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Noted E. P. SD. SEP 30 1991

MacKinnon Environmental Consulting

2834 San Antonio Drive
Walnut Creek, CA 94598
(415) 930-9272

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SEP 26 1991

September 20, 1991

Custom Alloy's Scrap Sales

3730 Peralta St., Oakland

• 9/20 QR
INT = Y
ABATE = FPET

Mr. Lester Feldman
Calif. RWQCB
1800 Harrison St.
Oakland, CA 94621

Dear Mr. Feldman:

Enclosed find the quarterly monitoring and progress report for Custom Alloy Sales and Service (CASS). CASS is a metal recycling yard in Oakland. A copy is also being forwarded to Mr. Dennis Byrne of ACHD (lead agency).

Sincerely,

Cinda MacKinnon

Cinda C. MacKinnon, R.G.

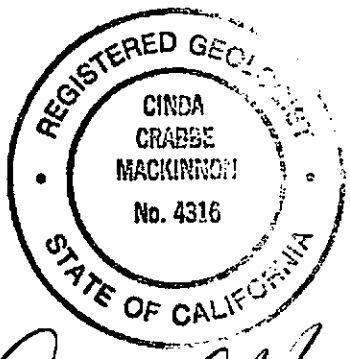
Comments:

- Duration of P/P test only last for 31 min (too short to draw any technically sound conclusion about the hydrogeologic parameters)
- 3' FP in MW1 & MW2 suggested that there might be some other sources of FP in the subsurface soil on site.
- who in RB stated that 10 ppm of diesel is the general response level? (in soil)
- No monthly FP Gauging report by CASS?
- Where is the FP removed to be disposed of?
- No proposed workplan to address the FP problem?
- Talked to Cinda MacKinnon on 11/5/92 about these items.

MACKINNON ENVIRONMENTAL CONSULTING

THIRD QUARTER MONITORING AND PROGRESS REPORT FOR CASS FACILITY OAKLAND, CALIFORNIA

Prepared for:
Custom Alloy Scrap Sales, Inc.
2730 Peralta Street
Oakland, California



Cinda Crabbe MacKinnon
Registered Geologist

September 20, 1991

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INTRODUCTION

This report describes the work performed by MacKinnon Environmental Consulting (MEC) for Custom Alloy Scrap Sales (CASS) in Oakland, California since June 1991. The results of the latest monitor well water sampling and remediation progress are addressed.

BACKGROUND

Two underground tanks were removed in April, 1990 at the site: a small gasoline tank and a large (10,000-gallon) diesel tank. Fuel had impacted the soil and ground water and required further investigation. Soil samples were collected, borings drilled, and six monitoring wells installed. Figure 1 (Appendix A) gives the location of wells and former subsurface tanks. The work is described in two reports: "Preliminary Subsurface Investigation for a Metal Recycling Yard in Oakland, California" (Phase I: June 1990) and "Phase II Subsurface Investigation for a Metal Recycling Yard in Oakland, California" (December 1990). Remediation of both soil and ground water was recommended and has been initiated. A trench with two extraction wells was installed in the side (ITP) yard in May 1991. This report is the third Quarterly Monitoring Report issued for the CASS facility since February 27, 1991.

QUARTERLY SAMPLING

On August 7, 1991 the monitor wells were purged and sampled. Sampling equipment was carefully decontaminated before initial use and between each well. Ground water samples were withdrawn from the wells by bailers which had been steam cleaned before arriving at the site. The bailers were scrubbed before each use with a TSP solution and a bottle brush. They were then rinsed with clean tap water, rinsed with reagent-grade methanol, and finally, rinsed with distilled water. A new rope was tied to the end of each bailer and every effort was made to keep the rope above the water in the well. As an extra precaution a separate teflon bailer is assigned to MW5 (the clean well) and the remaining wells were sampled from "clean to dirty" i.e. as contamination was anticipated to be low in MW4 it was sampled first and wells with higher levels of contamination were sampled last. MW1 and MW2 were not sampled due to the presence of free product.

Ground water was transferred, with minimal agitation, into glass bottles certified clean by the laboratory doing the analysis. The bottles for volatile organic analyses were checked to ensure that air bubbles were not present. Sample containers were immediately sealed, labeled, and placed on ice. All samples were delivered under chain-of custody procedures.

