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BP AMERICA PRODUCTION COMPANY

2/8/2017

ENVIROTECH INC.

PROPOSED REMEDIAL ACTION PLAN
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1
PRODUCTION TANK PIT AREA
FARMINGTON, SAN JUAN COUNTY
NEW MEXICO

PREPARED FOR:
MR. BUDDY SHAW
ENVIRONMENTAL COORDINATOR
AMOCO PRODUCTION COMPANY

APRIL 1993

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OIL CON. DIV.
DIST. 3

PROJECT/PIT NO.: 92140/C4028-29

5796 U.S. HIGHWAY 64 - 3014 • FARMINGTON, NEW MEXICO 87401 • PHONE: (505) 632-0615

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PROPOSED REMEDIAL ACTION PLAN
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1
PRODUCTION TANK PIT AREA

SE¼, SE¼ (P) SECTION 21, T29N, R13W, NMPM
FARMINGTON, SAN JUAN COUNTY, NEW MEXICO

PREPARED FOR:
MR. BUDDY SHAW
ENVIRONMENTAL COORDINATOR
AMOCO PRODUCTION COMPANY

PROJECT/PIT NO.: 92140/C4028-29

APRIL 1993

ENVIROTECH, INC.
Environmental Scientists & Engineers
5796 U.S. Highway 64-3014
Farmington, New Mexico
(505) 632-0615

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PROPOSED REMEDIAL ACTION PLAN
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1

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PROPOSED REMEDIAL ACTION PLAN
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1

PROPOSED REMEDIAL ACTION PLAN
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1
PRODUCTION TANK PIT AREA
SE¼, SE¼ (P) SECTION 21, T29N, R13W, NMPM
FARMINGTON, SAN JUAN COUNTY, NEW MEXICO

Amoco Production Company proposes to remediate soil and groundwater contamination resulting from the production equipment and storage system associated with the subject well located in the Southeast ¼ of the Southeast ¼ of Section 21, Township 29N, Range 13W, NMPM, San Juan County, New Mexico. This remedial action plan was developed by Amoco Production Company and Envirotech, Inc. based on the findings of field pit assessments of a production overflow pit and an abandoned separator pit at the site. This remedial Action Plan has been prepared pursuant to draft "Guidelines to Surface Impoundment Closure" (February 1993), State of New Mexico, Oil Conservation Division (NMOCD).

Full implementation of this Remedial Action Plan will be contingent on the approval of NMOCD.

PURPOSE & SCOPE OF SERVICES

The purpose of the proposed remediation is to abate soil and groundwater contamination caused by discharge during the normal operation of the subject oil/gas production well. This well was previously operated by Tenneco Oil and is presently operated by Amoco Production. The New Mexico Oil Conservation Division's guidelines and protocol will be followed.

The proposed scope of work for this remediation and abatement will consist of:

A. Notification of the NMOCD and any other appropriate authorities of the intent to remediate the referenced site.

B. Abatement of the contaminated areas by installation, operation, and maintenance of a groundwater treatment system.

C. Reclamation assessment by testing groundwater monitor wells during abatement to monitor the success of the clean up system.

D. Supplemental site assessment to determine the successful abatement and for closure of the site.

E. Documentation of the abatement and closure.

SITE DESCRIPTION

The San Juan Gravel Tank Battery A #1 well site is located in the Southeast 1/4 of the Southeast 1/4 of Section 21, Township 29N, Range 13W. Access to the site is from South Butler Street, Farmington and into the Bolack Game Refuge. Unpaved roads follow the river to approximately ¼ mile west of the west Game Refuge fence. Refer to the attached vicinity map (Sheet 1).

The site is an active crude oil and natural gas well, producing from the Dakota Formation. Surface equipment at the site consists of a sucker rod pumping unit, an above ground production storage tank (approximately 300 bbl) an above ground steel production overflow pit (approximately 100 bbl), a separator, and a natural gas compressor pump. Refer to the attached site plan for the approximate location of the referenced well site processing equipment (Sheet 2).

The site was originally constructed and the well drilled by Tenneco Oil Company. The date of completion was not available as of this writing. The site appeared to be built using normal cut/fill methods. The entire site appears to be have been built at ground level on the original floodplain. The soils appear to be dense, well graded gravels and sands with large cobbles and minor silt and clay lenses.

The depth to groundwater is approximately seven feet (7') below ground surface with a gradient toward the southwest.

SITE ASSESSMENT SUMMARY

In 1992 Amoco Production Company retained Envirotech Inc. to perform preliminary assessments of unlined impoundments (pits) on numerous well locations throughout the San Juan Basin. The preliminary pit assessments were to screen those areas suspect as having hydrocarbon contamination from previous unlined earthen pits. Due to the findings of the preliminary assessments for the subject location, additional field exploration was conducted subsequently to; 1) establish the vertical and horizontal extent of contamination, 2) characterize the site soil and groundwater conditions, and 3) develop a remedial action plan to reclaim the site.

Field Exploration

On the San Juan Gravel Tank Battery A-1 site there were two (2) active pits; one associated with the compressor and separator, and another associated with the wellhead.

All site assessment was performed by advancing test holes with a backhoe in areas where spills or soil and/or groundwater contamination was suspected.

Grab soil and groundwater samples were collected from the test holes following US EPA SW-846 protocol. Soil samples were field screened for volatile hydrocarbons following the Headspace Field Method [Guidelines For Surface Impoundment Closure, New Mexico Oil Conservation Division, Part 1 (IA.2a) October 29, 1991] using a photoionization detector (PID). To characterize any hydrocarbon contamination, additional soil and groundwater samples were collected and submitted for laboratory analysis. Laboratory analyses included aromatic hydrocarbons [specifically, Benzene, Toluene, Ethyl-benzene and Xylene (BTEX)] per EPA Methods 8020 and 3810 and Total Recoverable Petroleum Hydrocarbons (TPH) per US EPA Method 418.1.

Site Assessment

Two preliminary pit assessments were initiated in April 1992. For the compressor/separator pit, three test holes were advanced around pit and one test hole in a down gradient location. For the wellhead overflow pit, one test hole was advance in the center of the pit. Significant soil and groundwater contamination was identified during the initial assessments.

Following the pit assessments in August through September 1992, fourteen additional test holes were advanced in and around the entire well location to fully characterize the extent of contamination.

The site diagram (Appendix A: Sheet 2) shows the location of the test holes and the attached field assessment reports summarize the field findings of the assessments.

Based on the assessments, the subsurface soils in the area of the tank battery area typical alluvial sediments consisting primarily of well graded sands and gravel with variable amounts of silt and clay in lenses and stringers. There is significant hydrocarbon contamination of soil and groundwater throughout the site. The plume encompasses the entire fenced area of the storage complex, and extends east of the separator approximately 90 feet (up gradient). In all other directions, the plume extends 10 to 50 feet beyond the location fence.

Soil contamination extends from the surface to the groundwater interface in the areas of the compressor/separator and well head pits, and around some of the piping. In other areas the soil contamination is limited to the vadoze zone one to two feet above the groundwater. Soil TPH ranged from 500 to 3000 ppm with total BTEX on the order of 1 to 3 ppm.

A small amount of free product was observed on the groundwater, and dissolved phase BTEX contamination exceeded the regulatory action levels. Significant groundwater contamination is believed to be limited to within the storage location fence.

The source of the contamination is suspected to be from the two unlined pits, piping leaks and other activities that Tenneco may have done during the drilling and production (eg. abandoned reserve pits) east of the location.

Groundwater Assessment

Monitor wells were installed during the field assessment and placed at locations around the site to monitor the groundwater contamination, and the progress of the anticipated cleanup effort.

Monitor wells were drilled using a CME-55 truck mounted drill, with eight inch (8") hollow-stem augers. The monitor wells were typically constructed using two inch (2") diameter threaded-coupling schedule 40 PVC casing. A ten foot screen section (0.020" slot size) was set with the top of screen a minimum of two feet (2') above the groundwater level encountered during drilling. The screened interval was gravel packed to a minimum of one foot (1') above the slotted interval with 8-12 gradation silica sand and sealed with 200 mesh bentonite. Blank PVC casing was used to complete the wells to eighteen inches (18") above site grade. Each monitor well is secured with a locking cap. Refer to Appendix B for the monitor well details.

The depth to groundwater was measured during the development and sampling of the wells. As previously noted the depth to groundwater was observed to be on the order of six to eight feet below the site ground surface. This water level fluctuated significantly due to season recharge. The groundwater gradient is calculated to be to the southwest, flowing toward the San Juan River. Groundwater contours are plotted on a skeleton site plan (Appendix A: Sheet 3) with relative water levels given for each monitor well.

PROPOSED RECLAMATION PLAN

It is proposed to abate the site by installation of a groundwater collection and treatment system. Due to the relative proximity of the site to the San Juan River and free product on the groundwater, AMOCO elected to initiate installation of the system to minimize offsite migration of contamination. The pump and treat system consists of; a collection gallery of four recovery wells, water treatment system with an oil/water separator and air stripper, water disposal in percolation/infiltration ponds, and groundwater monitoring. Sheet 4 Appendix B is a flow-chart of the pump and treat system.

Following completion of the initial installation, a pilot test of the system was conducted from March to April of 1993. The pilot was to fine tune the system, check flow rates, verify the treated water quality and complete a pump test of the recovery well collection gallery. Effluent was routed to the steel pit on location and disposed of at an approved NMOCD water treatment facility. No effluent was placed in the infiltration ponds.

Full implementation of the reclamation system is pending NMOCD review and approval of this RAP.

Collection Gallery

The collection gallery consists of four recovery wells located within the AMOCO location and down gradient of the contamination source. Due to deep gravel and cobble subsurface soil conditions, the wells were installed using a cable tool rig driving slotted 8" steel casing. The wells were advanced to bedrock, a "blue" shale or siltstone at a depth of 18 to 28 feet below the site surface. Following drilling, the recovery wells were constructed with 4 1/2" PVC casing placed in the steel casing. The wells consisted of a screened interval (0.020" slot size) from approximately 6' to total depth, and sand filter packed with 8-12 gradation silica sand between the steel and PVC casing annulus. Four inch submersible water pumps have been placed in each recovery well, designed for an output for one to sixteen gallons per minute (gpm). Recovered groundwater from all four wells is commingled and piped to the water treatment system.

Water Treatment System

The collected hydrocarbon contaminated groundwater will be initially treated by skimming free product in a 100 bbl settling tank. Recovered free product will be routed to the oil storage vessels at the tank battery. The water will then be routed through an air stripper to remove any dissolved phase hydrocarbons. The water treatment system has been design for an influent rate of 5 to 15 gpm. Refer to the Air Stripper Detail in Appendix B.

Based on similar air stripping systems of waters contaminated with produced crude, air emissions from the air stripper will be substantially below 10 pounds per day. Therefore, no air emission permits for air quality are anticipated.

Water Disposal

Once treated and below the New Mexico Groundwater Standards for hydrocarbons, the effluent will be pumped into two infiltration ponds. Both ponds are up-gradient of the contamination plume, with surface areas of approximately 3000 square feet (sf) and 1900 sf. The infiltration ponds were located up-gradient of the plume and constructed by shallow excavation, with berms to retain effluent and fenced to minimize livestock access. Infiltration tests in the ponds indicated a percolation rate on the order of 135 gpd/sf, indicating an infiltration capability on the order of 600,000 gpd. No additional gravel percolation galleries are anticipated to be required.

Monitor Wells

Seven groundwater recovery wells were installed to monitor the site and will be used to evaluate and monitor the clean-up. Four wells are located down and cross gradient (MW#1, MW#2, MW#3, and MW#4). Monitor well MW#5 is located near the center of the plume, and wells MW #6 and MW#7 are located up gradient.

Sheet 3 Appendix A is a site diagram showing the location of the recovery wells, treatment system, infiltration ponds and monitor wells.

Pilot Test

During the pilot test, a limited pump test was conducted in April 1993 to project the anticipated effective capture of the collection gallery. Recovery well #3 was used for the pump test. Based on the findings of the pump test and the earlier site assessments, the shallow aquifer is believed to be unconfined, with a transmissivity of approximately 3,000 gpd/foot, storativity of 0.25, and gradient of 0.003 feet/foot. The effective capture radius per well at a pump rate of one (1) to three (3) gpm is anticipated to be on the order of 50 to 100 feet with a drawdown on the order of 0.25 feet at the capture radius. Therefore, the four recovery wells are anticipated to effectively capture and collect any groundwater contamination from the site, assuming a sustained pump rate of 15 to 25 gpm. If groundwater monitoring indicates that contamination is continuing to migrate down gradient, additional evaluation of the collection system may be needed as noted in the pump test evaluation (Appendix D).

Recovery rates for the four wells indicated that RW #1 could only sustain a production of 1 to 1.5 gpm, while RW #2, RW #3, and RW#4 will produce between 5 to 8 gpm.

A groundwater sample from MW #5 indicates relatively fresh water with a TDS of 1,310 ppm. During the pilot start-up in March 1993, a water sample of the commingled influent to the air stripper indicated a benzene concentration of 280 ppb; well above the NMWQCC standard for groundwater of 10 ppb. Following the pump test and pilot shut-down, the effluent from the air stripper was sampled. Laboratory analytical results of the effluent indicated a benzene concentration of 4.7 ppb, total BTEX of 7.2 ppb, and TPH below a detection limit of 0.1 ppm. Therefore the water treatment system appeared to affectively treat the water to below the NMWQCC standards.

Operation & Maintenance

Based on the pilot, the system is anticipated to remove and treat approximately 15 to 25 gpm of contaminated groundwater. The addition of nutrients and/or biotreatments to the water in the infiltration ponds will be considered if substantial decreases in soil and groundwater contamination are not realized within the first quarter of system operation.

Successful reclamation is anticipated to take approximately one year (1). A site assessment similar in scope to the initial assessments may be necessary to verify completion and closure for the subject site.

Once in operation the following schedule will be followed to maintain the system and verify the success of the reclamation.

- Weekly inspection of the system to check and adjust flow rates, verify infiltration, and servicing as necessary. At this time no adjustment of the water pH is anticipated to minimize scaling of the water treatment system. However, pH adjustment will be provided if scaling becomes a problem.

- During the weekly inspections the concentration of off gasses from the air stripper will be tested with an organic vapor meter (OVM) and air flow meter to assure air quality standards are not exceeded.

- Initial sampling and analysis of the groundwater, recovered water and treated effluent from the air stripper and prior to placement in the infiltration ponds will follow Table 1.

- Following the initial water sampling and analysis, groundwater from the monitor wells and effluent will be collected quarterly following the schedule outlined in Table 2. All collected water samples will be analyzed for BTEX constituents.

TABLE 1
INITIAL WATER ANALYSIS
GROUNDWATER RECLAMATION SYSTEM
SAN JUAN GRAVEL TANK BATTERY A-1
AMOCO PRODUCTION COMPANY

Sample Pt.	PAH	BTEX	TPH	A/C
All MW's		X	X	
Influent	X	X		
Effluent	X	X	X	X

Notes: PAH - Polynuclear Aromatic Hydrocarbons analyzed per EPA Method 8100.

BTEX - Aromatic Hydrocarbons per EPA Method 8020.

TPH - Total Petroleum Hydrocarbons per EPA Method 8015.

A/C - major anions and cations analyzed following EPA 600 Standard Methods.

TABLE 2
QUARTERLY WATER SAMPLING SCHEDULE
GROUNDWATER RECLAMATION SYSTEM
SAN JUAN GRAVEL TANK BATTERY A-1
AMOCO PRODUCTION COMPANY

MW - 1	JUL.-SEPT. 93	OCT.-DEC. 93	JAN.-MAR. 93	APR.-JUN. 93
MW - 1		X		X
MW - 2	X		X	
MW - 3		X		X
MW - 4	X		X	
MW - 5	X	X	X	X
MW - 6	X		X	
MW - 7		X		X
EFFLUENT	X	X	X	X

CLOSURE & LIMITATIONS

Based on the performance of the water reclamation system on similar sites, successful reclamation is anticipated to take approximately one year (1). A site assessment similar in scope to the initial assessments may be necessary to verify completion and closure for the subject site.

This remedial action plan is based on the preliminary site assessments, laboratory analysis, information provided by Amoco Production Company, and previously approved RAP at similar sites.

NMOCD review and approval of this RAP is assumed to be the only regulatory approval required to implement and maintain this reclamation.

All services to be performed in the execution of this RAP and the development of this RAP are in accordance with generally accepted professional practices in construction/excavation and geotechnical/environmental/petroleum engineering.

This remedial action plan has been prepared for the exclusive use of Amoco Production Company as it pertains to their San Juan Gravel Tank Battery A #1 facility located on the Southeast ¼ of the Southeast ¼ of Section 21, Township 29N, Range 13W, NMPM, San Juan County, New Mexico.

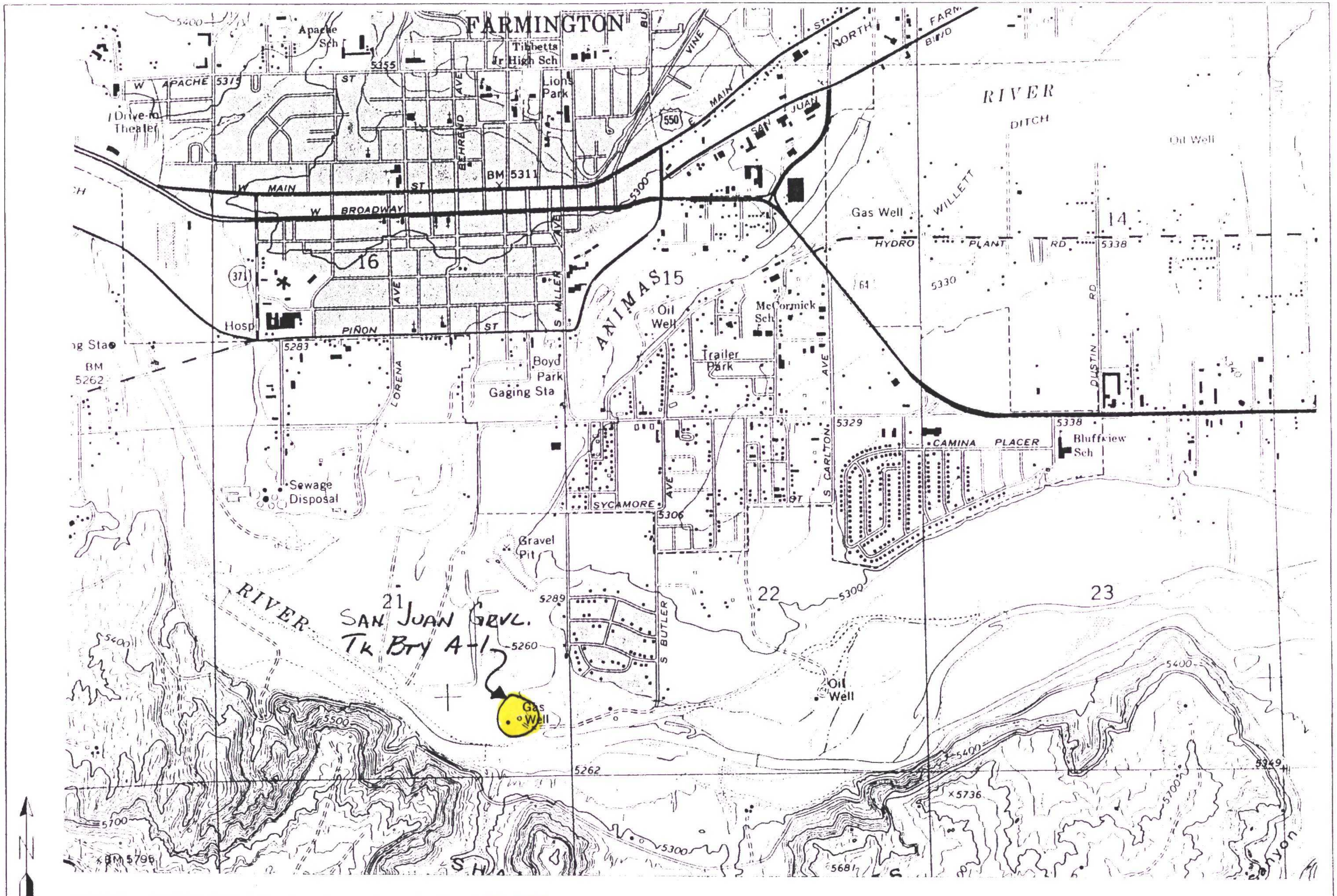
Respectfully Submitted,
ENVIROTECH, INC.
Jim Weahkee/sem
Jim Weahkee
Civil Engineer

Reviewed by:
Michael K. Lane, P.E.
Geological Engineer

APPENDICES

JW/MKL:mkl

4028RM.PLN



REFERENCE: USGS FARMINGTON SOUTH QUADRANGLE, SAN JUAN COUNTY, NM 7.5' SERIES.

SAN JUAN GRAVEL TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W
PRODUCTION TANK PIT AREA

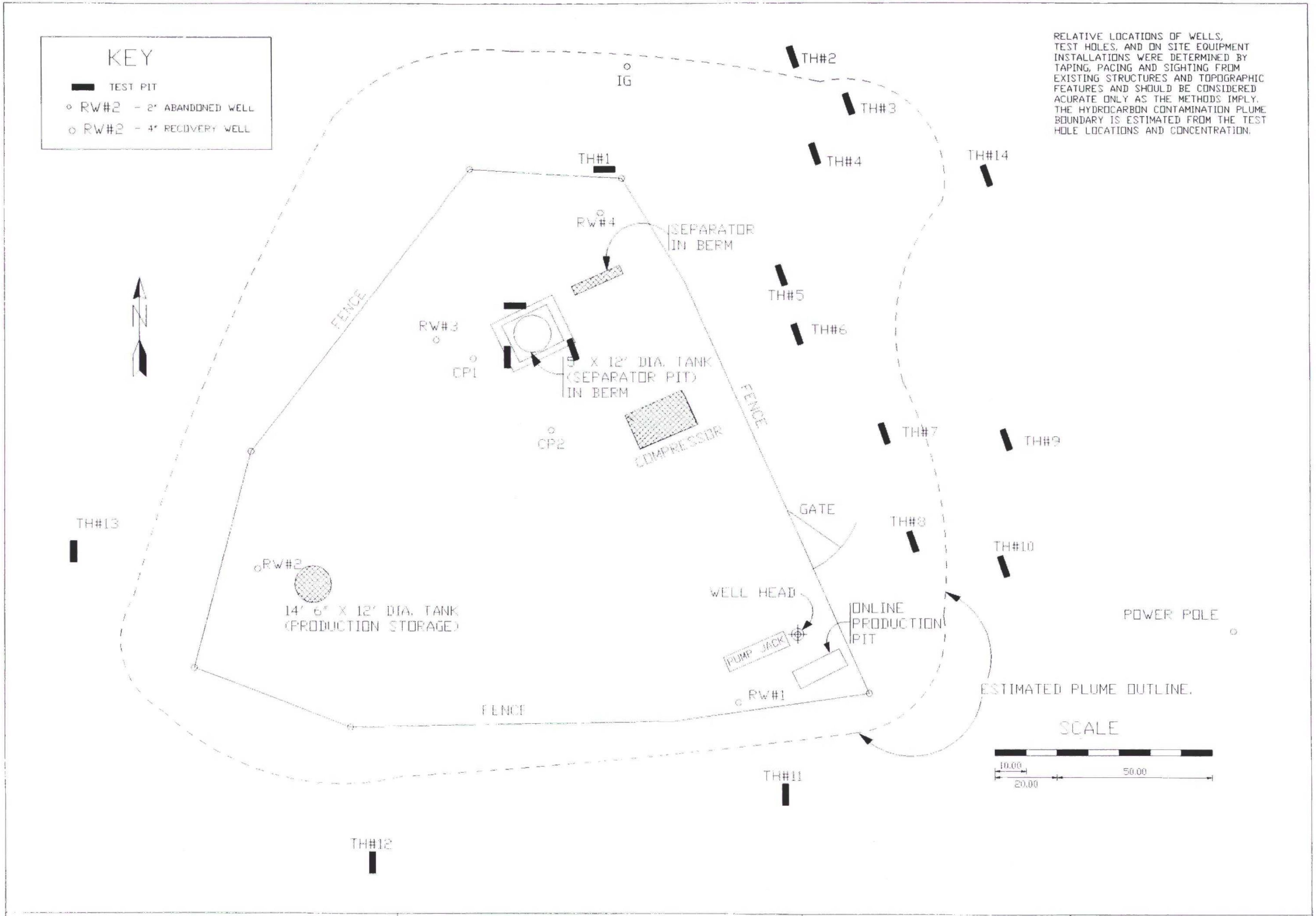
REMEDIATION PLAN PROJECT NO: 92140/94028-29

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

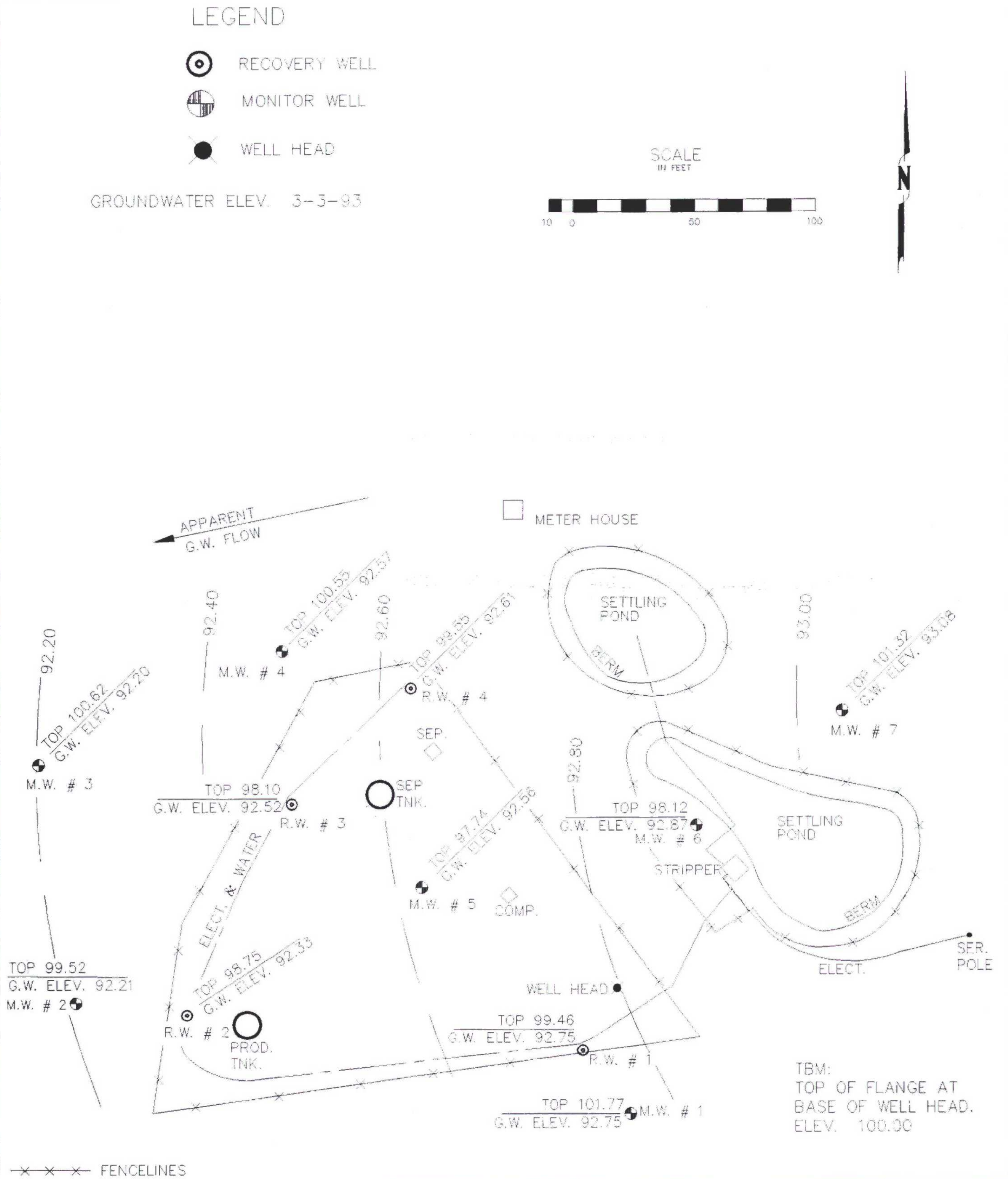
VICINITY MAP
SHEET 1

9/30/92



RELATIVE LOCATIONS OF WELLS,
TEST HOLES, AND ON SITE EQUIPMENT
INSTALLATIONS WERE DETERMINED BY
TAPING, PACING AND SIGHTING FROM
EXISTING STRUCTURES AND TOPOGRAPHIC
FEATURES AND SHOULD BE CONSIDERED
ACURATE ONLY AS THE METHODS IMPLY.
THE HYDROCARBON CONTAMINATION PLUME
BOUNDARY IS ESTIMATED FROM THE TEST
HOLE LOCATIONS AND CONCENTRATION.

