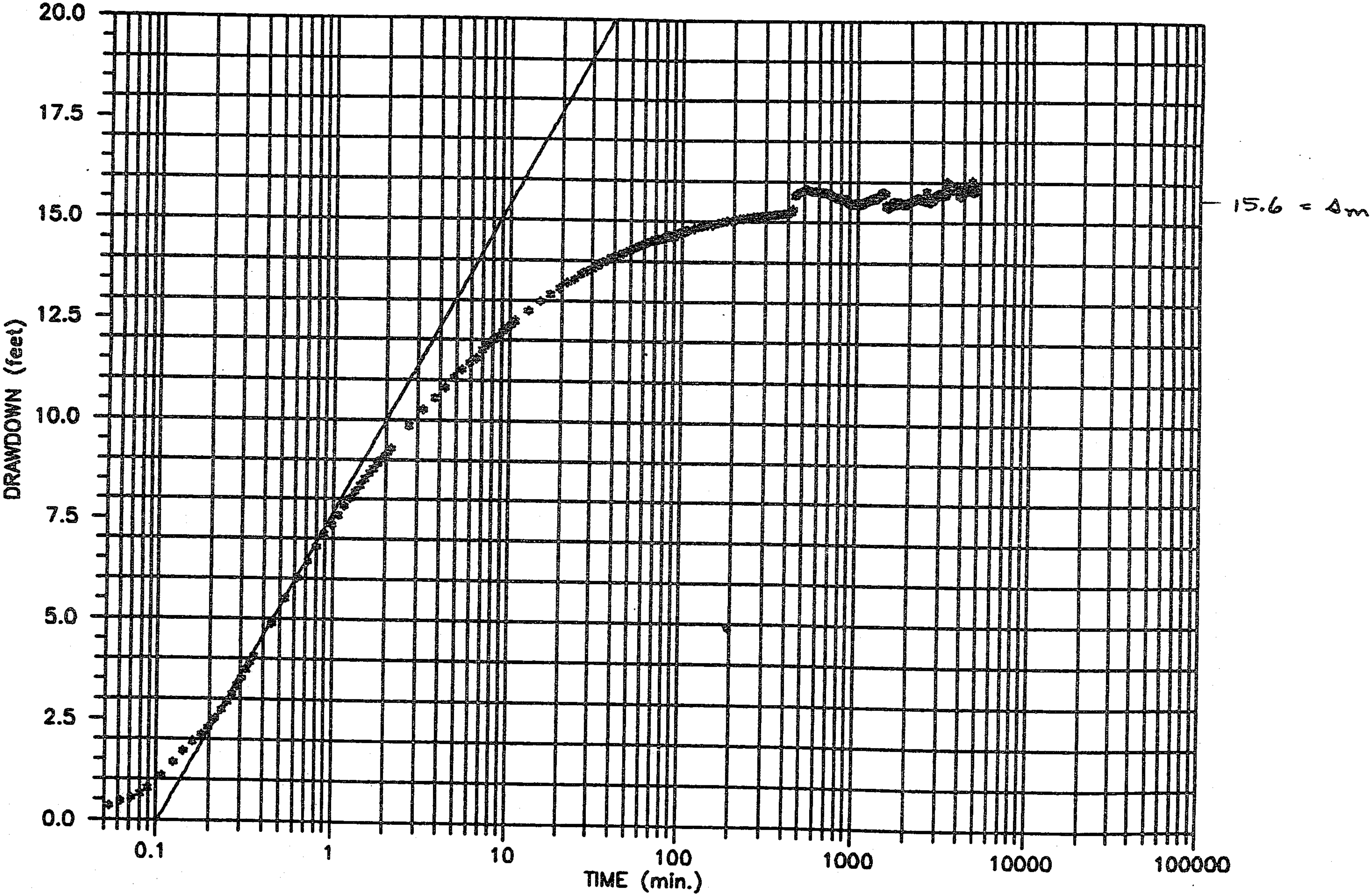
Find S using $up = (r^2S)/(4Ttp) = r/(2L) = (36\ ft)/(2\,(225\ ft)) = 0.08$

$S = (4Ttpup)/r^2 = (4\,(0.16)\,(60)\,(0.08))/(36)^2$

$S = 0.0002$

Find c; $c = b'/k'$ $L = \sqrt{Tb'/k'}$

$k'/b' = T/L^2 = (0.016\ ft^2/sec)/(225\ ft)^2 = 3.2E\text{-}07\ sec^{-1}$



TIME – DRAWDOWN SEMI-LOG PLOT FOR WELL PZ36D