RESULTS OF ANALYSES

Water samples were sent to Superior Analytical Laboratory, Martinez, California. This laboratory is certified by the state of California for drinking water and hazardous waste testing and analysis. Samples were analyzed following procedures developed and verified by the Environmental Protection Agency (EPA) or the California Department of Health Services (DHS) as follows:

EPA 8015 - Total petroleum hydrocarbons as diesel
EPA 8020/5030 - Benzene, toluene, ethylbenzene, and xylene (BTEX)
EPA 5030/8015 - Total petroleum hydrocarbons as gasoline

The analytical results shown in the tables below include both previous and recent results. Complete laboratory reports for the recent tests are attached in Appendix B.

RESULTS FOR GROUND WATER SAMPLES
TABLE 1

	Well	Gasoline	Diesel	Benzn	Toluene	Ethylbnzn	Xylenes	
6/90		mg/L	mg/L	ug/L				
	MW1	ND	ND	0.4	ND	1.0	0.7	
	MW3	ND	ND	1.8	ND	0.5	ND	
	Duplicate(MW3)	NA	NA	1.8	ND	0.5	ND	
								TOG
10/90	MW3	ND	0.27	0.9	ND	ND	1.6	ND
	MW4	ND	0.35	0.3	ND	ND	0.4	ND
	MW5	ND	ND	ND	ND	ND	ND	ND
	MW6	0.22	0.80	4.9	4.6	0.9	4.8	ND
01/91	MW3	ND	0.32	2.1	ND	ND	ND	NA
	MW4	ND	0.18	ND	ND	ND	ND	ND
	MW5	ND	0.05*	ND	ND	ND	ND	ND
	MW6	1.7	5.3	43.0	6.0	4.3	12.0	NA
05/91	MW3	NA	0.22	3.3	ND	ND	ND	NA
	MW4	NA	0.08	ND	ND	ND	ND	NA
	MW5	NA	ND	ND	ND	ND	ND	NA
	MW6	0.88	5.1	11.0	2.2	2.1	4.8	NA
08/91(current)								
	MW3	NA	ND	8.6	ND	ND	0.4	
	MW4	NA	0.130	ND	ND	ND	ND	
	MW5	NA	ND	ND	ND	ND	ND	
	MW6	120.0	26	12,000	20,000	2,200	12,000	

a) Results for diesel and gasoline are expressed in milligrams per liter (mg/L). Mg/L is roughly equivalent to parts per million (ppm).
b) BTEX results are expressed in micrograms per liter (ug/L).
c) ND = not detected NA = not analyzed
d) TOG = Total oil & grease expressed in milligrams per liter

** "Negligible spike on the chromatogram which is not a petroleum fuel." See report and chromatograph Feb 1991 for more information.*

TABLE 2

		Nickel	Chromium	Lead	Zinc	Cadmium	
10/90							
	MW3	ND	ND	ND	ND	NA	
	MW4	ND	ND	ND	ND	NA	
	MW5	ND	NA	ND	ND	ND	
							Copper
1/91	MW5	ND	ND	ND	ND	ND	ND
	MW6	ND	ND	ND	0.3	ND	0.3

a) Results are expressed in milligrams per liter (mg/L). Mg/L is roughly equivalent to parts per million (ppm).
b) ND = not detected NA = not analyzed

The two wells (MW3 and 4) on either side of the diesel tank pit show moderately low results consistent with the previous sampling. MW3 levels of diesel have fallen to "non-detect" although benzene is slightly higher than initial analyses. MW5, the downgradient well, continues to test "non-detect" (Table 1).

Contamination levels in MW6 however have jumped two levels of magnitude. MW6 is the well in the north end of the property monitoring the former gasoline tank. The presence of diesel in the well is also perplexing as the management at CASS report that this tank never contained diesel.

Gasoline has not been detected in the ground water in any of the other wells in three previous testings. Previous analyses for metals (lead, nickel, cadmium and chromium) and oil and grease have also been "non-detect" (Table 2). Trace amounts of zinc and copper were detected in MW6. Gasoline, metals, and oil and grease are tested on an annual basis. The next annual tests will be reported in January.

DISCUSSION

The high level of contamination is an anomaly for MW6 in comparison with previous results. Although the concentration of gasoline is higher, the presence of diesel is also an anomaly. At least two water contamination projects list diesel as a contaminant however in nearby (less than 2 blocks away) projects. The high baseline of the chromatogram (Appendix B) suggests the diesel has been degraded.