SAN JUAN GRAVEL TANK BATTERY #1 SE/4, SE/4, SEC 21, T29, R13W PRODUCTION TANK PIT AREA PEMEDIATION PLAN PROJECT NO: 92140/94028-29	AMOCO PRODUCTION COMPANY 200 AMOCO CT. FARMINGTON, NEW MEXICO	ENVIROTECH INC. ENVIRONMENTAL SCIENTISTS & ENGINEERS 5796 U.S. HIGHWAY 64-3014 FARMINGTON, NEW MEXICO 87401 PHONE: (505) 632-0615	SITE PLAN SHEET 2 9/4/92



SITE DIAGRAM
AMOCO PRODUCTION CO
SAN JUAN GRAVEL
TANK BATTERY A-1

PROJECT NO. 92140/94028

ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

ENGINEERED BY: DEF
DRAWN BY: DEF
PROJECT MGR.: JW
DATE SURVEYED: 2-24-93
DATE DRAWN: 3-2-93

SHEET: #3

94028

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

OVM Model 580B

4/14 2hours 4
4/15 2hours 3.5

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: Back w/24"

DATE STARTED: 4/14/92
DATE FINISHED: 4/16/92
ENVIRO. SPCLT: RB
OPERATOR: D
ASSISTANT: LT

LOCATION: LEASE: San Juan Gra WELL: Tank Bat. No. QD: SE/4 SE/4
SEC: 21 TWP: T29 N RNG: R13W BM: NMPM CNTY: SJ ST: NM PIT: Steel Tank #1217
LAND USE: Range / Game (Bolack Ranch) Refuge (Big Sage)
SURFACE CONDITIONS: Sandy ↓ 36"

FIELD NOTES & REMARKS: Very Sandy site w/ clean surface on top to a depth of 36". 36" ↓ GW Gray to Black soils. GW @ 6'. Free Product in H_2O in all 4 Test holes.
✓ Water samples from monitoring Well to be taken by MKL.

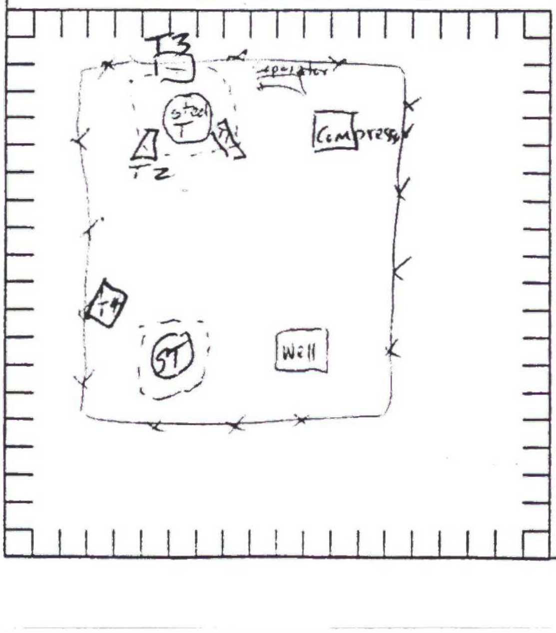
SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:
T1@5'	SOIL	Head
T1@GW	SOIL	Head
T1@5'	SOIL	8020 / 418.1
T1@GW	SOIL	8020 / 418.1
T1@GW	WATER	8020 (2x)
"	"	"
T2@5'	SOIL	8020 / 418.1
T2@GW	WATER	8020
"	WATER	8020
T2@5'	SOIL	Head
T3@5	SOIL	HEAD
T3 GW	WATER	Head (2x)
T3@5	SOIL	8020 / 418.1
T4@5	SOIL	Head
T4 GW	WATER	Head (2x)
T[illegible]	SOIL	8020 / 418.1

4/14
4/15

SCALE
0 2 4 FEET

SITE DIAGRAM



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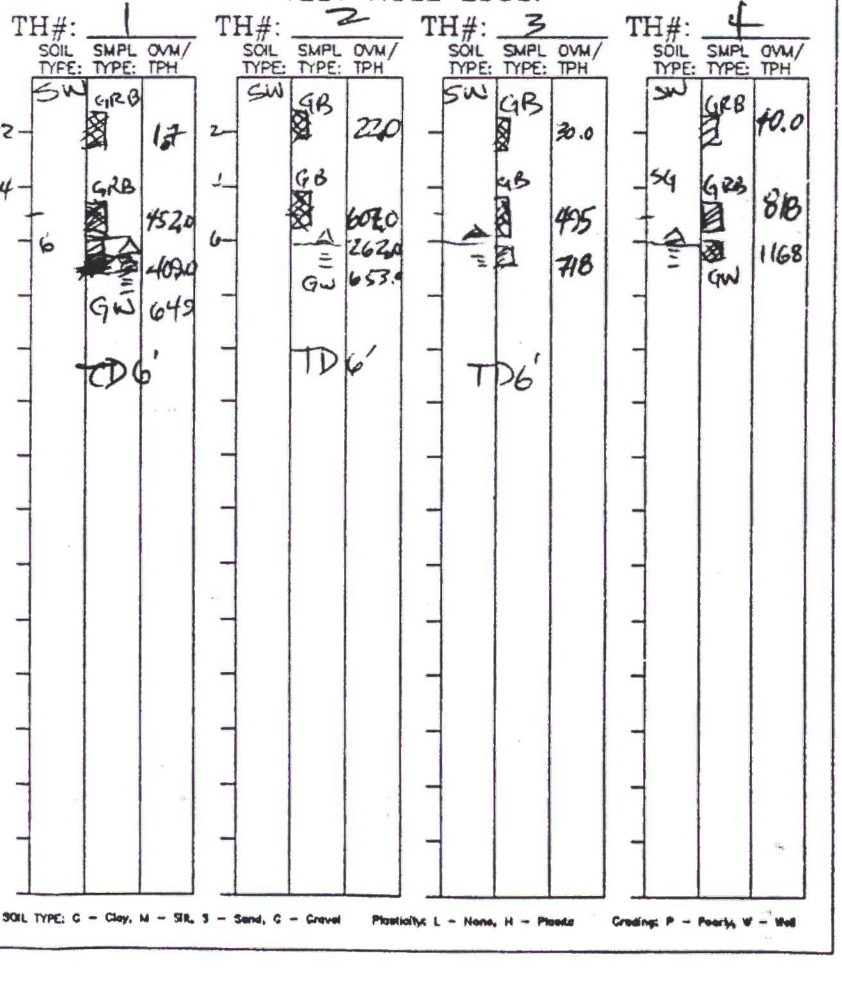


SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Grading: P - Poorly, W - Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

1 hr
94029

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: [illegible] of 3 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: Back Hoe w/ 24"

DATE STARTED: 4/15/92
DATE FINISHED: 4/16/92
ENVIRO. SPCLT: RB
OPERATOR: DD
ASSISTANT: LT

LOCATION: LEASE: San Juan Gravel WELL: Tank Battery QD: SE/4 SE 4
SEC: 21 TWP: T29N RNG: R13W BM: NMPM CNTY: SJ ST: NM PIT: [illegible] # [illegible] Well Head
LAND USE: Range & Wildlife Refuge Tom (Black)
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: Well Head appears to be 20+ yrs at site. Sandy soils ~~Br~~ from surface to depth of 5', 6 foot depth has gray/~~dk~~ black river gravel/soils & GW @ 7'. Pit located 20' from well head in SE/E direction

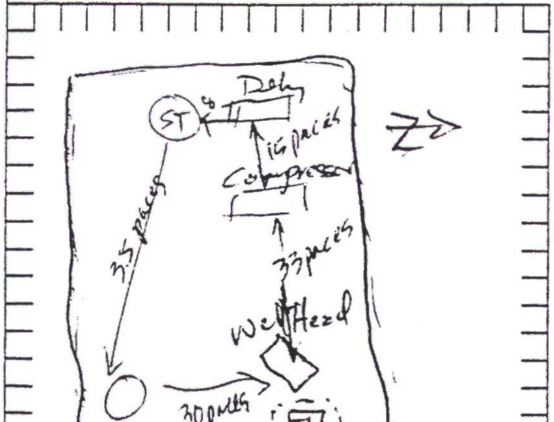
SAMPLE INVENTORY:

SMPL ID:	SMPL. TYPE:	LABORATORY ANALYSIS:
T1@5' WH	SOIL	Head
T1@5 WH	SOIL	8020 [illegible] 418.1
T1@GW WH	WATER	HEAD
4		

SCALE

0 FEET

SITE DIAGRAM



TEST HOLE LOGS:

TH#: 1

	SOIL TYPE:	SMPL TYPE:	OVM/TPH
	SW	GRB	
2		☒	N/D
4		GRB	
		☒	1124
6		GRB	
7		☒ GW	1212

TH#:

SOIL TYPE:	SMPL TYPE:	OVM/TPH

TH#:

SOIL TYPE:	SMPL TYPE:	OVM/TPH

TH#:

SOIL TYPE:	SMPL TYPE:	OVM/TPH

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Grading: P - Poorly, W - Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

C4028

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: EXTENDAHOE

DATE STARTED: 7-7-92
DATE FINISHED: 7-7-92
ENVIRO. SPCLT: JW
OPERATOR: MS
ASSISTANT: TN

LOCATION: LSE: SJG WELL: TB No1 QD:
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: SJ ST: NM PIT:
LAND USE: Private B Square Ranch Bdack
SURFACE CONDITIONS:

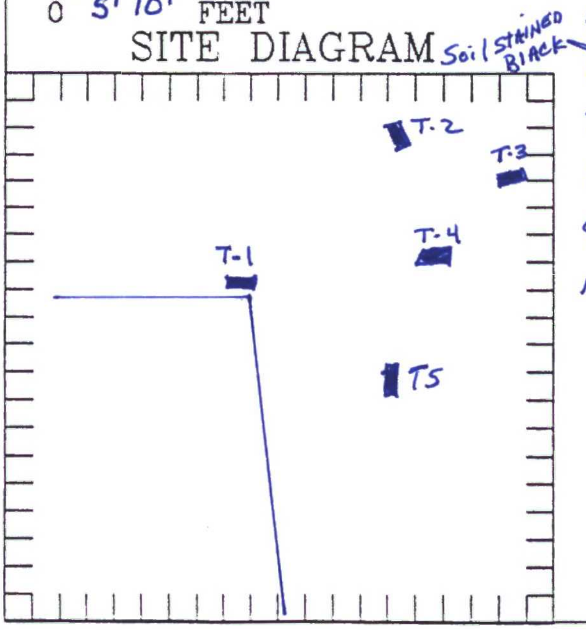
FIELD NOTES & REMARKS: Soil surrounding location is brawn sandy contamination through-out site area, except T-2

SAMPLE INVENTORY:

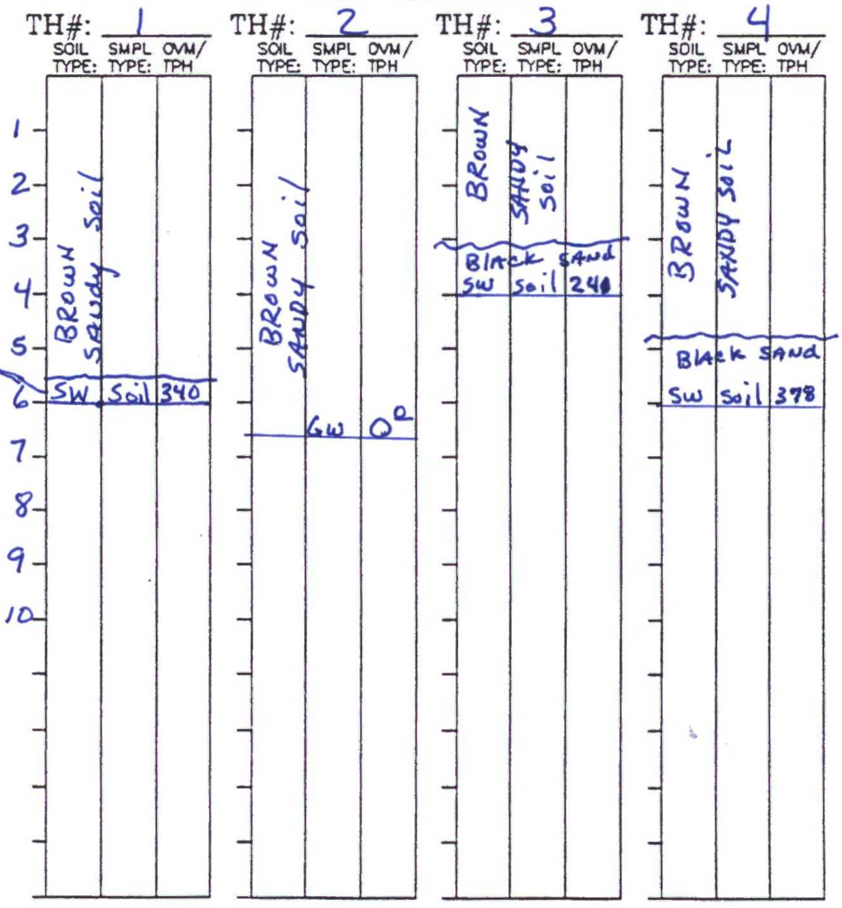
SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE
0 5' 10' FEET

SITE DIAGRAM



TEST HOLE LOGS:



SOIL TYPE: C – Clay, M – Silt, S – Sand, G – Gravel Plasticity: L – None, H – Plastic Grading: P – Poorly, W – Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

C4028

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 7-7-92
DATE FINISHED:
ENVIRO. SPCLT:
OPERATOR: JW
ASSISTANT:

LOCATION: LSE: WELL: QD:
SEC: TWP: RNG: PM: CNTY: ST: PIT:
LAND USE:
SURFACE CONDITIONS:

FIELD NOTES & REMARKS:

SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE

0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

TH#: 5

	SOIL TYPE:	SMPL TYPE:	OVM/ TPH
1	BROWN		
2	SAND		
3			
	BLACK		SAND
4	SW	soil	190
5			
6			
7			
8			
9			
10			

TH#:

SOIL TYPE:	SMPL TYPE:	OVM/ TPH

TH#:

SOIL TYPE:	SMPL TYPE:	OVM/ TPH

TH#:

SOIL TYPE:	SMPL TYPE:	OVM/ TPH

SOIL TYPE: C – Clay, M – Silt, S – Sand, G – Gravel   Plasticity: L – None, H – Plastic   Grading: P – Poorly, W – Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: EXTENDAHOE

DATE STARTED: 9-1-92
DATE FINISHED: 9-1-92
ENVIRO. SPCLT: JW
OPERATOR: BW
ASSISTANT:

LOCATION: LSE: SJG WELL: TB No QD:
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: SJ ST: NM PIT:
LAND USE: Private Bolack
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: Soil is brown sandy not apparent sign of contamination

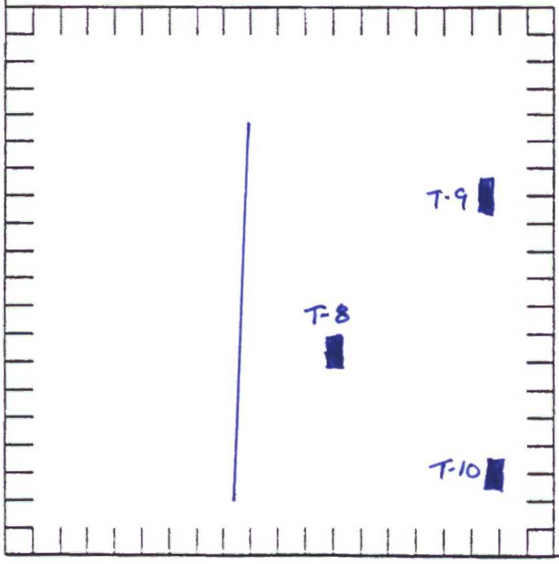
SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE

0 5' 10' FEET

SITE DIAGRAM



TEST HOLE LOGS:

	TH#: 8			TH#: 9			TH#: 10			TH#:		
	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH
1												
2												
3	BROWN	SANDY SOIL		BROWN	SANDY	SOIL	BROWN	SANDY SOIL				
4												
5												
6	SW		0°	SW		0°	SW		0°			
7												
8												
9												
10												

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Grading: P - Poorly, W - Well

ENVIROTECH Inc.

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FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: Extendahoe

DATE STARTED: 9-2-92
DATE FINISHED:
ENVIRO. SPCLT: JDD
OPERATOR: B.W.
ASSISTANT: P.U.

LOCATION: LSE: S.J.G. TK. Batt WELL: A-1 QD: SE¼ - SE¼ (P)
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: S.J. ST: NM PIT: Extent of Plume
LAND USE: Game Refuge B-Square Ranch (Bolack)
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: No samples were taken for laboratory ~~Results~~. Analysis.

OVM readings only.

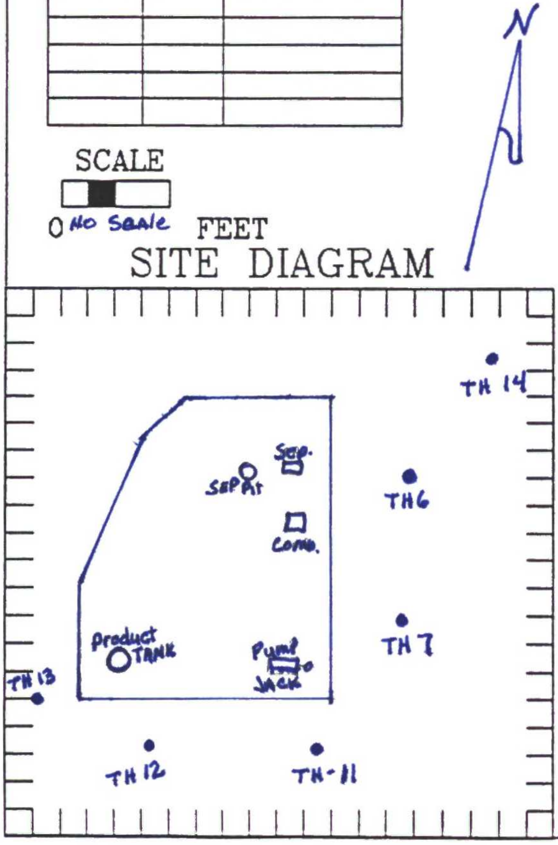
SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE

0 No Scale FEET

SITE DIAGRAM



TEST HOLE LOGS:

TH#: 6 (SOIL TYPE: / SMPL TYPE: / OVM/TPH)
- 0–5: BROWN SAND with silt & GRAVEL
- 5: SW • soil 131

TH#: 7 (SOIL TYPE: / SMPL TYPE: / OVM/TPH)
- 0–4: BROWN SAND with silt and GRAVEL
- 4: SW
- 4–5: Lite brown sandy GRAVEL 62.3

TH#: 11 (SOIL TYPE: / SMPL TYPE: / OVM/TPH)
- 0–3: SW BROWN SAND with silt AND GRAVEL
- 3–6: Lite Brown SANDY Gravel
- 6: SW ND
- 6–9: wet black SANDY Gravel ND
- 9: GW
- 9–10: H2o ND

TH#: 12 (SOIL TYPE: / SMPL TYPE: / OVM/TPH)
- 0–4: BROWN SAND with silt AND GRAVEL
- 4: SW Soil ND
- 4–9: Lite Brown Sandy Gravel
- 9: GW soil ND
- 9–10: H2o ND

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20

SOIL TYPE: C – Clay, M – Silt, S – Sand, G – Gravel   Plasticity: L – None, H – Plastic   Grading: P – Poorly, W – Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 2 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: extendahoe

DATE STARTED: 9-2-92
DATE FINISHED:
ENVIRO. SPCLT: JDD
OPERATOR: BW
ASSISTANT: PU

LOCATION: LSE: S.J.G Tk. BAtt WELL: A-1 QD: SE 1/4 SE 1/4 (P)
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: S.J ST: N.M. PIT: EXTENT of Plume
LAND USE: Game Refuge B-Square Ranch (Bolack)
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: O.U.M. Readings only

SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE

0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

	TH#: 13			TH#: 14			TH#:			TH#:		
	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH
	BROWN SAND											
1	with silt			BROWN SAND								
				with silt								
2	AND GRAVEL			AND GRAVEL								
3												
4	SW	Soil	ND									
5	Lite BROWN			SW	Soil	ND						
				Lite BROWN								
6	SAND &			SAND & GRAVEL								
	GRAVEL											
7				GW	Soil	ND						
					H2O	ND						
8	GW	Soil	ND									
		H2O	ND									
9												
10												
12												
14												
16												
18												
20												

SOIL TYPE: C – Clay, M – Silt, S – Sand, G – Gravel Plasticity: L – None, H – Plastic Grading: P – Poorly, W – Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0815

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 3

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 2-2-93
DATE FINISHED: 2-2-93
ENVIRO. SPCLT: JW
OPERATOR:
ASSISTANT:

LOCATION: LSE: S.J.G. Unit A TK BAH WELL: 1 QD: SE 1/4 NE 1/4
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: S.J ST: NM PIT: M/w's R/w's
LAND USE: Wild Life Refuge – Bolack B square Ranch
SURFACE CONDITIONS: 2" monitor well 4 1/2" Recovery wells

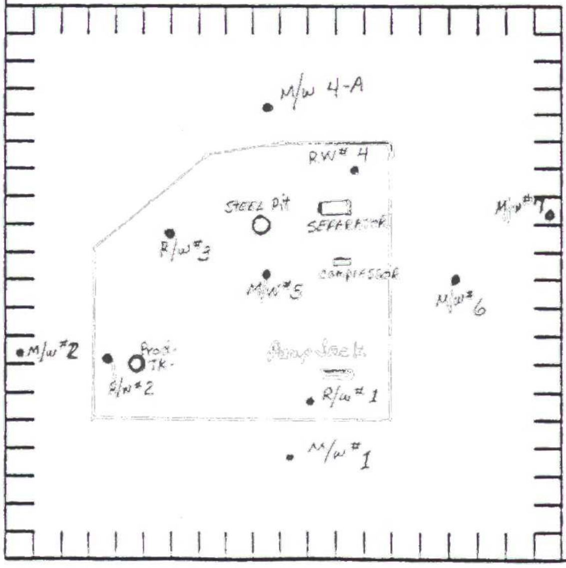
FIELD NOTES & REMARKS: OVM samples of water taken from each Recovery well and monitor well.

SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE
0 10 40 FEET

SITE DIAGRAM



TEST HOLE LOGS:

	TH#: R/w#1			TH#: R/w#2			TH#: R/W#3			TH#: R/w#4		
	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH
1												
2												
3												
4												
5		~~[illegible]~~ Jw						H2O	134			
6												
7		H2O	0^{0}	/	H2O	2.^{4}					H2O	6.^{2}
8												
9												
10												

SOIL TYPE: C – Clay, M – Silt, S – Sand, G – Gravel   Plasticity: L – None, H – Plastic   Grading: P – Poorly, W – Well

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 2 of 3

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 2-2-93
DATE FINISHED: 2-2-93
ENVIRO. SPCLT: JW
OPERATOR:
ASSISTANT:

LOCATION: LSE: S.J. Gc. Unit A Tk. Batt WELL: 1 QD:
SEC: TWP: RNG: PM: CNTY: ST: PIT:

LAND USE:
SURFACE CONDITIONS:

FIELD NOTES & REMARKS:

SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE

0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

TH#: M/W #1

	SOIL TYPE:	SMPL TYPE:	OVM/TPH
1			
2			
3			
4			
5			
6			
7			
8			
9		● H2O	0°
10			

TH#: M/W #2

	SOIL TYPE:	SMPL TYPE:	OVM/TPH
7		● H2O	0°

TH#: M/W #4A

	SOIL TYPE:	SMPL TYPE:	OVM/TPH
8		● H2O	539

TH#: M/W #5

	SOIL TYPE:	SMPL TYPE:	OVM/TPH
5		● H2O	552

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Grading: P - Poorly, W - Wel

ENVIROTECH Inc.

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(505) 632-0615

FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 3 of 3

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 2-2-93
DATE FINISHED: 2-2-93
ENVIRO. SPCLT: JW
OPERATOR:
ASSISTANT:

LOCATION: LSE: S.J.G Unit A Tk. Batt WELL: 1 QD:
SEC: TWP: RNG: PM: CNTY: ST: PIT:
LAND USE:
SURFACE CONDITIONS:

FIELD NOTES & REMARKS:

SAMPLE INVENTORY:

SMPL ID:	SMPL TYPE:	LABORATORY ANALYSIS:

SCALE

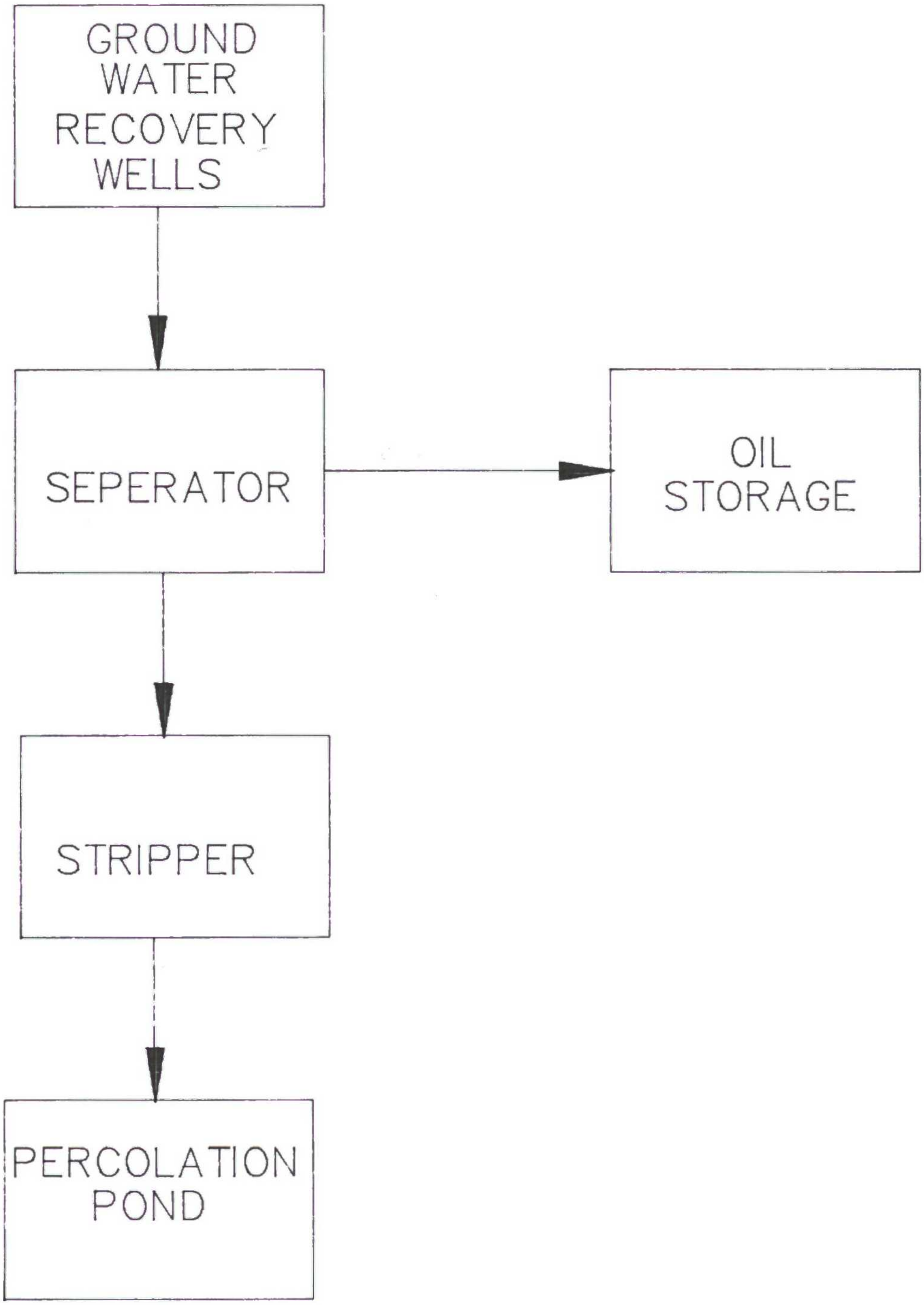
0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

	TH#: M/W #6			TH#: M/W #7			TH#:			TH#:		
	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH	SOIL TYPE:	SMPL TYPE:	OVM/ TPH
1												
2												
3												
4												
5		● H20	$1.^{\underline{4}}$									
6												
7												
8					● H20	$2.^{\underline{3}}$						
9												
10												

SOIL TYPE: C – Clay, M – Silt, S – Sand, G – Gravel Plasticity: L – None, H – Plastic Grading: P – Poorly, W – Well

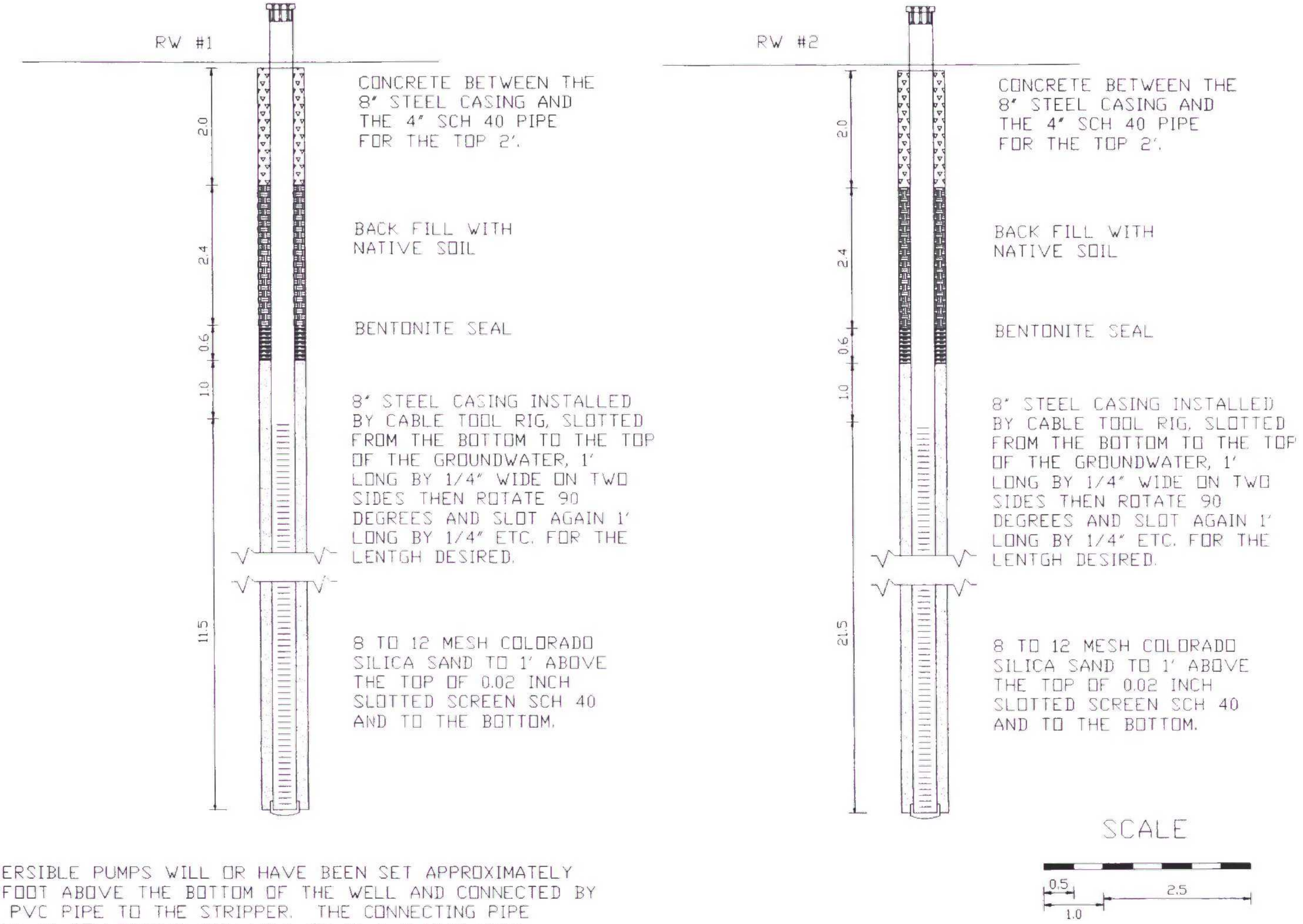


ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64–3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632–0615

CONTAMINATED WATER TREATMENT FLOW–CHART

SHEET 4



CONCRETE BETWEEN THE
8" STEEL CASING AND
THE 4" SCH 40 PIPE
FOR THE TOP 2'.

BACK FILL WITH
NATIVE SOIL

BENTONITE SEAL

8" STEEL CASING INSTALLED
BY CABLE TOOL RIG, SLOTTED
FROM THE BOTTOM TO THE TOP
OF THE GROUNDWATER, 1'
LONG BY 1/4" WIDE ON TWO
SIDES THEN ROTATE 90
DEGREES AND SLOT AGAIN 1'
LONG BY 1/4" ETC. FOR THE
LENTGH DESIRED.

8 TO 12 MESH COLORADO
SILICA SAND TO 1' ABOVE
THE TOP OF 0.02 INCH
SLOTTED SCREEN SCH 40
AND TO THE BOTTOM.

CONCRETE BETWEEN THE
8" STEEL CASING AND
THE 4" SCH 40 PIPE
FOR THE TOP 2'.

BACK FILL WITH
NATIVE SOIL

BENTONITE SEAL

8" STEEL CASING INSTALLED
BY CABLE TOOL RIG, SLOTTED
FROM THE BOTTOM TO THE TOP
OF THE GROUNDWATER, 1'
LONG BY 1/4" WIDE ON TWO
SIDES THEN ROTATE 90
DEGREES AND SLOT AGAIN 1'
LONG BY 1/4" ETC. FOR THE
LENTGH DESIRED.

8 TO 12 MESH COLORADO
SILICA SAND TO 1' ABOVE
THE TOP OF 0.02 INCH
SLOTTED SCREEN SCH 40
AND TO THE BOTTOM.

SUBMERSIBLE PUMPS WILL OR HAVE BEEN SET APPROXIMATELY ONE FOOT ABOVE THE BOTTOM OF THE WELL AND CONNECTED BY A 2" PVC PIPE TO THE STRIPPER. THE CONNECTING PIPE TO THE 2" COLLECTION PIPE WILL OR IS A 1" PVC WITH AN INLINE BALL VALVE.

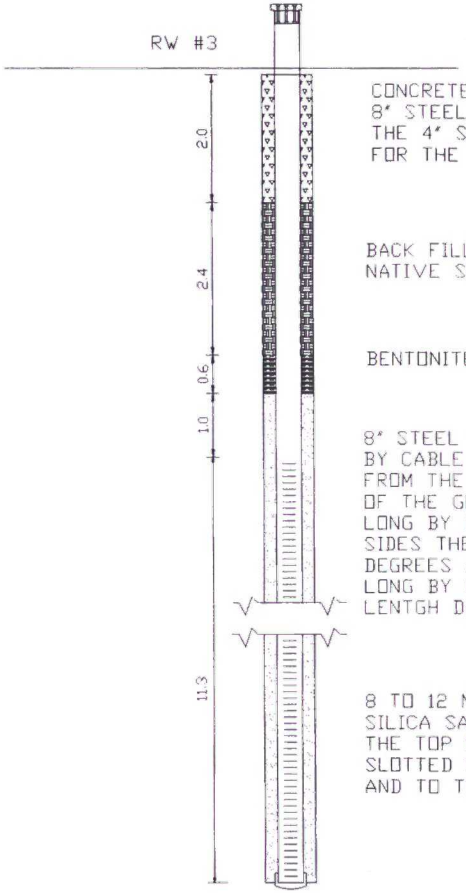
SAN JUAN GRAVEL TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W
PRODUCTION TANK PIT AREA
RECOVERY WELLS #1 AND #2.

RECOVERY WELL DETAIL   PROJECT NO: 92140/94028-29
DRW BY: JDD   DATE: 10/13/92

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615



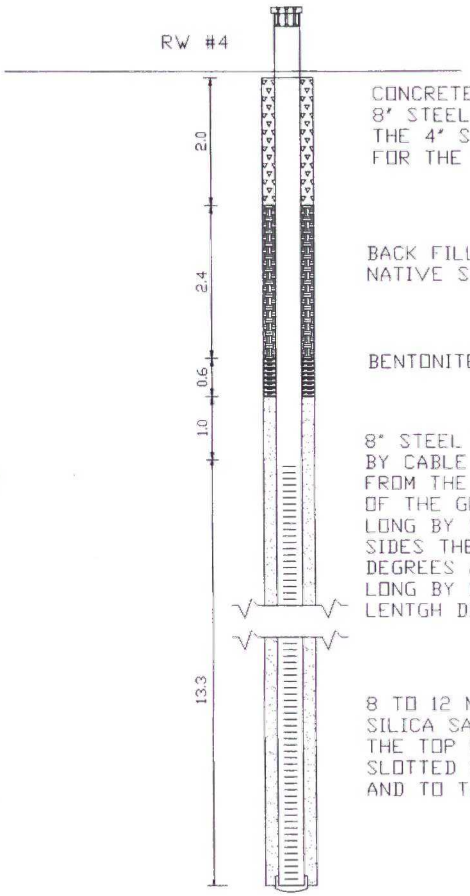
CONCRETE BETWEEN THE 8" STEEL CASING AND THE 4" SCH 40 PIPE FOR THE TOP 2'.

BACK FILL WITH NATIVE SOIL

BENTONITE SEAL

8" STEEL CASING INSTALLED BY CABLE TOOL RIG, SLOTTED FROM THE BOTTOM TO THE TOP OF THE GROUNDWATER, 1' LONG BY 1/4" WIDE ON TWO SIDES THEN ROTATE 90 DEGREES AND SLOT AGAIN 1' LONG BY 1/4" ETC. FOR THE LENTGH DESIRED.

8 TO 12 MESH COLORADO SILICA SAND TO 1' ABOVE THE TOP OF 0.02 INCH SLOTTED SCREEN SCH 40 AND TO THE BOTTOM.



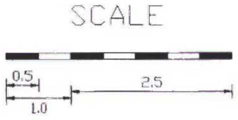
CONCRETE BETWEEN THE 8" STEEL CASING AND THE 4" SCH 40 PIPE FOR THE TOP 2'.

BACK FILL WITH NATIVE SOIL

BENTONITE SEAL

8" STEEL CASING INSTALLED BY CABLE TOOL RIG, SLOTTED FROM THE BOTTOM TO THE TOP OF THE GROUNDWATER, 1' LONG BY 1/4" WIDE ON TWO SIDES THEN ROTATE 90 DEGREES AND SLOT AGAIN 1' LONG BY 1/4" ETC. FOR THE LENTGH DESIRED.

8 TO 12 MESH COLORADO SILICA SAND TO 1' ABOVE THE TOP OF 0.02 INCH SLOTTED SCREEN SCH 40 AND TO THE BOTTOM.

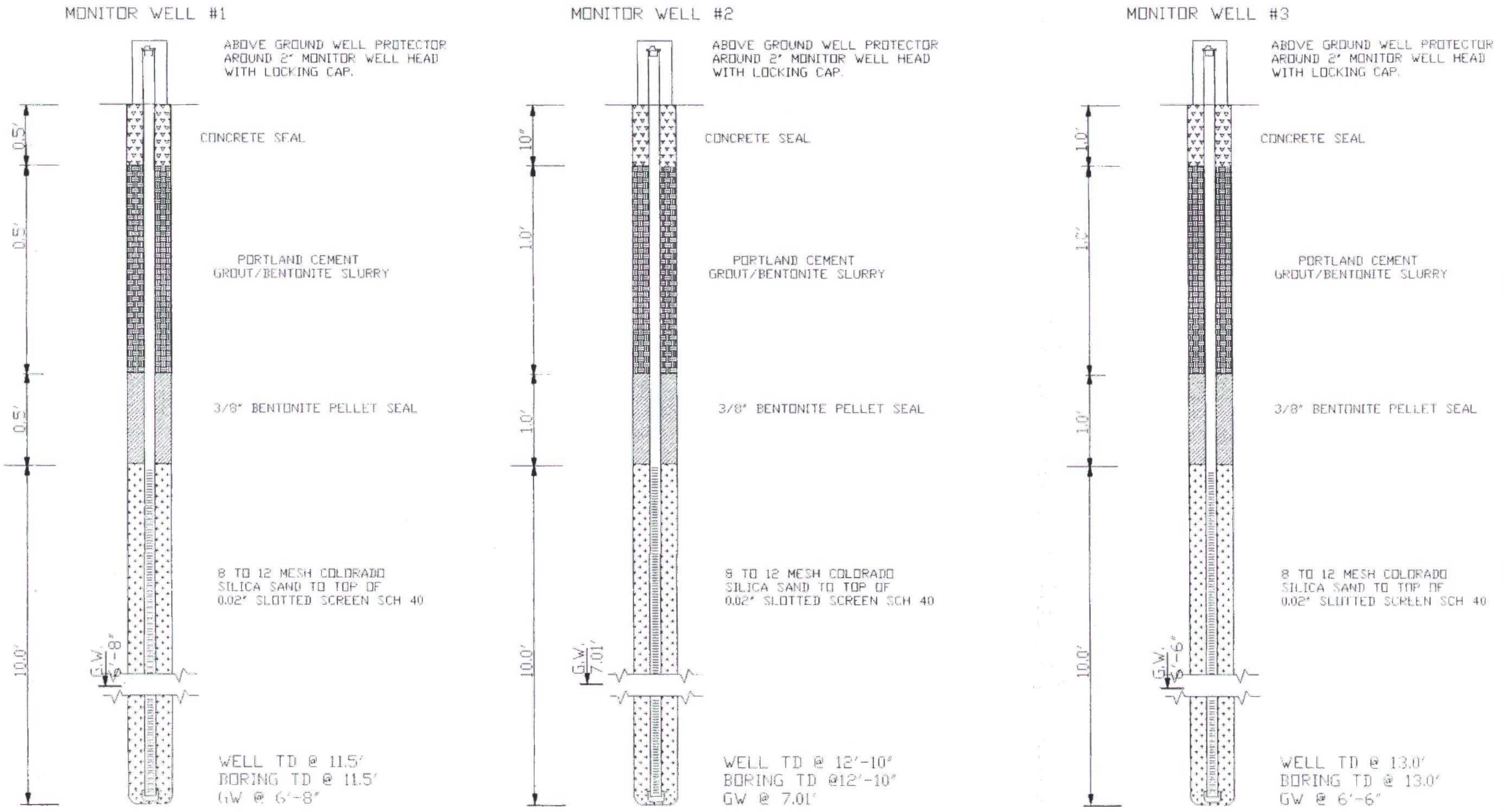


SUBMERSIBLE PUMPS WILL OR HAVE BEEN SET APPROXIMATELY ONE FOOT ABOVE THE BOTTOM OF THE WELL AND CONNECTED BY A 2" PVC PIPE TO THE STRIPPER. THE CONNECTING PIPE TO THE 2" COLLECTION PIPE WILL OR IS A 1" PVC WITH AN INLINE BALL VALVE.