MW6 was pumped or bailed thoroughly immediately prior to the two previous sampling events. The objective of exceeding minimal purging was to flush out the well in hopes that contamination was minimal, localized, and could be removed. In August the well was purged up to one well volume prior to sampling but was not overpumped as before. The sampler noted a sheen on the water suggesting product may have pooled in the well casing. Before concluding that contamination has increased in the well, we suggest resampling after pumping over 30 gallons. This will insure that stagnant water is removed from the well casing. Results should indicate whether the current high level is representative of the formation. Wells MW2 and MW1 will be purged of free product at the same time. An oil recycler will dispose of the contaminated water.

A new water quality standard for diesel has been issued by the EPA. The "suggested no adverse response level" (SNARLs) is 100 ppb over a 10-day period. The 10 days refers to an ingestion period and thus the California Regional Water Board suggests 10 ppb as a more general response level. Although this is the only standard currently on record for diesel it is a drinking water concentration and hardly applies to ground water in an industrial area. No criteria exists for gasoline although action levels have been established for benzene (5100 ppb), toluene (6300 ppb), and ethylbenzene (430 ppb). These levels have been designated to protect fresh and/or salt water life, agriculture and "other" beneficial uses.

MINI-PUMP TEST

On August 13, 1991 one of the six-inch wells (RW1) in the trench, was pumped. The main objective of pumping was to estimate drawdown and transmissivity and hence gain information on what type of pump should be used and the discharge volume which can be sustained for remedial purposes. Generally such tests are run for a minimum of 24 hours, however we anticipated a problem either in having the well run dry or disposing of a large volume of contaminated water. Hence we planned to pump for 3-6 hours. Water storage tanks were smaller than anticipated, however, and

pumping was terminated after 91 minutes. Water is being temporarily stored on site in three 250 gallon tanks.

Our understanding is that CASS is arranging with BAAQCD to recycle and dispose of the water in their furnace quench pit. If this does not work, MEC suggests having an oil recycler dispose of the pumped water. MEC collected a water sample from the pump hose and another from one of the tanks. Results were in the 1-2 ppm range (see lab report, Appendix B).

Static water levels were measured in wells within a 100-foot radius before pumping began. The thickness of free product was also measured in MW1 and MW2 and each of these wells had over three feet of product. This thickness indicates that the amount of free product in MW1 has doubled since it was last measured six months ago.

The test was conducted by pumping the well at a constant discharge of approximately 7 gallons/minute using a jet surface pump. Discharge was measured 4 times in a 5-gallon bucket and averaged 5 gal/43 sec (7 gpm). The water level in the pumping well (RW1) fell only one inch in the first 8 minutes and was depressed by a total of .802 feet (9-3/8 inches) by the time the pump was shut off. — may not reach to a steady state drawdown?

Four wells (RW2, MW1, MW2 and MW3) were used as observation wells as a check to see if water levels would be affected by pumping over this short time period. MW1 and MW2 are the closest to the pumping well, however, response in these wells was minimal to negligible. Both wells are located approximately 40 feet away from the pumping well; MW1 is on the upgradient side, and MW2 is (indirectly) downgradient

RW2 (60 feet away) and MW3 (75 feet away), however, both showed declines in water levels with time. MW3 first registered a change over 1 hour after pumping began; further drawdown of .13 feet (1.5 in.) was noted almost 5 hours after the pump had been shut off and at 52 hours the water level had declined to .224 feet (2-5/8 inches); three weeks later the water level in MW3 measured .224 feet (registered no change). Similarly, RW2 did not respond during the first hour, but declined 1/2 an inch during the last 1/2 hour of pumping; a drop of .146 feet (1-3/4 inches) was recorded 5 hours after the pump had been turned off and .302 feet (~3-3/8 inches) after 52 hours. MW3 is approximately upgradient and RW2 is almost perpendicular to the upgradient direction of flow, with respect to RW1. It is likely that the response seen in these two wells, in spite of their distance from RW1, is due to 1) lithologic connection (trench gravel in RW2 and probably sand in MW3) and 2) their approximate upgradient locations.

Time vs. drawdown graphs were plotted on semilog paper for RW1, the pumping well, and the observation wells, RW2 and MW3. Both pumping and recovery were plotted (see Figures 2-5, Appendix A). Such graphs can yield information on sustainable pumping and drawdown rates, boundary conditions and recharge. Using the straight-line recovery graph, the Jacob's mathematical model was applied to calculate transmissivity (T) with the following equation, where Q = discharge and Δs = drawdown over one log cycle of time:

$$T = 35Q/\Delta s$$
$$T = 35(7gpm)/.205 = <1200ft^2/day \text{ or } <9000 \text{ gpd/ft}$$

Transmissivity relates to the ease with which water moves through the entire saturated formation. The formation in this case is a silty clay (Bay Mud) known to be up to 100 feet thick. If the Bay Mud is considered to be the "aquifer", the shallow pumping well would be considered only "partially penetrating" - hence the actual ability to transmit water may be less than the "total aquifer" transmissivity calculated above. Even within the formation transmissivity will vary for sand and clay and hence, with a heterogeneous lithology, the cone of depression is not going to have an equidimensional radius.

In the extraction trench, the cone will be shallow with a large radius that can extend the length of the trench. The cone will be steeper with a smaller radius of capture in the natural (clay) formation. Thus the trench optimizes product capture by increasing the extent of the cone of depression. The trench also increases initial yield (as long as it is not dewatered) and allows product to flow into the more permeable area if the water level is lowered. However ultimately, the trench is constrained by the transmissivity of the surrounding formation

The recovery graph was used to calculate transmissivity, rather than the pumping graph as certain factors make the latter less reliable (such as the short duration of pumping). However, the change in slope of the pumping graph after 40 minutes may be significant, suggesting that discharge exceeded recharge. A steepening of the slope (Figure 2) is commonly interpreted as a barrier or boundary - in this case the accelerated drawdown probably indicates the cone of depression reached the boundary of the trench at that time.

When discharge equals aquifer yield, recovery may be seen as a mirror image of the pumping-drawdown graph, i.e., the water level recovers at a similar rate to which it was drawndown. Although drawdown in RW1 was small, recovery was very slow - indicating discharge exceeded aquifer yield. During initial minutes of both

pumping and recovery, response is generally rapid and then proceeds more slowly, but this pattern was not in evidence.

These discrepancies are probably due to the "bathtub" effect formed by the presence of the more permeable trench. The trench recharges slowly and can hold approximately 4000 gallons. When pumping began, instead of the well being quickly dewatered, it had a ready supply of water entering it from the trench and hence water levels were slow to decline. When the pump was shut off, the trench had been partially dewatered and recharge from the clay sidewalls proceeded very slowly.

Thus, recovery was slow in RW1 (the pumping well) and was not noted in the observation wells two days later. Response of the depressed water level in RW1 was practically negligible for over 100 minutes. After this time the recovery rate increased slightly, but 8-1/2 hours after the pump was shut off the water level had only recovered 2 inches (out of the total 9-3/8 inches.). Forty-eight hours after the end of the test the well had only recovered 50%. This indicates a low efficiency "aquifer" of low hydraulic conductivity. The water levels in RW2 and MW3 continued to decline over the next two days (3-3/8 and 2-5/8 inches respectively). By comparison, MW4 and MW5 also dropped slightly (1/2 and 1-1/2 inches respectively) over a two-week period. It seems unlikely however that MW4 and MW5 would be affected by 9 inches of drawdown in the pumped well, as they are located respectively ~150 feet upgradient and ~135 feet (at a angle) downgradient.

The slow recharge shown by the minimal recovery of the water table explains how the water levels in the observation wells continued to decline long after the pump was turned off. The shallow cone of depression was able to expand as long as the water table was low around RW1 and the observation wells exhibited a time lag in their response. Theoretically after the time lag, RW2 should behave similar to RW1 with respect to water levels and rates of decline and recharge; this is because both are located in the trench and share a common "lithology."

The decline in water levels could be somewhat misleading or at least exaggerated however, by other factors. Variables which could contribute to the lower water levels could be tides, barometric pressure, or simply the lower recharge that can be anticipated during the dry season. (Recharge and hence recovery may be enhanced during the winter rainy season.)

Barometric pressure was obtained for each day between August 12 and 15 from the National Weather Service at Oakland Airport (see table below). The flutuations in barometric pressure appear to be negligible during this time period.

BAROMETRIC PRESSURE DATA

	Inches of Mercury
8/12 8am	30.09
8/13 "	30.07
8/14 9am	29.94
8/15 8am	30.07

In conclusion, the test shows the formation can probably only sustain a low pumping rate: approximately 2 gpm is recommended. Even at this low discharge it may be possible to lower the water table sufficiently to allow product to drain towards the trench to be removed. A skimmer type pump will be sufficient to maintain drawdown and remove product. The principal drawback however, is that the low yield may require many years to clean-up the ground water.