SAN JUAN GRAVEL TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W
PRODUCTION TANK PIT AREA
RECOVERY WELLS #3 AND #4.
RECOVERY WELL DETAIL PROJECT NO: 92140/94028-29
DRW BY: JDD DATE: 10/13/92

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

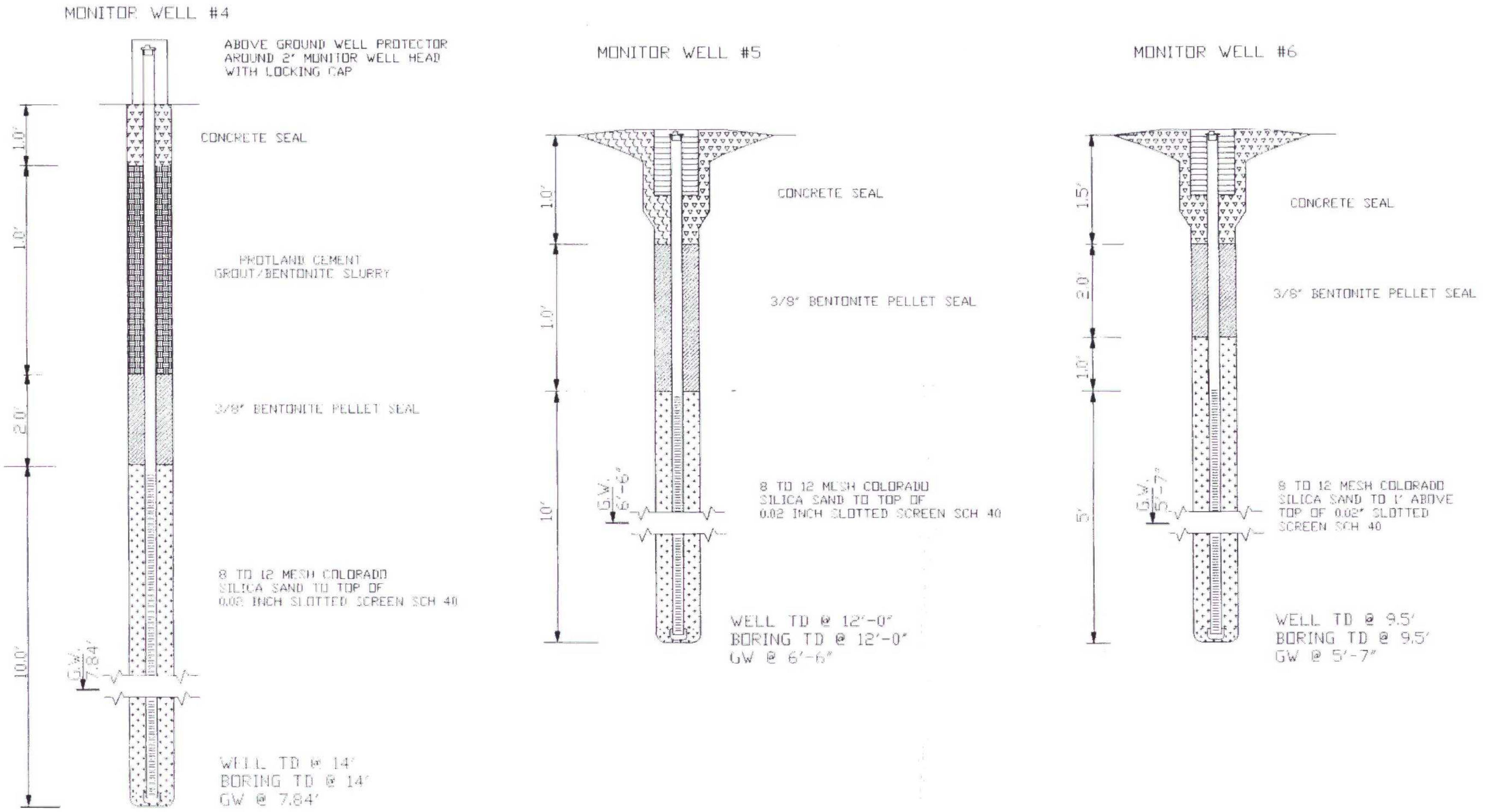


MONITOR WELL DETAILS
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL
TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W

ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

ENGINEER: J. WEAHKEE
DRAFTER: R. YOUNG
DATE: 4-21-93
MONITOR WELLS: 1,2,3



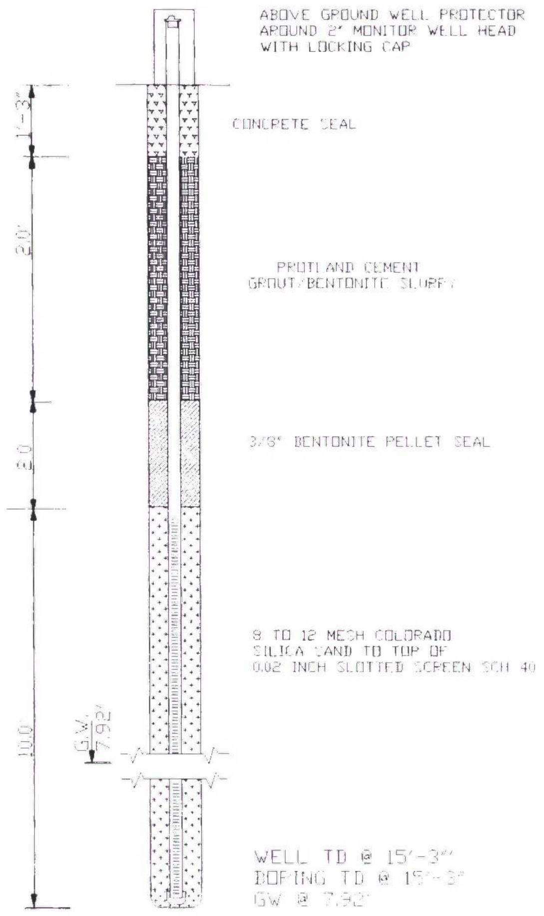
MONITOR WELL DETAILS
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL
TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W

ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

ENGINEER: J. WEAHKEE
DRAFTER: R. YOUNG
DATE: 4-21-93
MONITOR WELLS: 4,5,6

MONITOR WELL #7

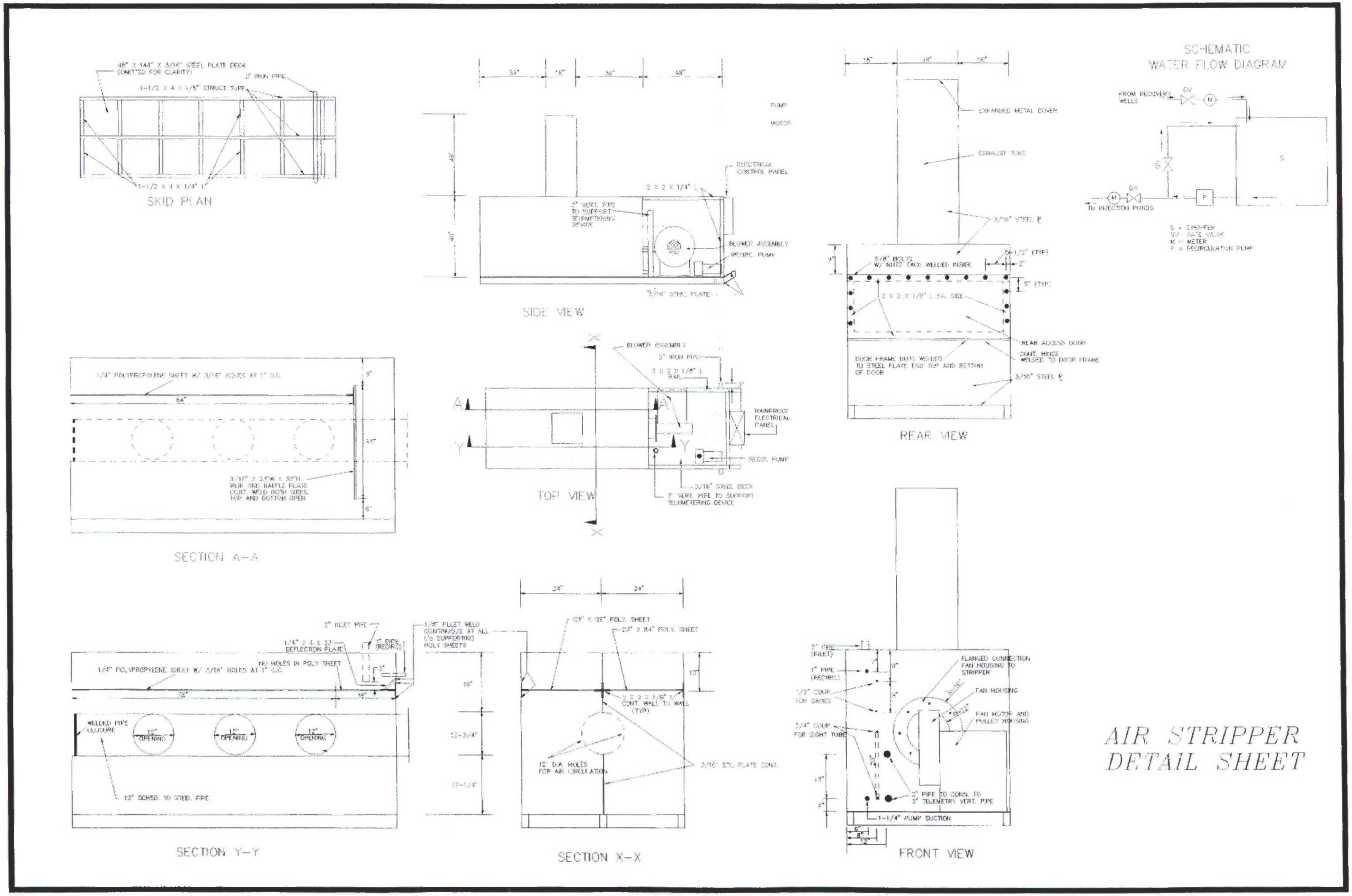


MONITOR WELL DETAILS
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL
TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W

ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

ENGINEER: J. WEAHKEE
DRAFTER: R. YOUNG
DATE: 4-21-93
MONITOR WELL: 7



AIR STRIPPER
DETAIL SHEET

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	**Envirotech Inc.**		
Sample ID:	m/w # 5 (4678)	Date Reported:	03/25/93
Laboratory ID:	2045	Date Sampled:	03/04/93
Sample Matrix:	Water	Time Sampled:	0916
Condition:	Cool/Intact	Date Received:	03/05/93

Parameter	Analytical Result	Units		Units
Lab pH	7.8	s.u.		
Lab Conductivity @ 25° C	2,060	umhos/cm		
Total Dissolved Solids @ 180°C	1,310	mg/L		
Total Dissolved Solids (Calc)	1,390	mg/L		
Total Alkalinity as CaCO3	807	mg/L		
Total Hardness as CaCO3	831	mg/L		
Bicarbonate as HCO3	985	mg/L	16.14	meq/L
Carbonate as CO3	0	mg/L	0.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Chloride	102	mg/L	2.87	meq/L
Sulfate	326	mg/L	6.79	meq/L
Calcium	193	mg/L	9.62	meq/L
Magnesium	85	mg/L	7.01	meq/L
Potassium	14	mg/L	0.37	meq/L
Sodium	190	mg/L	8.26	meq/L
Cations			25.26	meq/L
Anions			25.82	meq/L
Cation/Anion Difference			1.11	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Reviewed by________

ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865

EPA METHOD 8020
AROMATIC VOLATILE ORGANICS

Client: Amoco
Sample ID: Stripper (inlet)
Laboratory Number: 4675
Sample Matrix: Water
Preservative: HgCl & Cool
Condition: Cool & Intact

Project #: 92140
Date Reported: 03-04-93
Date Sampled: 03-04-93
Date Received: 03-04-93
Date Analyzed: 03-04-93
Analysis Requested: BTEX

Parameter	Concentration (ug/L)	Det. Limit (ug/L)
Benzene	280	0.4
Toluene	31.8	0.4
Ethylbenzene	8.6	0.5
p,m-Xylene	67	0.2
o-Xylene	15.2	0.3

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Trifluorotoluene	102 %
Bromfluorobenzene	106 %

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: Stripper, San Juan Gravel TK. Battery A-1, C-4028.

Analyst

Review

ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865

EPA METHOD 8020
AROMATIC VOLATILE ORGANICS

Client: Amoco		Project #:	92140
Sample ID:	Stripper(outlet)	Date Reported:	03-04-93
Laboratory Number:	4676	Date Sampled:	03-04-93
Sample Matrix:	Water	Date Received:	03-04-93
Preservative:	HgCl & Cool	Date Analyzed:	03-04-93
Condition:	Cool & Intact	Analysis Requested:	BTEX

Parameter	Concentration (ug/L)	Det. Limit (ug/L)
Benzene	81	0.4
Toluene	10.0	0.4
Ethylbenzene	2.5	0.5
p,m-Xylene	21.0	0.2
o-Xylene	5.0	0.3

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Trifluorotoluene	93 %
Bromfluorobenzene	103 %

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: Stripper, San Juan Gravel TK. Battery A-1, C-4028.

Ce Chaharlang
Analyst

Morris D Young
Review

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PHONE: (505) 632-0615 • FAX: (505) 632-1865

EPA METHOD 8020
AROMATIC VOLATILE ORGANICS

Client: Amoco
Sample ID: Stripper Outlet
Laboratory Number: 4917
Sample Matrix: Water
Preservative: HgCl & Cool
Condition: Cool & Intact

Project #: 92140
Date Reported: 04-14-93
Date Sampled: 04-13-93
Date Received: 04-13-93
Date Analyzed: 04-13-93
Analysis Requested: BTEX

Parameter	Concentration (ug/L)	Det. Limit (ug/L)
Benzene	4.7	0.3
Toluene	0.6	0.4
Ethylbenzene	0.2	0.2
p,m-Xylene	1.4	0.2
o-Xylene	0.3	0.2

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Trifluorotoluene	82 %
Bromofluorobenzene	87 %

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: San Juan Gravel TK.Battery A-1, Stripper Outlet, C-4028.

Analyst

Morris D. Young
Review

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PHONE: (505) 632-0615 • FAX: (505) 632-1865

EPA METHOD 418.1
TOTAL PETROLEUM HYDROCARBONS

Client:	Amoco	Project #:	92140
Sample ID:	Stripper outlet	Date Sampled:	03-04-93
Laboratory Number:	4677	Date Received:	03-04-93
Sample Matrix:	Water	Date Analyzed:	03-04-93
Preservative:	Cool	Date Reported:	03-04-93
Condition:	Cool & Intact	Analysis Needed:	TPH

Parameter	Concentration (mg/L)	Det. Limit (mg/L)
TPH	0.9	0.5

Method: Method 418.1, Total Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments: Stripper S.J.G. Tk. Batt. A-1 C-4028

Analyst

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PHONE: (505) 632-0615 • FAX: (505) 632-1865

MODIFIED EPA METHOD 8015
NONHALOGENATED VOLATILE ORGANICS

Client:	Amoco	Project #:	92140
Sample ID:	Stripper Outlet	Date Reported:	04-13-93
Laboratory Number:	4917	Date Sampled:	04-13-93
Sample Matrix:	Water	Date Received:	04-13-93
Preservative:	Cool	Date Analyzed:	04-13-93
Condition:	Cool and Intact	Analysis Requested:	TPH

Parameter	Concentration (mg/L)	Det. Limit (mg/L)
Gasoline Range (C5 - C10)	ND	0.1
Diesel Range (C10 - C28)	ND	0.1
C28 - C36 Range	ND	0.1
Total Petroleum Hydrocarbons	ND	0.1

Method: Method 8015, Nonhalogenated Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: S.J.G. Tk Batt A-1 C-4028

Analyst

Morris D Young
Review

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EPA METHOD 8020
AROMATIC VOLATILE ORGANICS

Client:	NA	Project #:	NA
Sample ID:	Laboratory Blank	Date Reported:	03-04-93
Laboratory Number:	0304AM.BLK	Date Sampled:	NA
Sample Matrix:	Water	Date Received:	NA
Preservative:	NA	Date Analyzed:	03-04-93
Condition:	NA	Analysis Requested:	BTEX

Parameter	Concentration (ug/L)	Det. Limit (ug/L)
Benzene	ND	0.4
Toluene	ND	0.4
Ethylbenzene	ND	0.5
p,m-Xylene	ND	0.2
o-Xylene	ND	0.3

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Trifluorotoluene	88 %
Bromfluorobenzene	95 %

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Morris D Young
Review

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EPA METHOD 8020
AROMATIC VOLATILE ORGANICS

Client:	NA	Project #:	NA
Sample ID:	Laboratory Blank	Date Reported:	04-14-93
Laboratory Number:	0413AM.BLK	Date Sampled:	NA
Sample Matrix:	Water	Date Received:	NA
Preservative:	NA	Date Analyzed:	04-13-93
Condition:	NA	Analysis Requested:	BTEX

Parameter	Concentration (ug/L)	Det. Limit (ug/L)
Benzene	ND	0.3
Toluene	ND	0.4
Ethylbenzene	ND	0.2
p,m-Xylene	ND	0.2
o-Xylene	ND	0.2

SURROGATE RECOVERIES:

Parameter	Percent Recovery
Trifluorotoluene	91 %
Bromofluorobenzene	89 %

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Chaharlang
Analyst

Morris D Young
Review

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** QUALITY ASSURANCE EPA METHOD 8020
MATRIX SPIKE - AROMATIC VOLATILE ORGANICS

Client:	NA	Project #:	NA
Sample ID:	Sample Spike	Date Reported:	04-14-93
Laboratory Number:	4917	Date Sampled:	04-13-93
Sample Matrix:	Water	Date Received:	04-13-93
Analysis Requested:	BTEX	Date Analyzed:	04-13-93
Condition:	NA		

Parameter	Sample Result (ug/L)	Spike Added (ug/L)	Spiked Sample Result (ug/L)	Det. Limit (ug/L)	Percent Recovery	SW-846 % Rec. Accept. Range
Benzene	4.7	20.0	28.1	0.3	113	39-150
Toluene	0.6	20.0	21.3	0.4	104	46-148
Ethylbenzene	0.2	20.0	21.0	0.2	104	32-160
p,m-Xylene	1.4	20.0	23.3	0.2	109	46-148
o-Xylene	0.3	20.0	21.3	0.2	105	46-148

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Morris D. Young
Review

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PHONE: (505) 632-0615 • FAX: (505) 632-1865

EPA METHOD 418.1
TOTAL PETROLEUM HYDROCARBONS

Client:	NA	Project #:	NA
Sample ID:	Laboratory Blank	Date Sampled:	NA
Laboratory Number:	TPWB0304	Date Received:	NA
Sample Matrix:	Water	Date Analyzed:	03-04-93
Preservative:	NA	Date Reported:	03-04-93
Condition:	NA	Analysis Needed:	TPH

Parameter	Concentration (mg/L)	Det. Limit (mg/L)
TPH	ND	0.5

Method: Method 418.1, Total Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments:

Analyst

Morris D Young
Review

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** QUALITY ASSURANCE REPORT
MATRIX SPIKE - TOTAL PETROLEUM HYDROCARBONS

Client: NA
Project #: NA
Sample ID: Laboratory Spike
Date Sampled: NA
Laboratory Number: TPWS0304
Date Received: NA
Sample Matrix: Water
Date Analyzed: 03-04-93
Analysis Requested: TPH
Date Reported: 03-04-93
Condition: NA

Parameter	Sample Result (mg/L)	Spike Added (mg/L)	Spiked sample Result (mg/L)	Percent Recovery
Total Petroleum Hydrocarbons	ND	50.0	53.6	107

QA ACCEPTANCE CRITERIA:

Parameter	Acceptance Range %
TPH	80 - 120

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments:

Sheila Feltman
Analyst

Morris D Young
Review

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MODIFIED EPA METHOD 8015
NONHALOGENATED VOLATILE ORGANICS

Client:	NA	Project #:	NA
Sample ID:	Laboratory Blank	Date Reported:	04-13-93
Laboratory Number:	0413tph.blk	Date Sampled:	NA
Sample Matrix:	Methanol	Date Received:	NA
Preservative:	NA	Date Analyzed:	04-03-93
Condition:	NA	Analysis Requested:	TPH

Parameter	Concentration (mg/L)	Det. Limit (mg/L)
Gasoline Range C5 - C10	ND	0.1
Diesel Range C10 - C28	ND	0.1
C28 - C36 Range	ND	0.1
Total Petroleum Hydrocarbons	ND	0.1

Method: Method 8015, Nonhalogenated Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Morris D. Young
Review

2442

CHAIN OF CUSTODY RECORD

C-4028

Client/Project Name Amoco 92140	**Project Location** STRIPPER S.J.G TK. BAtt. A-1	**ANALYSIS/PARAMETERS**	
Sampler: (Signature) Ji Weahkee	**Chain of Custody Tape No.**		

Sample No./ Identification	Sample Date	Sample Time	Lab Number	Sample Matrix	No. of Containers	BTEX	TPH	MJR. CATIONS IONS				Remarks
STRIPPER (Inlet)	3-4-93	900	4675	WATER	2	✓						
STRIPPER (outlet)	3-493	905	4676	WATER	2	✓						
STRIPPER (outLet)	3-4-93	920	4677	WATER	1		✓					
M/W # 5	3-4-93	916	4678	WATER	1			✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ji Weahkee	3-4-93	940	Leila Feltman	3-4-93	940
Relinquished by: (Signature)			Received by: (Signature)		
Relinquished by: (Signature)			Received by: (Signature)		

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Farmington, New Mexico 87401
(505) 632-0615

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C-4028

CHAIN OF CUSTODY RECORD

Client/Project Name Amoco 92140	Project Location Stripper Outlet S.J.G. TK BATH A-1	ANALYSIS/PARAMETERS
Sampler: (Signature) Weahkee	Chain of Custody Tape No.	

Sample No./ Identification	Sample Date	Sample Time	Lab Number	Sample Matrix	No. of Containers	BTEX 8015						Remarks
Stripper Outlet	4-13-93	8:15	4917	WATER	3	✓						

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Weahkee	4-13-93	9:15	Linda Pender	4-13-93	9:15
Relinquished by: (Signature)			Received by: (Signature)		
Relinquished by: (Signature)			Received by: (Signature)		

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(505) 632-0615

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PUMP TEST EVALUATION
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A#1
SAN JUAN COUNTY, NEW MEXICO
MAY 10, 1993

Introduction

This report documents the results of an evaluation of data obtained during a limited pump test performed April 1, 1993 by Envirotech Inc. at the Amoco Production Company San Juan Gravel Tank Battery A#1 site, San Juan County, New Mexico. A rigorous interpretation of the pump test data could not be executed due to limited piezometric surface impacts witnessed at observation wells, thus restricting data analysis to the effects recorded within the pumping well only. Additionally, the pump test data was evaluated using extremely limited knowledge of the aquifer geology, boundary effects, aquifer type (confined or unconfined), barometric effects, aquifer thickness and other variables. Therefore, the conclusions presented herein concerning aquifer properties (ie, transmissivity, storativity and pumping well capture radius) will require additional investigation to substantiate.

Background and Pump Test Procedure

The near surface site geology at the San Juan Gravel Tank Battery A#1 is poorly documented. Review of logs for 13 test holes advanced in the area indicates the lithology to be a sand and sand/gravel mix beginning from the ground surface and extending to a depth of approximately 7 feet. Information on the subsurface lithology at depths greater than this is not documented, but reportedly a plastic clay layer is found immediately above the shallow aquifer known to exist at a depth of approximately 10 feet to 12 feet below the ground surface. The aquifer is reportedly a sand and sand/gravel mix approximately 10 feet thick, with a base defined by a well cemented sandstone found at approximately 17 feet to 27 feet below the ground surface. There is insufficient lithologic data available to determine if the aquifer is confined or unconfined, or if the strata reportedly above and below the aquifer (clay layer and sandstone, respectively) may act as an aquitard or aquiclude.

There are 4 groundwater recovery wells located at the San Juan Gravel Tank Battery A#1 (see attached Site Plan). One groundwater recovery well (RW#3) was selected for performance of a pump test and the remaining three groundwater recovery wells were utilized as observation wells. Observation wells RW#1, RW#2 and RW#4 were located 152 feet, 93 feet and 67 feet, respectively, from pumping well RW#3.

Recovery well RW#3 was installed with an inner and outer casing string. The outer casing was constructed of a driven 8-inch diameter steel pipe with a slotted interval across the aquifer, and the inner casing was constructed of 4 1/2-inch PVC casing, also with a slotted interval across the aquifer. A filter pack of 8-12 mesh sand was installed in the annulus between the casing strings.

The pump test was designed to operate for 24 hours at a pump rate of 2 gpm - 2.5 gpm. Electronic transducers were installed in the three observation wells and in the pumping well and connected to a data logger to provide a continuous record of water level changes during the test. Pre-pumping water level fluctuations, barometric pressure readings and confirmation water level readings using a tape or electronic probe were not obtained.

An electronic submersible pump was installed in well RW#3 and the pump test commenced at 10:55 AM on April 1, 1993. A pump rate of 2 gpm was maintained for approximately 1 hour, followed by a step rate increase to 2.5 gpm. A pump failure occurred at approximately 2 hours 20 minutes into the test. After pump repairs the test was resumed at approximately 3:00 PM on April 1, 1993. A flow rate of 2 gpm was maintained until 10:57 AM on April 2, 1993, at which time the pump test was terminated.

Pumping well and observation well drawdown data was down-loaded from the data logger to a computer spreadsheet (Lotus 123) following the pump test (attached). The data was plotted on a linear drawdown versus time scale for initial interpretation (attached). Review of the pumping well data indicates that water level changes were recorded during each phase of the pump test, however, data obtained on the observation wells is of questionable quality. The water level recorded in each observation well was constant with no drawdown until the end of the test, and then a minimal drawdown response over time was recorded in each well. An identical water level and water level change was recorded in each observation well, indicating a malfunction in the data logger. Post test analysis of the aquifer properties (see below) would allow an investigator to predict that the observation wells are too distant to experience an effect until the end of the test, but an identical response in three wells at various distances from the pump well is not an acceptable aquifer reaction. The data logger may have been connected in series rather than in parallel, thus recording a summation of the response of all three observation wells. No attempt was made at analyzing aquifer properties from the observation well data.

Pump Test Analysis

Analysis of the pump test performed at the Amoco San Juan Gravel A#1 Tank Battery was restricted to evaluation of the pumping well response only. Observation well data was not interpreted due to questionable data quality and minimal response during the test (see

Background and Pump Test Procedure, above). Transient drawdown data could not be interpreted due to an almost instantaneous response when pumping was initiated. Therefore, analysis was performed on the buildup data recorded following the pump failure which occurred at approximately 2 hours 20 minutes into the test.

Due to limited knowledge of the aquifer type, numerous models for analysis were selected. These models included the Jacob Method for pumping well analysis, specific capacity analysis, Boulton delayed yield analysis and Hantush-Jacob analysis. Each model is inhibited by numerous assumptions and limitations. Universal assumptions for all methods include:

1) An aquifer infinite in extent
2) Isotropic and homogeneous lithology
3) An aquifer of uniform thickness throughout
4) Known effects of recharge and no-flow boundaries

Assumptions 1), 2) and 3) may have been valid during the limited extent of the well test. Assumption 4) was violated; flow is known to exist with a gradient of 0.00277 feet/foot at the site and pre-test piezometric fluctuations were not recorded. However, this violation is not expected to be a significant factor in evaluation of the pump test data because analysis was limited to the pumping well only.

Following is a discussion of the results of each analysis performed in evaluation of the San Juan Gravel A#1 Tank Battery pump test.

Jacob Method of Pumped Well Analysis

The Jacob Method of pumped well analysis was selected due to its universal application to well test analysis. The method is documented in "Ground Water Hydrology", David Keith Todd, PhD, 1959, John Wiley & Sons, Inc., pages 94-98.

The primary restriction in use of this model for analysis of buildup data is the requirement of transient water level conditions after wellbore storage and loss (skin damage) effects are overcome. Insufficient data is available to determine if this limitation was violated. A second restriction is that shut in time, t', be "large". The pump time for the test, t, was rate adjusted to 128.6 minutes, and the total buildup time was 28 minutes. Therefore, the restriction that t' be large may be violated. This method does not allow calculation of wellbore storage effects or well losses.

Plots, calculations and evaluation using the Jacob Method are attached. Transmissivity using this method was determined to be 3,300 gpd/foot and storativity was estimated at 1.3×10^{-4}. Based on this value of storativity, one could infer that the aquifer is confined.

Specific Capacity Analysis

A method for estimating transmissivity by specific capacity analysis is presented by William C. Walton in "Practical Aspects of Ground Water Modeling", third edition, 1988, National Water Well Association, pages 130-134. The primary restriction in use of this method is that the pumping well penetrate the entire aquifer and be uncased throughout, and that well losses be negligible. Although the well is believed to penetrate the entire aquifer, it is cased and significant well losses were likely experienced during the well test. A limitation in use of specific capacity is that storativity is not determined with the method. Storativity must be estimated by interpretation of aquifer type and lithology.

Specific capacity analysis was performed using data from the two separate pump rates executed during the pump test. An unconfined aquifer was assumed, due to the relative ease with which one can estimate storativity in an unconfined aquifer versus a confined aquifer. Transmissivity determinations obtained from the two pump rates was extrapolated to a zero pump rate to account for well losses. Plots, calculations and evaluation using the specific capacity method are included. Storativity was estimated at 0.25 and transmissivity was calculated to be 3,512 gpd/foot.

Boulton Delayed Yield Analysis

The Boulton delayed yield analytical method was selected for analysis of the pump test because it was noted that a log-log plot of drawdown versus buildup time followed the general trend of the type curves used in the model. The method is described by S.W. Lohman in "Ground-Water Hydraulics", 1972, USGS Professional Paper 708, pages 34-40, and requires use of the type curves which accompany the paper. The Boulton delayed yield method accounts for an anisotropic unconfined aquifer in which there is a delayed yield from storage. The method is not normally applied to a pumped well because wellbore storage effects and well losses (skin damage) can significantly skew the analytical results.

Plots, calculations and evaluation using the Boulton method are included. Transmissivity was calculated at 686 gpd/foot, however, an unreasonable estimate of storativity was obtained. Therefore, the Boulton method may not be applicable and the transmissivity estimate should be used with considerable caution.

Hantush-Jacob Transient Analysis

The Hantush-Jacob transient analytical method was selected for analysis because it was noted that a log-log plot of drawdown versus buildup time divided by radius squared followed the general trend of the type curves used in the model. The method is described by Lohman (previously referenced), pages 30-32, and require the use of type curves.

A leaky confined aquifer with water released from the aquitard is modeled with the Hantush-Jacob transient analysis. As with the Boulton method, it is not normally applied to a pumped well because of storage and well loss effects.

Plots, calculations and evaluation using the Hantush-Jacob model are included. Transmissivity was calculated at 421 gpd/foot, but an unreasonable estimate of storativity was obtained. The Hantush-Jacob estimate of transmissivity should therefore be used with considerable caution.

Capture Radius Estimate

The following section provides an estimate of the capture radius of the recovery well used in the pump test at the San Juan Gravel Tank Battery A#1. Capture radius is the limit to which drawdown effects can overcome the natural gradient. The gradient at the subject site has been reported to be 0.00277 feet/foot.

Pump test analysis presented herein has indicated that more than one value of transmissivity can be supported, depending on the model applied for transmissivity determination. The most conservative model for estimation of capture radius, if aquifer type (confined or unconfined) is unknown, is use of an unconfined (water table) model because drawdown effects are substantially less in unconfined aquifers than in confined aquifers at any given pump rate.

There is evidence that the aquifer at the San Juan Gravel Tank Battery A#1 site is unconfined. Although the observation well drawdown data was not utilized in the pump test analysis because the data was of questionable validity, the minimal drawdown effects observed at the conclusion of the 24 hour pump test indicate that the aquifer is unconfined. Preliminary calculations (not presented herein), based on the values of transmissivity determined by this investigation, indicate that a considerable drawdown effect would have been experienced at the observation wells if the aquifer were confined.

Based on the assumption of an unconfined aquifer, capture radius can be estimated with the Boulton Model for a water table aquifer.

Application of this model requires the use of type curves and the usual assumptions that the aquifer is infinite, homogenous, isotropic and of equal thickness throughout. Equations and type curves presented in "Groundwater Resource Evaluation", William C. Walton, 1970, McGraw - Hill, Inc., pages 153-157 and 222-225, were used for evaluation. General assumptions for the analysis included:

1) Capture radius based on 100 days pump time
2) Water table storativity of 0.25
3) Transmissivity of 3,512 gpd/foot
4) Natural gradient of 0.00277 feet/foot

Calculations of capture radius are attached. Presented below is a summary table indicating the required pump rate to achieve a capture radius downgradient from the pumping well:

Table 1
San Juan Gravel Tank Battery A#1
Estimate of Pump Rate to Achieve Capture Radius

Capture Radius	Drawdown Required[1]	Pump Rate Required[2]
10 feet	0.03 feet	0.1 gpm
50 feet	0.14 feet	0.8 gpm
100 feet	0.28 feet	2.2 gpm
200 feet	0.55 feet	7.1 gpm

[1] Drawdown required to be established at the given downgradient radius to effect capture.

[2] Pump rate which will produce the required downgradient drawdown to achieve the given capture radius.

Summary

Limited information is available concerning the aquifer type at the San Juan Gravel Tank Battery A#1 site. Analysis of the pump test performed at the site indicates that the aquifer may be unconfined. Additional pump testing or subsurface investigation is required to provide supportable documentation of the aquifer type.

Assuming that the aquifer is unconfined, the transmissivity estimate is 3,512 gpd/foot with an assumed storativity of 0.25. If the aquifer is confined, the transmissivity estimate is 3,300 gpd/foot and the storativity estimate is 1.3×10^{-4}.

Capture radius estimates based on an unconfined aquifer indicate that a 100 foot radius can be achieved at a rate of 2.2 gpm and a 200 foot radius can be achieved at a rate of 7.1 gpm.

If supportable estimates of aquifer properties at the San Juan Gravel Tank Battery A#1 are required, further investigation may be necessary as follows:

1) Drilling additional borings at the site to verify three dimensional lithology from the ground surface to the base of the aquifer

2) Installation of observation wells at approximately 10 foot, 20 foot and 40 foot distances from the recovery well

3) Performance of a pump test which includes pre-pumping water fluctuation data collection. The pump test should be performed with a constant, undisturbed pump rate and water level changes should be continuously recorded in the pump well and each of the observation wells

4) Data evaluation should be performed using a model which reflects the type of aquifer encountered at the site. Type curve matching should be performed if significant storage, loss, and/or pre-post transient conditions are identified.

Limitations

This evaluation of the pump test performed at the San Juan Gravel Tank Battery A#1 site on April 1, 1993 is based on review of the data obtained during the pump test, review of test hole logs and personal communication with the personnel who designed and operated the test. Considerable interpretation is required in well test analysis and un-recorded or non-reported information could substantially alter the selection of methods applied for the well test analysis.

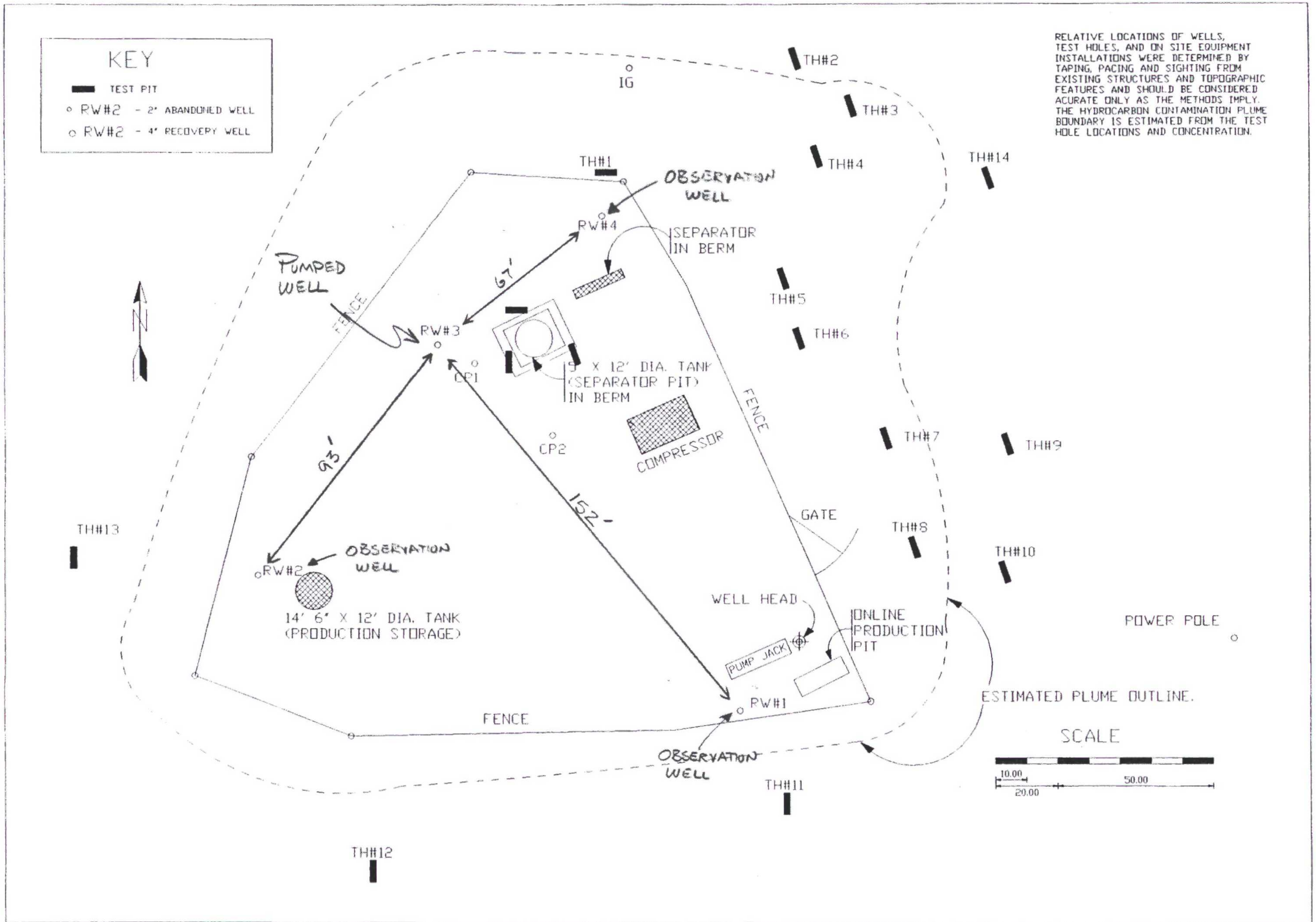
Prepared by:
Envirotech Inc.
Jeff C. Blagg
Jeffrey C. Blagg, P.E.
Geological Engineer

Reviewed By:
Michael K. Lane, P.E.
Geological Engineer

Attachments

San Juan Gravel Tank Battery A#1 Pump Test

Site Plan
Plot of Drawdown vs Time
Printout of Drawdown vs Time



RELATIVE LOCATIONS OF WELLS, TEST HOLES, AND ON SITE EQUIPMENT INSTALLATIONS WERE DETERMINED BY TAPING, PACING AND SIGHTING FROM EXISTING STRUCTURES AND TOPOGRAPHIC FEATURES AND SHOULD BE CONSIDERED ACURATE ONLY AS THE METHODS IMPLY. THE HYDROCARBON CONTAMINATION PLUME BOUNDARY IS ESTIMATED FROM THE TEST HOLE LOCATIONS AND CONCENTRATION.

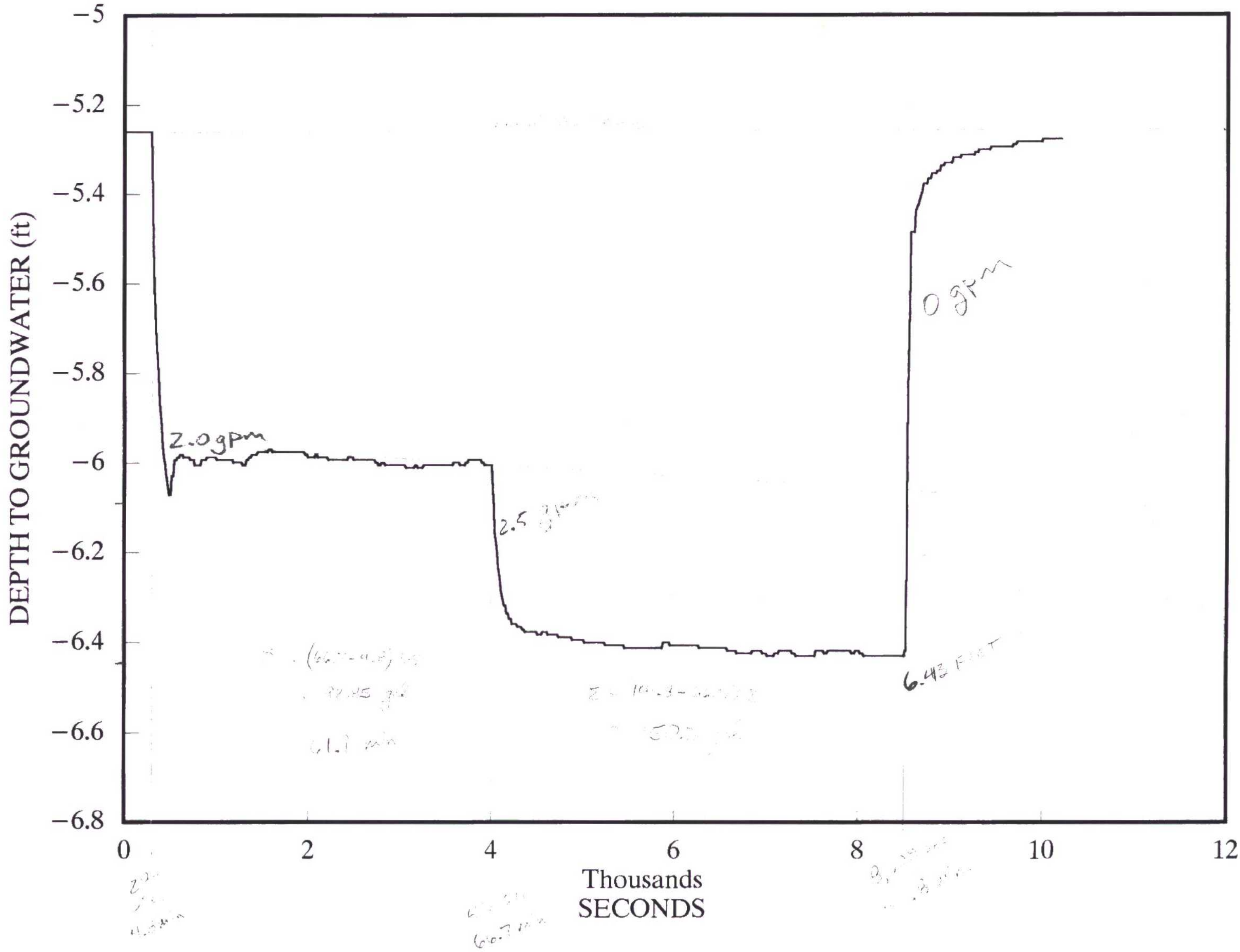
SAN JUAN GRAVEL TANK BATTERY #1
SE/4, SE/4, SEC 21, T29, R13W
PRODUCTION TANK PIT AREA
REMEDIATION PLAN PROJECT NO: 92140/94028-29

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

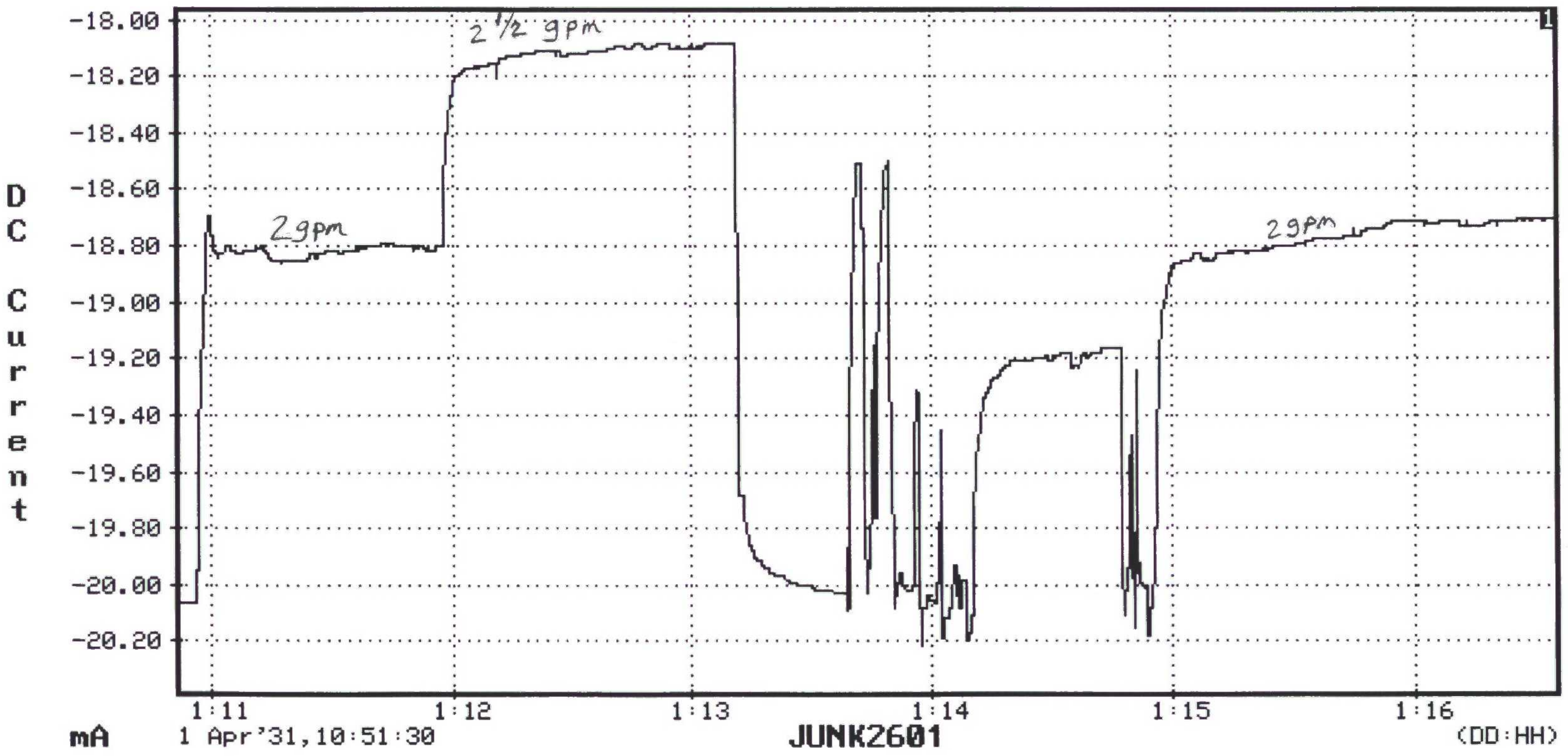
ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

SITE PLAN
SHEET 2
9/4/92

Amoco S.J. [illegible] RW#2



[illegible] 2 gpm = [illegible] min


-18.00
-18.20
-18.40
-18.60
-18.80
-19.00
-19.20
-19.40
-19.60
-19.80
-20.00
-20.20
DC Current
mA
1:11
1:12
1:13
1:14
1:15
1:16
1 Apr'31,10:51:30
JUNK2601
(DD:HH)
1
2 gpm
2 1/2 gpm
2 gpm

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
0	20.06	0.00	5.26	−5.26
10	20.06	0.00	5.26	−5.26
20	20.06	0.00	5.26	−5.26
30	20.06	0.00	5.26	−5.26
40	20.06	0.00	5.26	−5.26
50	20.06	0.00	5.26	−5.26
60	20.06	0.00	5.26	−5.26
70	20.06	0.00	5.26	−5.26
80	20.06	0.00	5.26	−5.26
90	20.06	0.00	5.26	−5.26
100	20.06	0.00	5.26	−5.26
110	20.06	0.00	5.26	−5.26
120	20.06	0.00	5.26	−5.26
130	20.06	0.00	5.26	−5.26
140	20.06	0.00	5.26	−5.26
150	20.06	0.00	5.26	−5.26
160	20.06	0.00	5.26	−5.26
170	20.06	0.00	5.26	−5.26
180	20.06	0.00	5.26	−5.26
190	20.06	0.00	5.26	−5.26
200	20.06	0.00	5.26	−5.26
210	20.06	0.00	5.26	−5.26
220	20.06	0.00	5.26	−5.26
230	20.06	0.00	5.26	−5.26
240	20.06	0.00	5.26	−5.26
250	20.06	0.00	5.26	−5.26
260	20.06	0.00	5.26	−5.26
270	20.06	0.00	5.26	−5.26
280	20.06	0.00	5.26	−5.26
290	20.06	0.00	5.26	−5.26
300	19.95	0.07	5.33	−5.325
310	19.63	0.25	5.51	−5.51409
320	19.47	0.35	5.61	−5.60864
330	19.39	0.40	5.66	−5.65591
340	19.32	0.44	5.70	−5.69727
350	19.24	0.48	5.74	−5.74455
360	19.19	0.51	5.77	−5.77409
370	19.14	0.54	5.80	−5.80364
380	19.04	0.60	5.86	−5.86273
390	18.99	0.63	5.89	−5.89227
400	18.95	0.66	5.92	−5.91591
410	18.9	0.69	5.95	−5.94546
420	18.85	0.72	5.98	−5.975
430	18.82	0.73	5.99	−5.99273
440	18.8	0.74	6.00	−6.00455
450	18.77	0.76	6.02	−6.02227
460	18.75	0.77	6.03	−6.03409
470	18.72	0.79	6.05	−6.05182
480	18.69	0.81	6.07	−6.06955
490	18.69	0.81	6.07	−6.06955
500	18.69	0.81	6.07	−6.06955
510	18.76	0.77	6.03	−6.02818
520	18.76	0.77	6.03	−6.02818
530	18.76	0.77	6.03	−6.02818
540	18.82	0.73	5.99	−5.99273
550	18.82	0.73	5.99	−5.99273
560	18.82	0.73	5.99	−5.99273
570	18.83	0.73	5.99	−5.98682
580	18.83	0.73	5.99	−5.98682
590	18.83	0.73	5.99	−5.98682
600	18.84	0.72	5.98	−5.98091

Elap Time SECONDS	–mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
610	18.84	0.72	5.98	–5.98091
620	18.84	0.72	5.98	–5.98091
630	18.84	0.72	5.98	–5.98091
640	18.83	0.73	5.99	–5.98682
650	18.83	0.73	5.99	–5.98682
660	18.83	0.73	5.99	–5.98682
670	18.83	0.73	5.99	–5.98682
680	18.83	0.73	5.99	–5.98682
690	18.83	0.73	5.99	–5.98682
700	18.83	0.73	5.99	–5.98682
710	18.82	0.73	5.99	–5.99273
720	18.82	0.73	5.99	–5.99273
730	18.82	0.73	5.99	–5.99273
740	18.82	0.73	5.99	–5.99273
750	18.82	0.73	5.99	–5.99273
760	18.8	0.74	6.00	–6.00455
770	18.8	0.74	6.00	–6.00455
780	18.8	0.74	6.00	–6.00455
790	18.8	0.74	6.00	–6.00455
800	18.8	0.74	6.00	–6.00455
810	18.8	0.74	6.00	–6.00455
820	18.8	0.74	6.00	–6.00455
830	18.82	0.73	5.99	–5.99273
840	18.82	0.73	5.99	–5.99273
850	18.82	0.73	5.99	–5.99273
860	18.82	0.73	5.99	–5.99273
870	18.82	0.73	5.99	–5.99273
880	18.82	0.73	5.99	–5.99273
890	18.83	0.73	5.99	–5.98682
900	18.83	0.73	5.99	–5.98682
910	18.83	0.73	5.99	–5.98682
920	18.83	0.73	5.99	–5.98682
930	18.83	0.73	5.99	–5.98682
940	18.83	0.73	5.99	–5.98682
950	18.83	0.73	5.99	–5.98682
960	18.83	0.73	5.99	–5.98682
970	18.83	0.73	5.99	–5.98682
980	18.83	0.73	5.99	–5.98682
990	18.83	0.73	5.99	–5.98682
1000	18.82	0.73	5.99	–5.99273
1010	18.82	0.73	5.99	–5.99273
1020	18.82	0.73	5.99	–5.99273
1030	18.82	0.73	5.99	–5.99273
1040	18.82	0.73	5.99	–5.99273
1050	18.82	0.73	5.99	–5.99273
1060	18.82	0.73	5.99	–5.99273
1070	18.82	0.73	5.99	–5.99273
1080	18.82	0.73	5.99	–5.99273
1090	18.82	0.73	5.99	–5.99273
1100	18.82	0.73	5.99	–5.99273
1110	18.82	0.73	5.99	–5.99273
1120	18.82	0.73	5.99	–5.99273
1130	18.82	0.73	5.99	–5.99273
1140	18.82	0.73	5.99	–5.99273
1150	18.82	0.73	5.99	–5.99273
1160	18.82	0.73	5.99	–5.99273
1170	18.82	0.73	5.99	–5.99273
1180	18.81	0.74	6.00	–5.99864
1190	18.81	0.74	6.00	–5.99864
1200	18.81	0.74	6.00	–5.99864
1210	18.81	0.74	6.00	–5.99864