REMEDIATION PROGRESS

Ground Water Extraction System

The trench was excavated in late spring to optimize capture for a ground water extraction system. The trench was elected over pumping MW2 and other wells alone partly because MW2 pumped dry so quickly. The trench will intercept product moving with the ground water from either the former diesel pit or the former piping. Product will be removed by pumping which will exert a measure of hydrodynamic control on the water table near the trench, thus inducing increased flow of hydrocarbons into the two recovery wells. Surrounding wells will be used to monitor progress. Unfortunately only a thin layer of product has filled the trench whereas both MW2 and MW1 contain at least three feet of product. For this reason we propose to pump MW1 and MW2 periodically in addition to the recovery wells.

Meanwhile the pump and piping extraction design has been completed and the pump and equipment have been purchased. The system has a skimmer pump to remove free product, but is also capable of depressing the water table by extracting total fluids. At present we suggest skimming the free product only. Figure 6 depicts the system which includes the following equipment: a peristaltic pump and float, 100 feet of extraction hose, three product drums, a secondary containment steel box, associated plumbing, electrical hookups and shut-off controls.

CASS is processing a storage permit with the Oakland Fire Dept. as the owner-builder. The Air Board (BAAQMD) will also be notified. According to the City of Oakland Building Dept., electrical and plumbing permits are not necessary as long as the system remains portable, i.e. it should not be "hardwired". We assume the ACHD

to have accepted the (KTW's) workplan for this project and thus approved the initial phase.

MEC plans to install the pump and associated hardware this week using CASS labor. RW1 will be the initial recovery well however, the system is portable and can be moved and set-up in any of the other three nearby wells. MEC will train a CASS employee to maintain the extraction system.

At present our efforts are focused on removal of free product and disposal of the bioremediated soils. Eventually we may need to consider treating the ground water and pumping total fluids. Pumping and treatment of dissolved product usually involves carbon absorption or biotreatment and a permit for disposal to the sewer. However recently the industry and regulators are concluding this extremely expensive technology addresses only a fraction of the problem and may not be a wise use of resources. *

Bioremediation (Soils)

Soil removed from the trench has been bioremediated on site. One hundred cubic yards of soil were sprayed with a liquid compost-nutrient mixture as the pile was tilled by the on-site crane. Twenty-five pounds of culture were hydrated in 165 gallons of water to form the mixture. An equal amount of nutrient enriched water was also applied. The soil was then covered with Visqueen. Due to space constraints, CASS could not spread the pile thin, but the pile was turned on a weekly basis and kept moist.

MEC collected four samples in July, from the middle and lower layers in different areas of the soil pile, to monitor bioremediation progress. The four were composited by the lab to yield two (composite) samples. Compositing reduces costs and yields an average contaminant profile. Samples were tested for diesel and oil and grease (O&G). The laboratory reports are in Appendix B.

Bioremediation appears to have reduced diesel contamination to less than 100 ppm although one of the O&G results was 200 ppm. These levels are not acceptable to the landfill we originally proposed but a landfill in Livermore has agreed to receive the soils providing further analyses are conducted. The soil is being tested for STLC metals and reactivity, corrosivity and ignitability in order to haul and dispose soils. Balch Petroleum will be handling paperwork, transport and all aspects of disposal. This letter serves to notify Alameda County Health Department (ACHD) of disposal plans.

RECOMMENDATIONS

We suggest that three other wells be pumped manually: MW1, MW2 and MW6. MW1 and MW2 will be purged periodically to remove free product. Product will be stored in drums in the steel containment box. MW6 contains minimal product but we hope to lower contaminant levels by this measure. MEC will then resample the well (MW6) after pumping. Product and water will be disposed through the services of an oil recycler. Product and fluids from the operation of the extraction system will also need to be disposed of. We propose to have an oil recycler handle this on a regular basis.

We have arranged to have Bates and Bailey Surveyors survey the recovery wells (as they did with the monitor wells).