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
1220	18.81	0.74	6.00	−5.99864
1230	18.81	0.74	6.00	−5.99864
1240	18.81	0.74	6.00	−5.99864
1250	18.81	0.74	6.00	−5.99864
1260	18.81	0.74	6.00	−5.99864
1270	18.81	0.74	6.00	−5.99864
1280	18.8	0.74	6.00	−6.00455
1290	18.8	0.74	6.00	−6.00455
1300	18.8	0.74	6.00	−6.00455
1310	18.8	0.74	6.00	−6.00455
1320	18.82	0.73	5.99	−5.99273
1330	18.82	0.73	5.99	−5.99273
1340	18.82	0.73	5.99	−5.99273
1350	18.83	0.73	5.99	−5.98682
1360	18.83	0.73	5.99	−5.98682
1370	18.83	0.73	5.99	−5.98682
1380	18.84	0.72	5.98	−5.98091
1390	18.84	0.72	5.98	−5.98091
1400	18.84	0.72	5.98	−5.98091
1410	18.84	0.72	5.98	−5.98091
1420	18.84	0.72	5.98	−5.98091
1430	18.84	0.72	5.98	−5.98091
1440	18.85	0.72	5.98	−5.975
1450	18.85	0.72	5.98	−5.975
1460	18.85	0.72	5.98	−5.975
1470	18.85	0.72	5.98	−5.975
1480	18.85	0.72	5.98	−5.975
1490	18.85	0.72	5.98	−5.975
1500	18.85	0.72	5.98	−5.975
1510	18.85	0.72	5.98	−5.975
1520	18.85	0.72	5.98	−5.975
1530	18.85	0.72	5.98	−5.975
1540	18.85	0.72	5.98	−5.975
1550	18.85	0.72	5.98	−5.975
1560	18.86	0.71	5.97	−5.96909
1570	18.86	0.71	5.97	−5.96909
1580	18.86	0.71	5.97	−5.96909
1590	18.86	0.71	5.97	−5.96909
1600	18.85	0.72	5.98	−5.975
1610	18.85	0.72	5.98	−5.975
1620	18.85	0.72	5.98	−5.975
1630	18.85	0.72	5.98	−5.975
1640	18.85	0.72	5.98	−5.975
1650	18.85	0.72	5.98	−5.975
1660	18.85	0.72	5.98	−5.975
1670	18.85	0.72	5.98	−5.975
1680	18.85	0.72	5.98	−5.975
1690	18.85	0.72	5.98	−5.975
1700	18.85	0.72	5.98	−5.975
1710	18.85	0.72	5.98	−5.975
1720	18.85	0.72	5.98	−5.975
1730	18.85	0.72	5.98	−5.975
1740	18.85	0.72	5.98	−5.975
1750	18.85	0.72	5.98	−5.975
1760	18.85	0.72	5.98	−5.975
1770	18.85	0.72	5.98	−5.975
1780	18.85	0.72	5.98	−5.975
1790	18.85	0.72	5.98	−5.975
1800	18.85	0.72	5.98	−5.975
1810	18.85	0.72	5.98	−5.975
1820	18.85	0.72	5.98	−5.975

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
1830	18.85	0.72	5.98	−5.975
1840	18.85	0.72	5.98	−5.975
1850	18.85	0.72	5.98	−5.975
1860	18.85	0.72	5.98	−5.975
1870	18.85	0.72	5.98	−5.975
1880	18.85	0.72	5.98	−5.975
1890	18.85	0.72	5.98	−5.975
1900	18.85	0.72	5.98	−5.975
1910	18.85	0.72	5.98	−5.975
1920	18.85	0.72	5.98	−5.975
1930	18.85	0.72	5.98	−5.975
1940	18.85	0.72	5.98	−5.975
1950	18.85	0.72	5.98	−5.975
1960	18.84	0.72	5.98	−5.98091
1970	18.84	0.72	5.98	−5.98091
1980	18.84	0.72	5.98	−5.98091
1990	18.83	0.73	5.99	−5.98682
2000	18.83	0.73	5.99	−5.98682
2010	18.83	0.73	5.99	−5.98682
2020	18.83	0.73	5.99	−5.98682
2030	18.83	0.73	5.99	−5.98682
2040	18.83	0.73	5.99	−5.98682
2050	18.83	0.73	5.99	−5.98682
2060	18.83	0.73	5.99	−5.98682
2070	18.84	0.72	5.98	−5.98091
2080	18.84	0.72	5.98	−5.98091
2090	18.84	0.72	5.98	−5.98091
2100	18.83	0.73	5.99	−5.98682
2110	18.83	0.73	5.99	−5.98682
2120	18.83	0.73	5.99	−5.98682
2130	18.83	0.73	5.99	−5.98682
2140	18.83	0.73	5.99	−5.98682
2150	18.83	0.73	5.99	−5.98682
2160	18.83	0.73	5.99	−5.98682
2170	18.83	0.73	5.99	−5.98682
2180	18.83	0.73	5.99	−5.98682
2190	18.83	0.73	5.99	−5.98682
2200	18.83	0.73	5.99	−5.98682
2210	18.82	0.73	5.99	−5.99273
2220	18.82	0.73	5.99	−5.99273
2230	18.82	0.73	5.99	−5.99273
2240	18.82	0.73	5.99	−5.99273
2250	18.82	0.73	5.99	−5.99273
2260	18.82	0.73	5.99	−5.99273
2270	18.82	0.73	5.99	−5.99273
2280	18.82	0.73	5.99	−5.99273
2290	18.82	0.73	5.99	−5.99273
2300	18.82	0.73	5.99	−5.99273
2310	18.82	0.73	5.99	−5.99273
2320	18.82	0.73	5.99	−5.99273
2330	18.82	0.73	5.99	−5.99273
2340	18.82	0.73	5.99	−5.99273
2350	18.82	0.73	5.99	−5.99273
2360	18.82	0.73	5.99	−5.99273
2370	18.82	0.73	5.99	−5.99273
2380	18.82	0.73	5.99	−5.99273
2390	18.82	0.73	5.99	−5.99273
2400	18.82	0.73	5.99	−5.99273
2410	18.82	0.73	5.99	−5.99273
2420	18.82	0.73	5.99	−5.99273
2430	18.83	0.73	5.99	−5.98682

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
2440	18.83	0.73	5.99	−5.98682
2450	18.83	0.73	5.99	−5.98682
2460	18.83	0.73	5.99	−5.98682
2470	18.83	0.73	5.99	−5.98682
2480	18.83	0.73	5.99	−5.98682
2490	18.82	0.73	5.99	−5.99273
2500	18.82	0.73	5.99	−5.99273
2510	18.82	0.73	5.99	−5.99273
2520	18.82	0.73	5.99	−5.99273
2530	18.82	0.73	5.99	−5.99273
2540	18.82	0.73	5.99	−5.99273
2550	18.82	0.73	5.99	−5.99273
2560	18.82	0.73	5.99	−5.99273
2570	18.82	0.73	5.99	−5.99273
2580	18.82	0.73	5.99	−5.99273
2590	18.82	0.73	5.99	−5.99273
2600	18.82	0.73	5.99	−5.99273
2610	18.82	0.73	5.99	−5.99273
2620	18.82	0.73	5.99	−5.99273
2630	18.82	0.73	5.99	−5.99273
2640	18.82	0.73	5.99	−5.99273
2650	18.82	0.73	5.99	−5.99273
2660	18.82	0.73	5.99	−5.99273
2670	18.82	0.73	5.99	−5.99273
2680	18.82	0.73	5.99	−5.99273
2690	18.82	0.73	5.99	−5.99273
2700	18.82	0.73	5.99	−5.99273
2710	18.82	0.73	5.99	−5.99273
2720	18.82	0.73	5.99	−5.99273
2730	18.81	0.74	6.00	−5.99864
2740	18.81	0.74	6.00	−5.99864
2750	18.81	0.74	6.00	−5.99864
2760	18.8	0.74	6.00	−6.00455
2770	18.8	0.74	6.00	−6.00455
2780	18.8	0.74	6.00	−6.00455
2790	18.81	0.74	6.00	−5.99864
2800	18.81	0.74	6.00	−5.99864
2810	18.81	0.74	6.00	−5.99864
2820	18.81	0.74	6.00	−5.99864
2830	18.8	0.74	6.00	−6.00455
2840	18.8	0.74	6.00	−6.00455
2850	18.8	0.74	6.00	−6.00455
2860	18.8	0.74	6.00	−6.00455
2870	18.8	0.74	6.00	−6.00455
2880	18.8	0.74	6.00	−6.00455
2890	18.8	0.74	6.00	−6.00455
2900	18.8	0.74	6.00	−6.00455
2910	18.8	0.74	6.00	−6.00455
2920	18.8	0.74	6.00	−6.00455
2930	18.8	0.74	6.00	−6.00455
2940	18.8	0.74	6.00	−6.00455
2950	18.8	0.74	6.00	−6.00455
2960	18.8	0.74	6.00	−6.00455
2970	18.8	0.74	6.00	−6.00455
2980	18.8	0.74	6.00	−6.00455
2990	18.8	0.74	6.00	−6.00455
3000	18.8	0.74	6.00	−6.00455
3010	18.8	0.74	6.00	−6.00455
3020	18.8	0.74	6.00	−6.00455
3030	18.8	0.74	6.00	−6.00455
3040	18.8	0.74	6.00	−6.00455

Elap Time SECONDS	–mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
3050	18.8	0.74	6.00	–6.00455
3060	18.79	0.75	6.01	–6.01046
3070	18.79	0.75	6.01	–6.01046
3080	18.79	0.75	6.01	–6.01046
3090	18.79	0.75	6.01	–6.01046
3100	18.79	0.75	6.01	–6.01046
3110	18.79	0.75	6.01	–6.01046
3120	18.79	0.75	6.01	–6.01046
3130	18.79	0.75	6.01	–6.01046
3140	18.79	0.75	6.01	–6.01046
3150	18.79	0.75	6.01	–6.01046
3160	18.8	0.74	6.00	–6.00455
3170	18.8	0.74	6.00	–6.00455
3180	18.8	0.74	6.00	–6.00455
3190	18.79	0.75	6.01	–6.01046
3200	18.79	0.75	6.01	–6.01046
3210	18.79	0.75	6.01	–6.01046
3220	18.79	0.75	6.01	–6.01046
3230	18.79	0.75	6.01	–6.01046
3240	18.79	0.75	6.01	–6.01046
3250	18.8	0.74	6.00	–6.00455
3260	18.8	0.74	6.00	–6.00455
3270	18.8	0.74	6.00	–6.00455
3280	18.8	0.74	6.00	–6.00455
3290	18.8	0.74	6.00	–6.00455
3300	18.8	0.74	6.00	–6.00455
3310	18.8	0.74	6.00	–6.00455
3320	18.8	0.74	6.00	–6.00455
3330	18.8	0.74	6.00	–6.00455
3340	18.8	0.74	6.00	–6.00455
3350	18.8	0.74	6.00	–6.00455
3360	18.8	0.74	6.00	–6.00455
3370	18.8	0.74	6.00	–6.00455
3380	18.8	0.74	6.00	–6.00455
3390	18.8	0.74	6.00	–6.00455
3400	18.8	0.74	6.00	–6.00455
3410	18.8	0.74	6.00	–6.00455
3420	18.8	0.74	6.00	–6.00455
3430	18.8	0.74	6.00	–6.00455
3440	18.8	0.74	6.00	–6.00455
3450	18.8	0.74	6.00	–6.00455
3460	18.8	0.74	6.00	–6.00455
3470	18.8	0.74	6.00	–6.00455
3480	18.8	0.74	6.00	–6.00455
3490	18.8	0.74	6.00	–6.00455
3500	18.8	0.74	6.00	–6.00455
3510	18.8	0.74	6.00	–6.00455
3520	18.8	0.74	6.00	–6.00455
3530	18.8	0.74	6.00	–6.00455
3540	18.8	0.74	6.00	–6.00455
3550	18.8	0.74	6.00	–6.00455
3560	18.8	0.74	6.00	–6.00455
3570	18.8	0.74	6.00	–6.00455
3580	18.81	0.74	6.00	–5.99864
3590	18.81	0.74	6.00	–5.99864
3600	18.81	0.74	6.00	–5.99864
3610	18.81	0.74	6.00	–5.99864
3620	18.81	0.74	6.00	–5.99864
3630	18.81	0.74	6.00	–5.99864
3640	18.81	0.74	6.00	–5.99864
3650	18.8	0.74	6.00	–6.00455

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
3660	18.8	0.74	6.00	−6.00455
3670	18.8	0.74	6.00	−6.00455
3680	18.8	0.74	6.00	−6.00455
3690	18.8	0.74	6.00	−6.00455
3700	18.8	0.74	6.00	−6.00455
3710	18.81	0.74	6.00	−5.99864
3720	18.81	0.74	6.00	−5.99864
3730	18.81	0.74	6.00	−5.99864
3740	18.82	0.73	5.99	−5.99273
3750	18.82	0.73	5.99	−5.99273
3760	18.82	0.73	5.99	−5.99273
3770	18.82	0.73	5.99	−5.99273
3780	18.82	0.73	5.99	−5.99273
3790	18.82	0.73	5.99	−5.99273
3800	18.82	0.73	5.99	−5.99273
3810	18.82	0.73	5.99	−5.99273
3820	18.82	0.73	5.99	−5.99273
3830	18.82	0.73	5.99	−5.99273
3840	18.82	0.73	5.99	−5.99273
3850	18.82	0.73	5.99	−5.99273
3860	18.82	0.73	5.99	−5.99273
3870	18.82	0.73	5.99	−5.99273
3880	18.82	0.73	5.99	−5.99273
3890	18.81	0.74	6.00	−5.99864
3900	18.81	0.74	6.00	−5.99864
3910	18.81	0.74	6.00	−5.99864
3920	18.8	0.74	6.00	−6.00455
3930	18.8	0.74	6.00	−6.00455
3940	18.8	0.74	6.00	−6.00455
3950	18.8	0.74	6.00	−6.00455
3960	18.8	0.74	6.00	−6.00455
3970	18.8	0.74	6.00	−6.00455
3980	18.8	0.74	6.00	−6.00455
3990	18.8	0.74	6.00	−6.00455
4000	18.8	0.74	6.00	−6.00455
4010	18.71	0.80	6.06	−6.05773
4020	18.64	0.84	6.10	−6.09909
4030	18.55	0.89	6.15	−6.15227
4040	18.52	0.91	6.17	−6.17
4050	18.49	0.93	6.19	−6.18773
4060	18.44	0.96	6.22	−6.21727
4070	18.41	0.98	6.24	−6.235
4080	18.39	0.99	6.25	−6.24682
4090	18.36	1.00	6.26	−6.26455
4100	18.33	1.02	6.28	−6.28227
4110	18.31	1.03	6.29	−6.29409
4120	18.29	1.05	6.31	−6.30591
4130	18.27	1.06	6.32	−6.31773
4140	18.27	1.06	6.32	−6.31773
4150	18.27	1.06	6.32	−6.31773
4160	18.24	1.08	6.34	−6.33546
4170	18.24	1.08	6.34	−6.33546
4180	18.24	1.08	6.34	−6.33546
4190	18.22	1.09	6.35	−6.34727
4200	18.22	1.09	6.35	−6.34727
4210	18.22	1.09	6.35	−6.34727
4220	18.2	1.10	6.36	−6.35909
4230	18.2	1.10	6.36	−6.35909
4240	18.2	1.10	6.36	−6.35909
4250	18.2	1.10	6.36	−6.35909
4260	18.2	1.10	6.36	−6.35909

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
4270	18.2	1.10	6.36	−6.35909
4280	18.19	1.11	6.37	−6.365
4290	18.19	1.11	6.37	−6.365
4300	18.19	1.11	6.37	−6.365
4310	18.19	1.11	6.37	−6.365
4320	18.19	1.11	6.37	−6.365
4330	18.18	1.11	6.37	−6.37091
4340	18.18	1.11	6.37	−6.37091
4350	18.18	1.11	6.37	−6.37091
4360	18.17	1.12	6.38	−6.37682
4370	18.17	1.12	6.38	−6.37682
4380	18.17	1.12	6.38	−6.37682
4390	18.17	1.12	6.38	−6.37682
4400	18.17	1.12	6.38	−6.37682
4410	18.17	1.12	6.38	−6.37682
4420	18.17	1.12	6.38	−6.37682
4430	18.17	1.12	6.38	−6.37682
4440	18.17	1.12	6.38	−6.37682
4450	18.17	1.12	6.38	−6.37682
4460	18.17	1.12	6.38	−6.37682
4470	18.17	1.12	6.38	−6.37682
4480	18.17	1.12	6.38	−6.37682
4490	18.17	1.12	6.38	−6.37682
4500	18.16	1.12	6.38	−6.38273
4510	18.16	1.12	6.38	−6.38273
4520	18.16	1.12	6.38	−6.38273
4530	18.16	1.12	6.38	−6.38273
4540	18.16	1.12	6.38	−6.38273
4550	18.17	1.12	6.38	−6.37682
4560	18.17	1.12	6.38	−6.37682
4570	18.17	1.12	6.38	−6.37682
4580	18.17	1.12	6.38	−6.37682
4590	18.17	1.12	6.38	−6.37682
4600	18.17	1.12	6.38	−6.37682
4610	18.16	1.12	6.38	−6.38273
4620	18.16	1.12	6.38	−6.38273
4630	18.16	1.12	6.38	−6.38273
4640	18.16	1.12	6.38	−6.38273
4650	18.16	1.12	6.38	−6.38273
4660	18.16	1.12	6.38	−6.38273
4670	18.16	1.12	6.38	−6.38273
4680	18.16	1.12	6.38	−6.38273
4690	18.16	1.12	6.38	−6.38273
4700	18.16	1.12	6.38	−6.38273
4710	18.16	1.12	6.38	−6.38273
4720	18.16	1.12	6.38	−6.38273
4730	18.15	1.13	6.39	−6.38864
4740	18.15	1.13	6.39	−6.38864
4750	18.15	1.13	6.39	−6.38864
4760	18.15	1.13	6.39	−6.38864
4770	18.15	1.13	6.39	−6.38864
4780	18.15	1.13	6.39	−6.38864
4790	18.15	1.13	6.39	−6.38864
4800	18.15	1.13	6.39	−6.38864
4810	18.15	1.13	6.39	−6.38864
4820	18.15	1.13	6.39	−6.38864
4830	18.15	1.13	6.39	−6.38864
4840	18.15	1.13	6.39	−6.38864
4850	18.15	1.13	6.39	−6.38864
4860	18.15	1.13	6.39	−6.38864
4870	18.15	1.13	6.39	−6.38864

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
4880	18.14	1.13	6.39	−6.39455
4890	18.14	1.13	6.39	−6.39455
4900	18.14	1.13	6.39	−6.39455
4910	18.14	1.13	6.39	−6.39455
4920	18.14	1.13	6.39	−6.39455
4930	18.14	1.13	6.39	−6.39455
4940	18.14	1.13	6.39	−6.39455
4950	18.14	1.13	6.39	−6.39455
4960	18.14	1.13	6.39	−6.39455
4970	18.14	1.13	6.39	−6.39455
4980	18.14	1.13	6.39	−6.39455
4990	18.14	1.13	6.39	−6.39455
5000	18.14	1.13	6.39	−6.39455
5010	18.13	1.14	6.40	−6.40046
5020	18.13	1.14	6.40	−6.40046
5030	18.13	1.14	6.40	−6.40046
5040	18.13	1.14	6.40	−6.40046
5050	18.13	1.14	6.40	−6.40046
5060	18.13	1.14	6.40	−6.40046
5070	18.13	1.14	6.40	−6.40046
5080	18.13	1.14	6.40	−6.40046
5090	18.13	1.14	6.40	−6.40046
5100	18.13	1.14	6.40	−6.40046
5110	18.13	1.14	6.40	−6.40046
5120	18.13	1.14	6.40	−6.40046
5130	18.13	1.14	6.40	−6.40046
5140	18.13	1.14	6.40	−6.40046
5150	18.13	1.14	6.40	−6.40046
5160	18.13	1.14	6.40	−6.40046
5170	18.13	1.14	6.40	−6.40046
5180	18.13	1.14	6.40	−6.40046
5190	18.13	1.14	6.40	−6.40046
5200	18.13	1.14	6.40	−6.40046
5210	18.13	1.14	6.40	−6.40046
5220	18.13	1.14	6.40	−6.40046
5230	18.13	1.14	6.40	−6.40046
5240	18.12	1.15	6.41	−6.40637
5250	18.12	1.15	6.41	−6.40637
5260	18.12	1.15	6.41	−6.40637
5270	18.12	1.15	6.41	−6.40637
5280	18.12	1.15	6.41	−6.40637
5290	18.12	1.15	6.41	−6.40637
5300	18.12	1.15	6.41	−6.40637
5310	18.12	1.15	6.41	−6.40637
5320	18.12	1.15	6.41	−6.40637
5330	18.12	1.15	6.41	−6.40637
5340	18.12	1.15	6.41	−6.40637
5350	18.12	1.15	6.41	−6.40637
5360	18.12	1.15	6.41	−6.40637
5370	18.12	1.15	6.41	−6.40637
5380	18.12	1.15	6.41	−6.40637
5390	18.12	1.15	6.41	−6.40637
5400	18.12	1.15	6.41	−6.40637
5410	18.12	1.15	6.41	−6.40637
5420	18.12	1.15	6.41	−6.40637
5430	18.12	1.15	6.41	−6.40637
5440	18.12	1.15	6.41	−6.40637
5450	18.11	1.15	6.41	−6.41227
5460	18.11	1.15	6.41	−6.41227
5470	18.11	1.15	6.41	−6.41227
5480	18.11	1.15	6.41	−6.41227

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
5490	18.11	1.15	6.41	−6.41227
5500	18.11	1.15	6.41	−6.41227
5510	18.11	1.15	6.41	−6.41227
5520	18.11	1.15	6.41	−6.41227
5530	18.11	1.15	6.41	−6.41227
5540	18.11	1.15	6.41	−6.41227
5550	18.11	1.15	6.41	−6.41227
5560	18.11	1.15	6.41	−6.41227
5570	18.11	1.15	6.41	−6.41227
5580	18.11	1.15	6.41	−6.41227
5590	18.11	1.15	6.41	−6.41227
5600	18.11	1.15	6.41	−6.41227
5610	18.11	1.15	6.41	−6.41227
5620	18.11	1.15	6.41	−6.41227
5630	18.11	1.15	6.41	−6.41227
5640	18.11	1.15	6.41	−6.41227
5650	18.11	1.15	6.41	−6.41227
5660	18.11	1.15	6.41	−6.41227
5670	18.11	1.15	6.41	−6.41227
5680	18.11	1.15	6.41	−6.41227
5690	18.11	1.15	6.41	−6.41227
5700	18.11	1.15	6.41	−6.41227
5710	18.11	1.15	6.41	−6.41227
5720	18.11	1.15	6.41	−6.41227
5730	18.11	1.15	6.41	−6.41227
5740	18.11	1.15	6.41	−6.41227
5750	18.11	1.15	6.41	−6.41227
5760	18.11	1.15	6.41	−6.41227
5770	18.11	1.15	6.41	−6.41227
5780	18.11	1.15	6.41	−6.41227
5790	18.11	1.15	6.41	−6.41227
5800	18.11	1.15	6.41	−6.41227
5810	18.11	1.15	6.41	−6.41227
5820	18.11	1.15	6.41	−6.41227
5830	18.11	1.15	6.41	−6.41227
5840	18.11	1.15	6.41	−6.41227
5850	18.11	1.15	6.41	−6.41227
5860	18.11	1.15	6.41	−6.41227
5870	18.13	1.14	6.40	−6.40046
5880	18.13	1.14	6.40	−6.40046
5890	18.13	1.14	6.40	−6.40046
5900	18.13	1.14	6.40	−6.40046
5910	18.13	1.14	6.40	−6.40046
5920	18.13	1.14	6.40	−6.40046
5930	18.13	1.14	6.40	−6.40046
5940	18.13	1.14	6.40	−6.40046
5950	18.12	1.15	6.41	−6.40637
5960	18.12	1.15	6.41	−6.40637
5970	18.12	1.15	6.41	−6.40637
5980	18.12	1.15	6.41	−6.40637
5990	18.12	1.15	6.41	−6.40637
6000	18.12	1.15	6.41	−6.40637
6010	18.12	1.15	6.41	−6.40637
6020	18.12	1.15	6.41	−6.40637
6030	18.12	1.15	6.41	−6.40637
6040	18.12	1.15	6.41	−6.40637
6050	18.12	1.15	6.41	−6.40637
6060	18.12	1.15	6.41	−6.40637
6070	18.12	1.15	6.41	−6.40637
6080	18.12	1.15	6.41	−6.40637
6090	18.12	1.15	6.41	−6.40637

Elap Time SECONDS	-mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
6100	18.12	1.15	6.41	−6.40637
6110	18.12	1.15	6.41	−6.40637
6120	18.12	1.15	6.41	−6.40637
6130	18.12	1.15	6.41	−6.40637
6140	18.12	1.15	6.41	−6.40637
6150	18.12	1.15	6.41	−6.40637
6160	18.12	1.15	6.41	−6.40637
6170	18.12	1.15	6.41	−6.40637
6180	18.12	1.15	6.41	−6.40637
6190	18.12	1.15	6.41	−6.40637
6200	18.12	1.15	6.41	−6.40637
6210	18.12	1.15	6.41	−6.40637
6220	18.12	1.15	6.41	−6.40637
6230	18.12	1.15	6.41	−6.40637
6240	18.12	1.15	6.41	−6.40637
6250	18.12	1.15	6.41	−6.40637
6260	18.12	1.15	6.41	−6.40637
6270	18.11	1.15	6.41	−6.41227
6280	18.11	1.15	6.41	−6.41227
6290	18.11	1.15	6.41	−6.41227
6300	18.11	1.15	6.41	−6.41227
6310	18.11	1.15	6.41	−6.41227
6320	18.11	1.15	6.41	−6.41227
6330	18.11	1.15	6.41	−6.41227
6340	18.11	1.15	6.41	−6.41227
6350	18.11	1.15	6.41	−6.41227
6360	18.11	1.15	6.41	−6.41227
6370	18.11	1.15	6.41	−6.41227
6380	18.11	1.15	6.41	−6.41227
6390	18.11	1.15	6.41	−6.41227
6400	18.11	1.15	6.41	−6.41227
6410	18.11	1.15	6.41	−6.41227
6420	18.11	1.15	6.41	−6.41227
6430	18.11	1.15	6.41	−6.41227
6440	18.11	1.15	6.41	−6.41227
6450	18.11	1.15	6.41	−6.41227
6460	18.11	1.15	6.41	−6.41227
6470	18.11	1.15	6.41	−6.41227
6480	18.11	1.15	6.41	−6.41227
6490	18.11	1.15	6.41	−6.41227
6500	18.11	1.15	6.41	−6.41227
6510	18.11	1.15	6.41	−6.41227
6520	18.11	1.15	6.41	−6.41227
6530	18.11	1.15	6.41	−6.41227
6540	18.11	1.15	6.41	−6.41227
6550	18.11	1.15	6.41	−6.41227
6560	18.11	1.15	6.41	−6.41227
6570	18.11	1.15	6.41	−6.41227
6580	18.1	1.16	6.42	−6.41818
6590	18.1	1.16	6.42	−6.41818
6600	18.1	1.16	6.42	−6.41818
6610	18.1	1.16	6.42	−6.41818
6620	18.1	1.16	6.42	−6.41818
6630	18.1	1.16	6.42	−6.41818
6640	18.1	1.16	6.42	−6.41818
6650	18.1	1.16	6.42	−6.41818
6660	18.1	1.16	6.42	−6.41818
6670	18.1	1.16	6.42	−6.41818
6680	18.09	1.16	6.42	−6.42409
6690	18.09	1.16	6.42	−6.42409
6700	18.09	1.16	6.42	−6.42409

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
6710	18.09	1.16	6.42	−6.42409
6720	18.09	1.16	6.42	−6.42409
6730	18.09	1.16	6.42	−6.42409
6740	18.09	1.16	6.42	−6.42409
6750	18.09	1.16	6.42	−6.42409
6760	18.09	1.16	6.42	−6.42409
6770	18.09	1.16	6.42	−6.42409
6780	18.09	1.16	6.42	−6.42409
6790	18.09	1.16	6.42	−6.42409
6800	18.09	1.16	6.42	−6.42409
6810	18.09	1.16	6.42	−6.42409
6820	18.09	1.16	6.42	−6.42409
6830	18.09	1.16	6.42	−6.42409
6840	18.09	1.16	6.42	−6.42409
6850	18.1	1.16	6.42	−6.41818
6860	18.1	1.16	6.42	−6.41818
6870	18.1	1.16	6.42	−6.41818
6880	18.1	1.16	6.42	−6.41818
6890	18.1	1.16	6.42	−6.41818
6900	18.1	1.16	6.42	−6.41818
6910	18.1	1.16	6.42	−6.41818
6920	18.1	1.16	6.42	−6.41818
6930	18.1	1.16	6.42	−6.41818
6940	18.1	1.16	6.42	−6.41818
6950	18.1	1.16	6.42	−6.41818
6960	18.09	1.16	6.42	−6.42409
6970	18.09	1.16	6.42	−6.42409
6980	18.09	1.16	6.42	−6.42409
6990	18.09	1.16	6.42	−6.42409
7000	18.09	1.16	6.42	−6.42409
7010	18.08	1.17	6.43	−6.43
7020	18.08	1.17	6.43	−6.43
7030	18.08	1.17	6.43	−6.43
7040	18.08	1.17	6.43	−6.43
7050	18.08	1.17	6.43	−6.43
7060	18.08	1.17	6.43	−6.43
7070	18.08	1.17	6.43	−6.43
7080	18.08	1.17	6.43	−6.43
7090	18.09	1.16	6.42	−6.42409
7100	18.09	1.16	6.42	−6.42409
7110	18.09	1.16	6.42	−6.42409
7120	18.09	1.16	6.42	−6.42409
7130	18.09	1.16	6.42	−6.42409
7140	18.1	1.16	6.42	−6.41818
7150	18.1	1.16	6.42	−6.41818
7160	18.1	1.16	6.42	−6.41818
7170	18.1	1.16	6.42	−6.41818
7180	18.1	1.16	6.42	−6.41818
7190	18.1	1.16	6.42	−6.41818
7200	18.1	1.16	6.42	−6.41818
7210	18.1	1.16	6.42	−6.41818
7220	18.1	1.16	6.42	−6.41818
7230	18.1	1.16	6.42	−6.41818
7240	18.1	1.16	6.42	−6.41818
7250	18.1	1.16	6.42	−6.41818
7260	18.1	1.16	6.42	−6.41818
7270	18.1	1.16	6.42	−6.41818
7280	18.09	1.16	6.42	−6.42409
7290	18.09	1.16	6.42	−6.42409
7300	18.09	1.16	6.42	−6.42409
7310	18.09	1.16	6.42	−6.42409

Elap Time SECONDS	-mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
7320	18.08	1.17	6.43	-6.43
7330	18.08	1.17	6.43	-6.43
7340	18.08	1.17	6.43	-6.43
7350	18.08	1.17	6.43	-6.43
7360	18.08	1.17	6.43	-6.43
7370	18.08	1.17	6.43	-6.43
7380	18.08	1.17	6.43	-6.43
7390	18.08	1.17	6.43	-6.43
7400	18.08	1.17	6.43	-6.43
7410	18.08	1.17	6.43	-6.43
7420	18.08	1.17	6.43	-6.43
7430	18.08	1.17	6.43	-6.43
7440	18.08	1.17	6.43	-6.43
7450	18.08	1.17	6.43	-6.43
7460	18.08	1.17	6.43	-6.43
7470	18.08	1.17	6.43	-6.43
7480	18.08	1.17	6.43	-6.43
7490	18.08	1.17	6.43	-6.43
7500	18.08	1.17	6.43	-6.43
7510	18.08	1.17	6.43	-6.43
7520	18.08	1.17	6.43	-6.43
7530	18.08	1.17	6.43	-6.43
7540	18.1	1.16	6.42	-6.41818
7550	18.1	1.16	6.42	-6.41818
7560	18.1	1.16	6.42	-6.41818
7570	18.1	1.16	6.42	-6.41818
7580	18.1	1.16	6.42	-6.41818
7590	18.1	1.16	6.42	-6.41818
7600	18.1	1.16	6.42	-6.41818
7610	18.1	1.16	6.42	-6.41818
7620	18.1	1.16	6.42	-6.41818
7630	18.09	1.16	6.42	-6.42409
7640	18.09	1.16	6.42	-6.42409
7650	18.09	1.16	6.42	-6.42409
7660	18.09	1.16	6.42	-6.42409
7670	18.1	1.16	6.42	-6.41818
7680	18.1	1.16	6.42	-6.41818
7690	18.1	1.16	6.42	-6.41818
7700	18.1	1.16	6.42	-6.41818
7710	18.1	1.16	6.42	-6.41818
7720	18.1	1.16	6.42	-6.41818
7730	18.1	1.16	6.42	-6.41818
7740	18.1	1.16	6.42	-6.41818
7750	18.1	1.16	6.42	-6.41818
7760	18.1	1.16	6.42	-6.41818
7770	18.1	1.16	6.42	-6.41818
7780	18.1	1.16	6.42	-6.41818
7790	18.1	1.16	6.42	-6.41818
7800	18.1	1.16	6.42	-6.41818
7810	18.1	1.16	6.42	-6.41818
7820	18.1	1.16	6.42	-6.41818
7830	18.1	1.16	6.42	-6.41818
7840	18.1	1.16	6.42	-6.41818
7850	18.1	1.16	6.42	-6.41818
7860	18.1	1.16	6.42	-6.41818
7870	18.1	1.16	6.42	-6.41818
7880	18.1	1.16	6.42	-6.41818
7890	18.1	1.16	6.42	-6.41818
7900	18.1	1.16	6.42	-6.41818
7910	18.1	1.16	6.42	-6.41818
7920	18.1	1.16	6.42	-6.41818

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
7930	18.09	1.16	6.42	−6.42409
7940	18.09	1.16	6.42	−6.42409
7950	18.09	1.16	6.42	−6.42409
7960	18.09	1.16	6.42	−6.42409
7970	18.1	1.16	6.42	−6.41818
7980	18.1	1.16	6.42	−6.41818
7990	18.1	1.16	6.42	−6.41818
8000	18.1	1.16	6.42	−6.41818
8010	18.1	1.16	6.42	−6.41818
8020	18.09	1.16	6.42	−6.42409
8030	18.09	1.16	6.42	−6.42409
8040	18.09	1.16	6.42	−6.42409
8050	18.09	1.16	6.42	−6.42409
8060	18.08	1.17	6.43	−6.43
8070	18.08	1.17	6.43	−6.43
8080	18.08	1.17	6.43	−6.43
8090	18.08	1.17	6.43	−6.43
8100	18.08	1.17	6.43	−6.43
8110	18.08	1.17	6.43	−6.43
8120	18.08	1.17	6.43	−6.43
8130	18.08	1.17	6.43	−6.43
8140	18.08	1.17	6.43	−6.43
8150	18.08	1.17	6.43	−6.43
8160	18.08	1.17	6.43	−6.43
8170	18.08	1.17	6.43	−6.43
8180	18.08	1.17	6.43	−6.43
8190	18.08	1.17	6.43	−6.43
8200	18.08	1.17	6.43	−6.43
8210	18.08	1.17	6.43	−6.43
8220	18.08	1.17	6.43	−6.43
8230	18.08	1.17	6.43	−6.43
8240	18.08	1.17	6.43	−6.43
8250	18.08	1.17	6.43	−6.43
8260	18.08	1.17	6.43	−6.43
8270	18.08	1.17	6.43	−6.43
8280	18.08	1.17	6.43	−6.43
8290	18.08	1.17	6.43	−6.43
8300	18.08	1.17	6.43	−6.43
8310	18.08	1.17	6.43	−6.43
8320	18.08	1.17	6.43	−6.43
8330	18.08	1.17	6.43	−6.43
8340	18.08	1.17	6.43	−6.43
8350	18.08	1.17	6.43	−6.43
8360	18.08	1.17	6.43	−6.43
8370	18.08	1.17	6.43	−6.43
8380	18.08	1.17	6.43	−6.43
8390	18.08	1.17	6.43	−6.43
8400	18.08	1.17	6.43	−6.43
8410	18.08	1.17	6.43	−6.43
8420	18.08	1.17	6.43	−6.43
8430	18.08	1.17	6.43	−6.43
8440	18.08	1.17	6.43	−6.43
8450	18.08	1.17	6.43	−6.43
8460	18.08	1.17	6.43	−6.43
8470	18.08	1.17	6.43	−6.43
8480	18.08	1.17	6.43	−6.43
8490	18.08	1.17	6.43	−6.43
8500	18.08	1.17	6.43	−6.43
8510	18.1	1.16	6.42	−6.41818
t = 0 8520	18.1	1.16	6.42	−6.41818
8530	18.63	0.85	6.11	−6.105

BUILD-UP DATA ↓

	Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
	8540	19.07	0.59	5.85	−5.845
	8550	19.29	0.46	5.72	−5.715
	8560	19.51	0.33	5.59	−5.585
	8570	19.68	0.22	5.48	−5.48455
t = 1	8580	19.68	0.22	5.48	−5.48455
	8590	19.68	0.22	5.48	−5.48455
	8600	19.68	0.22	5.48	−5.48455
	8610	19.68	0.22	5.48	−5.48455
	8620	19.76	0.18	5.44	−5.43727
	8630	19.77	0.17	5.43	−5.43136
t = 2	8640	19.78	0.17	5.43	−5.42545
	8650	19.78	0.17	5.43	−5.42545
	8660	19.8	0.15	5.41	−5.41364
	8670	19.81	0.15	5.41	−5.40773
	8680	19.82	0.14	5.40	−5.40182
	8690	19.83	0.14	5.40	−5.39591
t = 3	8700	19.86	0.12	5.38	−5.37818
	8710	19.86	0.12	5.38	−5.37818
	8720	19.86	0.12	5.38	−5.37818
	8730	19.86	0.12	5.38	−5.37818
	8740	19.86	0.12	5.38	−5.37818
	8750	19.88	0.11	5.37	−5.36636
t = 4	8760	19.88	0.11	5.37	−5.36636
	8770	19.88	0.11	5.37	−5.36636
	8780	19.88	0.11	5.37	−5.36636
	8790	19.9	0.09	5.35	−5.35455
	8800	19.9	0.09	5.35	−5.35455
	8810	19.9	0.09	5.35	−5.35455
t = 5	8820	19.9	0.09	5.35	−5.35455
	8830	19.9	0.09	5.35	−5.35455
	8840	19.9	0.09	5.35	−5.35455
	8850	19.91	0.09	5.35	−5.34864
	8860	19.91	0.09	5.35	−5.34864
	8870	19.91	0.09	5.35	−5.34864
t = 6	8880	19.91	0.09	5.35	−5.34864
	8890	19.93	0.08	5.34	−5.33682
	8900	19.93	0.08	5.34	−5.33682
	8910	19.93	0.08	5.34	−5.33682
	8920	19.93	0.08	5.34	−5.33682
	8930	19.94	0.07	5.33	−5.33091
t = 7	8940	19.94	0.07	5.33	−5.33091
	8950	19.94	0.07	5.33	−5.33091
	8960	19.94	0.07	5.33	−5.33091
	8970	19.94	0.07	5.33	−5.33091
	8980	19.94	0.07	5.33	−5.33091
	8990	19.94	0.07	5.33	−5.33091
t = 8	9000	19.94	0.07	5.33	−5.33091
	9010	19.94	0.07	5.33	−5.33091
	9020	19.96	0.06	5.32	−5.31909
	9030	19.96	0.06	5.32	−5.31909
	9040	19.96	0.06	5.32	−5.31909
	9050	19.96	0.06	5.32	−5.31909
t = 9	9060	19.96	0.06	5.32	−5.31909
	9070	19.96	0.06	5.32	−5.31909
	9080	19.96	0.06	5.32	−5.31909
	9090	19.96	0.06	5.32	−5.31909
	9100	19.96	0.06	5.32	−5.31909
	9110	19.97	0.05	5.31	−5.31318
t = 10	9120	19.97	0.05	5.31	−5.31318
	9130	19.97	0.05	5.31	−5.31318
	9140	19.97	0.05	5.31	−5.31318

Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
9150	19.97	0.05	5.31	−5.31318
9160	19.97	0.05	5.31	−5.31318
9170	19.97	0.05	5.31	−5.31318
t = 11 9180	19.97	0.05	5.31	−5.31318
9190	19.97	0.05	5.31	−5.31318
9200	19.97	0.05	5.31	−5.31318
9210	19.97	0.05	5.31	−5.31318
9220	19.97	0.05	5.31	−5.31318
9230	19.97	0.05	5.31	−5.31318
t = 12 9240	19.97	0.05	5.31	−5.31318
9250	19.97	0.05	5.31	−5.31318
9260	19.98	0.05	5.31	−5.30727
9270	19.98	0.05	5.31	−5.30727
9280	19.98	0.05	5.31	−5.30727
9290	19.98	0.05	5.31	−5.30727
t = 13 9300	19.99	0.04	5.30	−5.30136
9310	19.99	0.04	5.30	−5.30136
9320	19.99	0.04	5.30	−5.30136
9330	19.99	0.04	5.30	−5.30136
9340	19.99	0.04	5.30	−5.30136
9350	19.99	0.04	5.30	−5.30136
t = 14 9360	19.99	0.04	5.30	−5.30136
9370	19.99	0.04	5.30	−5.30136
9380	19.99	0.04	5.30	−5.30136
9390	19.99	0.04	5.30	−5.30136
9400	19.99	0.04	5.30	−5.30136
9410	19.99	0.04	5.30	−5.30136
t = 15 9420	19.99	0.04	5.30	−5.30136
9430	20	0.04	5.30	−5.29545
9440	20	0.04	5.30	−5.29545
9450	20	0.04	5.30	−5.29545
9460	20	0.04	5.30	−5.29545
9470	20	0.04	5.30	−5.29545
t = 16 9480	20	0.04	5.30	−5.29545
9490	20	0.04	5.30	−5.29545
9500	20	0.04	5.30	−5.29545
9510	20	0.04	5.30	−5.29545
9520	20	0.04	5.30	−5.29545
9530	20	0.04	5.30	−5.29545
t = 17 9540	20	0.04	5.30	−5.29545
9550	20	0.04	5.30	−5.29545
9560	20	0.04	5.30	−5.29545
9570	20	0.04	5.30	−5.29545
9580	20	0.04	5.30	−5.29545
9590	20	0.04	5.30	−5.29545
t = 18 9600	20	0.04	5.30	−5.29545
9610	20	0.04	5.30	−5.29545
9620	20	0.04	5.30	−5.29545
9630	20	0.04	5.30	−5.29545
9640	20	0.04	5.30	−5.29545
9650	20	0.04	5.30	−5.29545
t = 19 9660	20	0.04	5.30	−5.29545
9670	20.01	0.03	5.29	−5.28955
9680	20.01	0.03	5.29	−5.28955
9690	20.01	0.03	5.29	−5.28955
9700	20.01	0.03	5.29	−5.28955
9710	20.02	0.02	5.28	−5.28364
t = 20 9720	20.02	0.02	5.28	−5.28364
9730	20.02	0.02	5.28	−5.28364
9740	20.02	0.02	5.28	−5.28364
9750	20.02	0.02	5.28	−5.28364

	Elap Time SECONDS	−mV	FEET OF DRAWDOWN	DTW	DEPTH FROM SURFACE
	9760	20.02	0.02	5.28	−5.28364
	9770	20.02	0.02	5.28	−5.28364
t = 21	9780	20.02	0.02	5.28	−5.28364
	9790	20.02	0.02	5.28	−5.28364
	9800	20.02	0.02	5.28	−5.28364
	9810	20.02	0.02	5.28	−5.28364
	9820	20.02	0.02	5.28	−5.28364
	9830	20.02	0.02	5.28	−5.28364
t = 22	9840	20.02	0.02	5.28	−5.28364
	9850	20.02	0.02	5.28	−5.28364
	9860	20.02	0.02	5.28	−5.28364
	9870	20.02	0.02	5.28	−5.28364
	9880	20.02	0.02	5.28	−5.28364
	9890	20.02	0.02	5.28	−5.28364
t = 23	9900	20.02	0.02	5.28	−5.28364
	9910	20.02	0.02	5.28	−5.28364
	9920	20.02	0.02	5.28	−5.28364
	9930	20.02	0.02	5.28	−5.28364
	9940	20.02	0.02	5.28	−5.28364
	9950	20.02	0.02	5.28	−5.28364
t = 24	9960	20.02	0.02	5.28	−5.28364
	9970	20.02	0.02	5.28	−5.28364
	9980	20.02	0.02	5.28	−5.28364
	9990	20.03	0.02	5.28	−5.27773
	10000	20.03	0.02	5.28	−5.27773
	10010	20.03	0.02	5.28	−5.27773
t = 25	10020	20.03	0.02	5.28	−5.27773
	10030	20.03	0.02	5.28	−5.27773
	10040	20.03	0.02	5.28	−5.27773
	10050	20.03	0.02	5.28	−5.27773
	10060	20.03	0.02	5.28	−5.27773
	10070	20.03	0.02	5.28	−5.27773
t = 26	10080	20.03	0.02	5.28	−5.27773
	10090	20.03	0.02	5.28	−5.27773
	10100	20.03	0.02	5.28	−5.27773
	10110	20.03	0.02	5.28	−5.27773
	10120	20.03	0.02	5.28	−5.27773
	10130	20.03	0.02	5.28	−5.27773
t = 27	10140	20.03	0.02	5.28	−5.27773
	10150	20.03	0.02	5.28	−5.27773
	10160	20.03	0.02	5.28	−5.27773
	10170	20.03	0.02	5.28	−5.27773
	10180	20.03	0.02	5.28	−5.27773
	10190	20.03	0.02	5.28	−5.27773
t = 28	10200	20.03	0.02	5.28	−5.27773

Jacob Method of Pumped Well Analysis
San Juan Gravel Tank Battery A#1 Pump Test

Calculations and Plots

AMOCO | PUMP TEST EVALUATION | S.J. Gvend | 4/22/93

JACOB METHOD OF PUMPED WELL ANALYSIS (TODD[4], pg 97)

$$T = \frac{2.30\,Q}{4\pi(s)} \log \frac{t}{t'}$$

$Q = 2.5$ gpm

$t = 128.6$ min

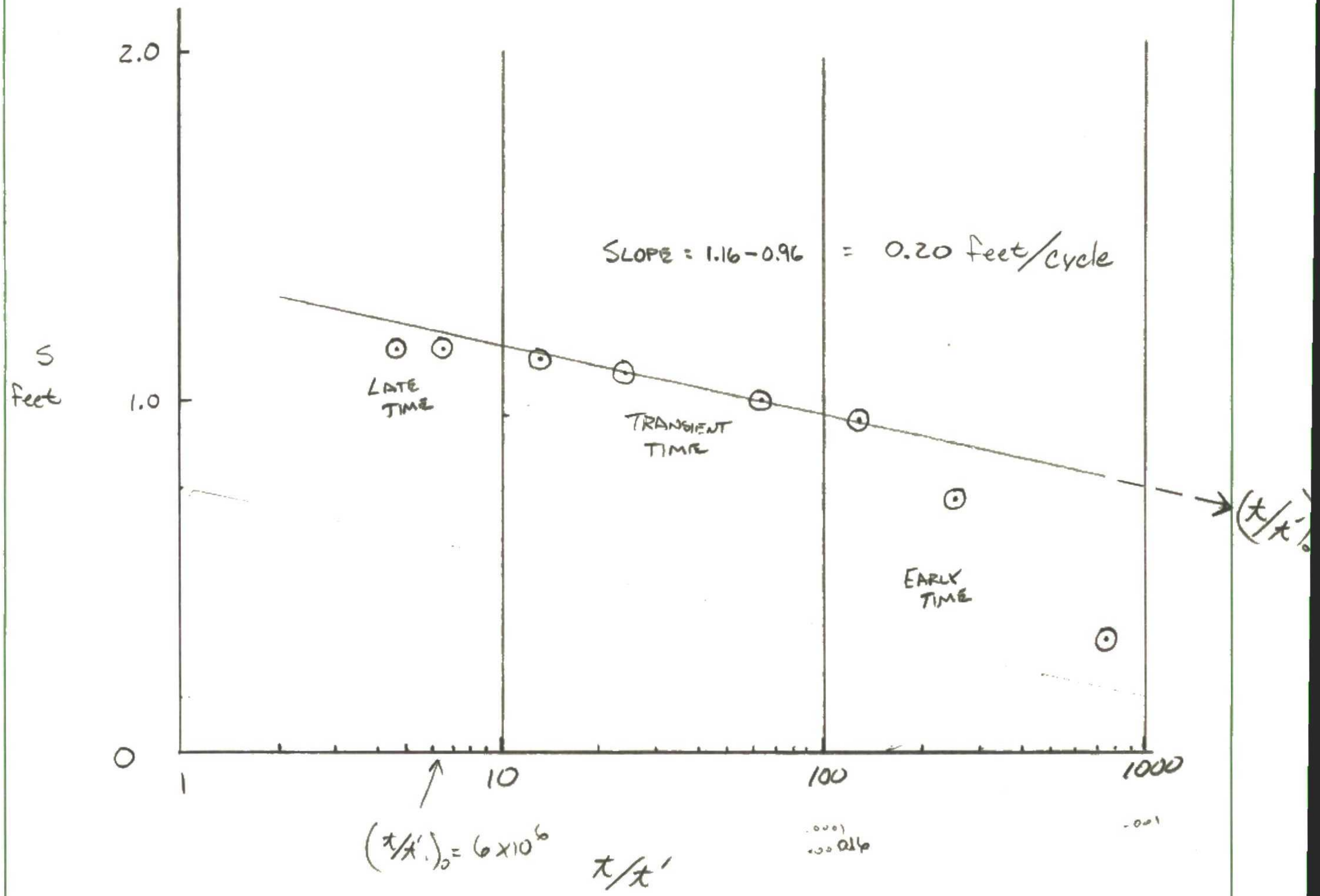
t' = Shut-in time

$s = \Delta h$ @ t'

$$T = \frac{264 \times 2.5}{0.20} = 3{,}300 \frac{\text{gpd}}{\text{foot}}$$

$$S = \frac{(0.3)(3{,}300)(1.49 \times 10^{-8})}{(.333)^2} = 1.33 \times 10^{-4}$$

t'	t/t'	s
0	∞	0
0.17	756	0.32
0.50	257	0.71
1.0	129	0.95
2.0	64.3	1.00
5.0	25.7	1.08
10.0	12.9	1.12
20.0	6.43	1.15
28.0	4.59	1.15



$\Rightarrow t' = 2.14 \times 10^{-5}$ min

$= 1.49 \times 10^{-8}$ days

Specific Capacity Analysis
San Juan Gravel Tank Battery A#1 Pump Test

Calculations and Plots

Amoco | Pump Test Evaluation | S.J. Gravel | 4/22/93

EVALUATION OF PUMP TEST USING SPECIFIC CAPACITY TO DETERMINE T

$$Q/s = \frac{T}{264 \log\left(\frac{Tt}{2693 r_w^2 S}\right) - 66.1}$$ WALTON[1], pg 130

Q_1 = 2.0 gpm
s_1 = 0.74 FEET
t_1 = 4000 sec = 67 min.
r_w = 4" = 0.333 feet

S (ESTIMATED) = 0.25 WALTON[2], pg 165
[ASSUMING UNCONFINED AQUIFER]

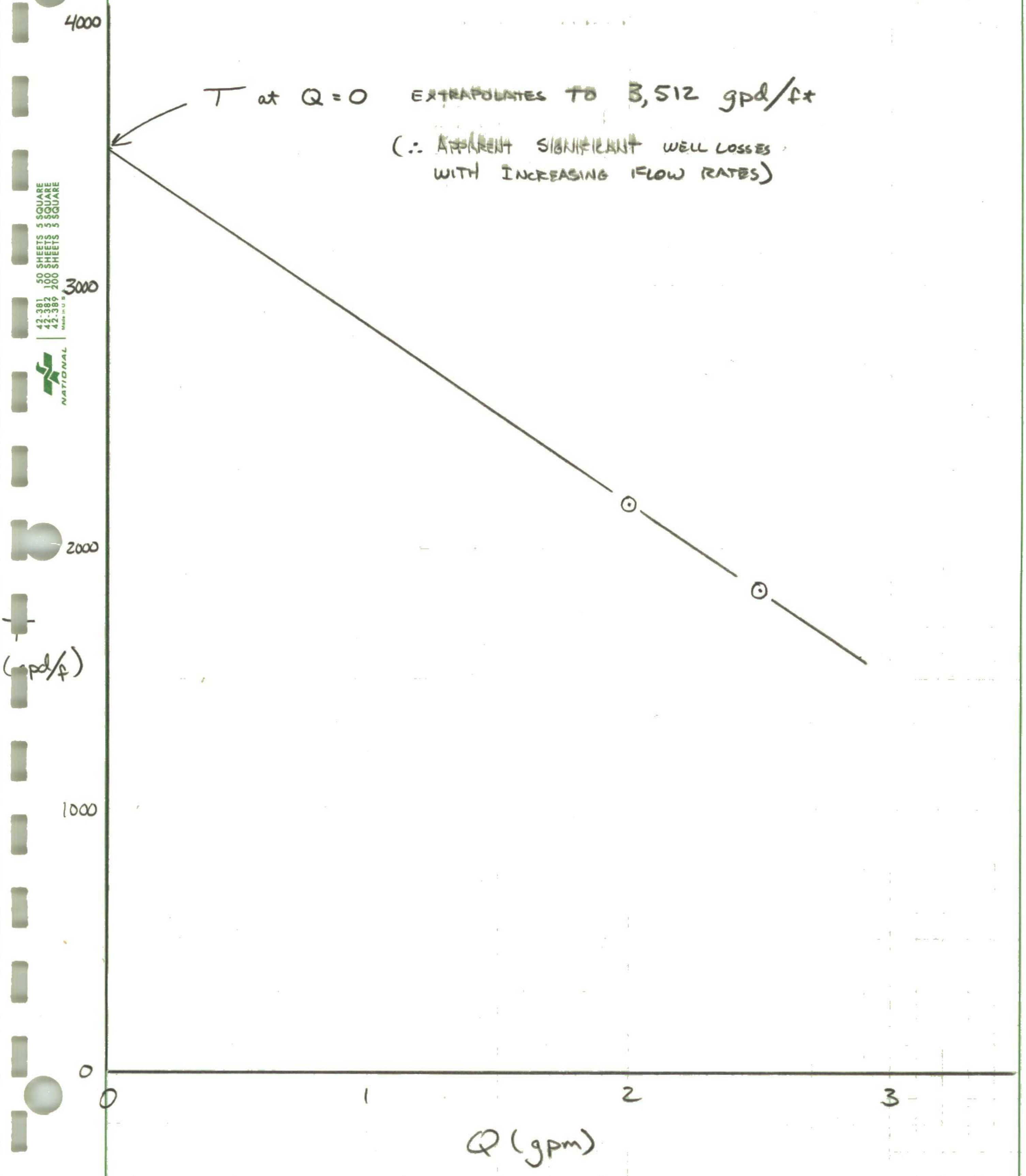
SOLVING FOR T, TRANSMISSIVITY = 2,168 gpd/ft

Q_2 = 2.5 gpm
s_2 = 1.17 feet
t_2 = Apparent Pump Time = $\frac{67 \text{ min.} \times 2 \text{ gpm} + (142-67) \text{min} \times 2.5 \text{gpm}}{2.5 \text{ gpm}}$ = 128.6 min
r_w = 0.333 feet
S = 0.25

SOLVING FOR T, TRANSMISSIVITY = 1,832 gpd/ft

Apparent T decreases with increasing Q. ∴ Assume well losses increase with flow rate. Will Plot Q vs T + EXTRAPOLATE TO Q = 0 to estimate T.

AMOCO | PUMP TEST EVALUATION | S.J. GRAVEL | 4/22/93



T at Q = 0 EXTRAPOLATES TO 3,512 gpd/ft

(∴ APPARENT SIGNIFICANT WELL LOSSES WITH INCREASING FLOW RATES)

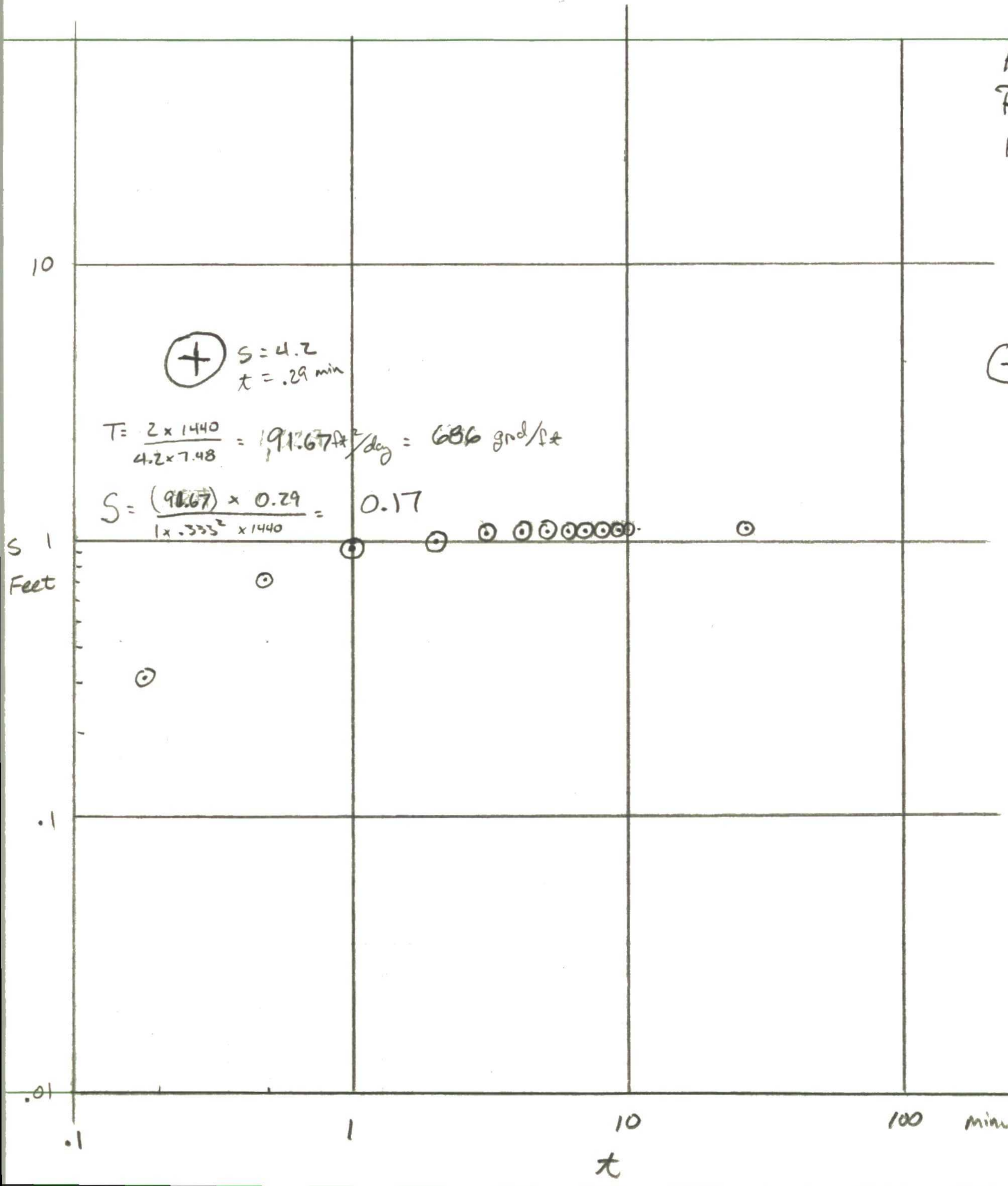
Boulton Delayed Yield Analysis
San Juan Gravel Tank Battery A#1 Pump Test

Calculations and Plots

AMOCO

PUMP TEST EVALUATION

FROM LOHMAN[3]: pg 36



$\oplus$ S = 4.2
t = .29 min

$T = \frac{2 \times 1440}{4.2 \times 7.48} = 91.67$ ft²/day = 686 gpd/ft

$S = \frac{(91.67) \times 0.29}{1 \times .333^2 \times 1440} =$ 0.17

$\oplus$ MATCH POINT

r/B = 2.0

s = 4.2 feet

t = 250 minutes

$$T = \frac{(1)(2.0\,g/m)(1440\ min/day)}{(4.2\,ft)(7.48\,gal/ft)} = 91.67\ ft^2/day$$

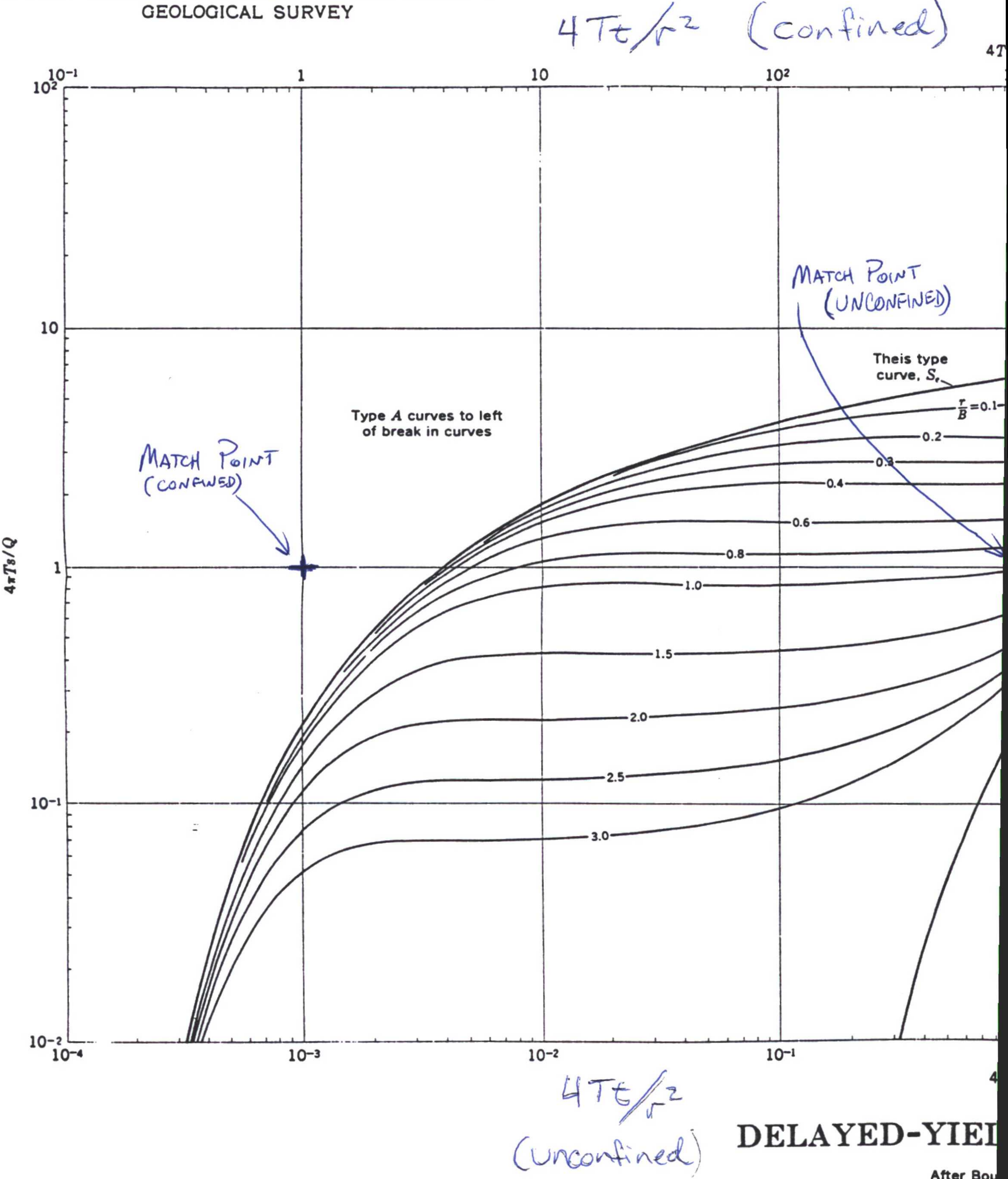
OR 686 gpd/ft

$$S = \frac{(91.67\ ft^2/d)\ (250\ min)}{(1)(.333)^2_{ft^2}(1440\ min/day)} = 144$$

NOTE: AN UNREASONABLE VALUE for S.
∴ ASSUME T is ALSO NOT VALID.

PROFESSIONAL PAPER 708
PLATE 8

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



DELAYED-YIEL

After Bou

Hantush-Jacob Analysis
San Juan Gravel Tank Battery A#1 Pump Test

Calculations and Plots

AMOCO | PUMP TEST EVALUATION | SAN JUAN GRAVEL | 4-22-93

t (min)	t (days)	t(d/r²)	s (feet)
0	0	0	0
0.17	1.18×10^{-4}	.00106	0.32
0.50	3.47×10^{-4}	.00313	0.71
1.0	6.94×10^{-4}	.00625	0.95
5.0	34.7×10^{-4}	.03125	1.08
10.0	69.4×10^{-4}	.06251	1.12
20.0	138.9×10^{-4}	0.125	1.15
28.0	194.4×10^{-4}	0.175	1.15
2.0	13.9×10^{-4}	0.0125	1.00

FROM LOHMAN[3] : pg 31

$$s = \frac{Q}{4\pi T} L(u,v)$$

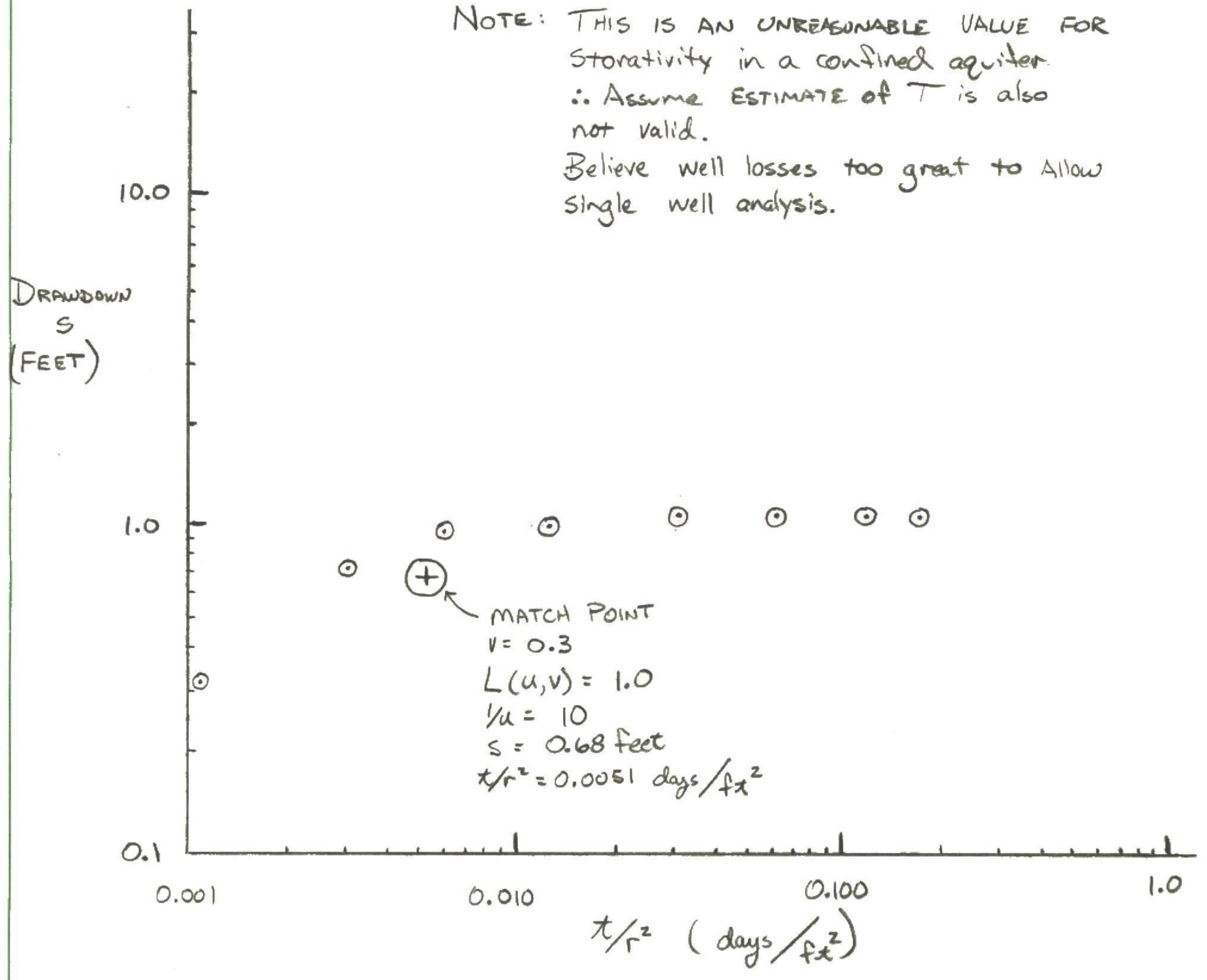
$$S = 4T \frac{t/r^2}{1/u}$$

Q = 2.5 gpm
r = 0.333 feet

$$T = \frac{2.5 \text{ gpm} \times 1440 \text{ min/day}}{4\pi \times 0.68 \text{ feet}} = 421 \text{ gpd/ft}$$

$$S = \frac{4 \times 421 \text{ gpd/ft} \times 0.0051 \text{ days/ft}^2}{10 \times 7.48 \text{ gal/ft}^3} = 0.115$$

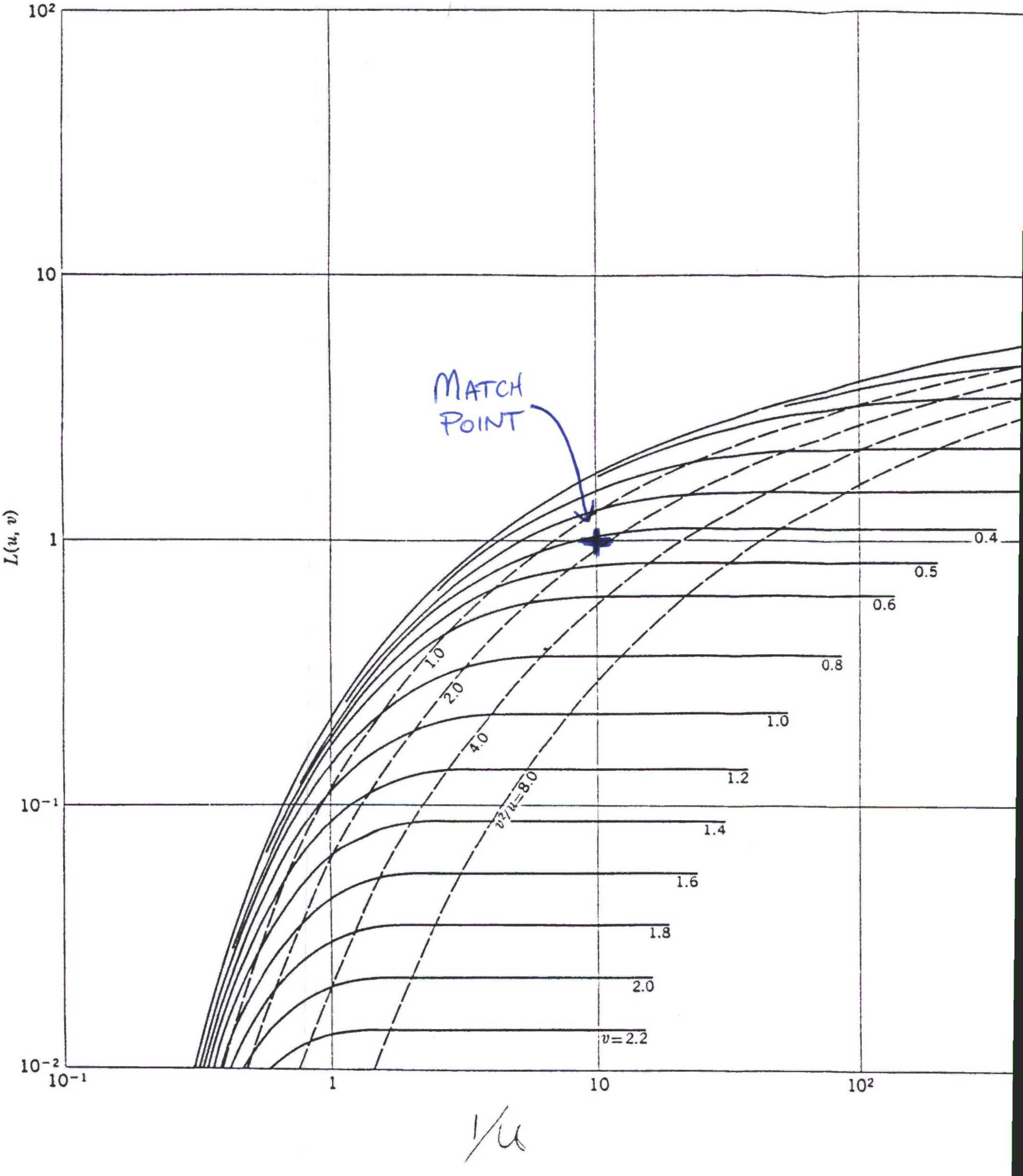
NOTE: THIS IS AN UNREASONABLE VALUE FOR Storativity in a confined aquifer
∴ Assume ESTIMATE of T is also not valid.
Believe well losses too great to Allow single well analysis.



MATCH POINT
v = 0.3
L(u,v) = 1.0
1/u = 10
s = 0.68 feet
t/r² = 0.0051 days/ft²

PROFESSIONAL PAPER 708
PLATE 3

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



Capture Radius Estimate
San Juan Gravel Tank Battery A#1 Pump Test

Calculations and Plots

AMOCO | PUMP TEST EVALUATION | S.J. GRAVEL 4/22/93

ESTIMATE OF RADIUS OF INFLUENCE + CAPTURE RADIUS

Assumptions: WATER TABLE AQUIFER WITH FULLY PENETRATING WELL
INFINITE + HOMOGENEOUS WITH NO RECHARGE BOUNDARIES
Constant DISCHARGE

FROM WALTON[3]: (pg 157)

$$s = \frac{114.6\,Q}{T} W(u)$$

$$u = \frac{1.87 r^2 S}{Tt}$$

T = 3,512 gpd/ft from Pump Test

$S = 0.25$ (ASSUMED FROM LITHOLOGY)

Assume radius of influence is defined by a drawdown of 0.05 feet

With a given pump time, pump rate + assumed T + S, calculate W(u), enter graph pg 222 (Walton[3]) to determine u, calculate r:

PUMP TIME t (days)	PUMP RATE Q (gpm)	DRAWDOWN s (feet)	W(u)	u	RADIUS of Influence r (feet)
1	2.5	0.05	0.61	0.48	60 feet
10	2.5	0.05	0.61	0.48	190 feet
100	2.5	0.05	0.61	0.48	600 feet

CAPTURE RADIUS: Assuming Local Gradient of 0.00277 feet/foot, the required pump rate to achieve a capture radius @ 100 days is as Follows:

CAPTURE RADIUS (feet)	PUMP TIME (DAYS)	REQUIRED DRAWDOWN (feet)	u	W(u)	Q (gpm)
10	100	0.028	1.3×10^{-4}	8.2	0.1 gpm
50	100	0.138	3.3×10^{-3}	5.3	0.8 gpm
100	100	0.277	1.3×10^{-2}	3.9	2.2 gpm
200	100	0.554	5.3×10^{-2}	2.4	7.1 gpm