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The next Quarterly Monitoring Report will be submitted in January 1992. At that time the annual tests for gasoline, metals, oil and grease will be submitted along with the regular quarterly analyses.
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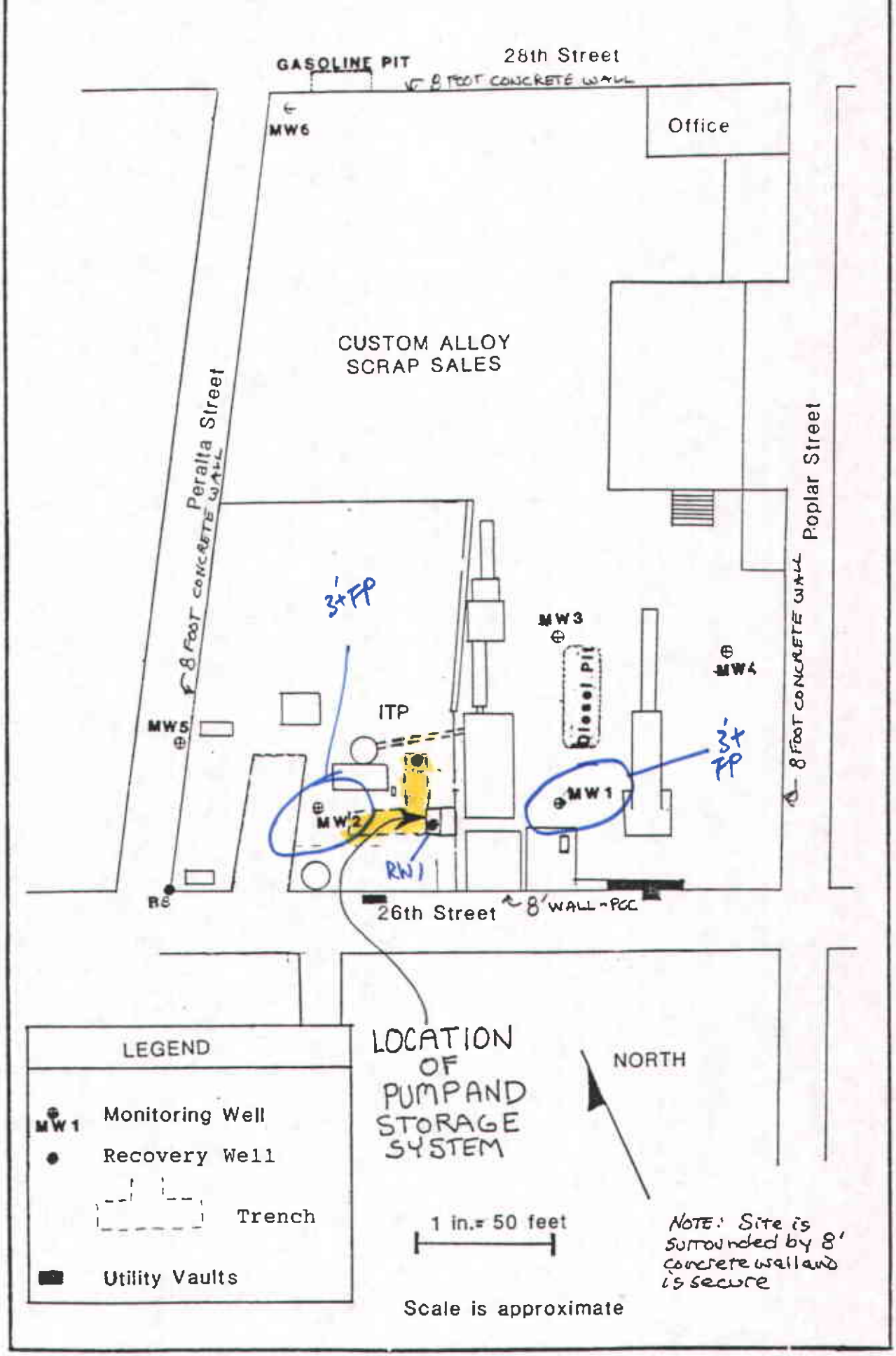

GASOLINE PIT
28th Street
8 FOOT CONCRETE WALL
MW6
Office
CUSTOM ALLOY
SCRAP SALES
Peralta Street
8 FOOT CONCRETE WALL
Poplar Street
8 FOOT CONCRETE WALL
3'+FP
MW3
Diesel Pit
MW4
ITP
MW5
MW2
MW1
3'+
FP
RW1
RS
26th Street
8' WALL - PCC
LEGEND
MW1 Monitoring Well
Recovery Well
Trench
Utility Vaults
LOCATION OF PUMP AND STORAGE SYSTEM
NORTH
1 in.= 50 feet
NOTE: Site is surrounded by 8' concrete wall and is secure
Scale is approximate

FIGURE 1

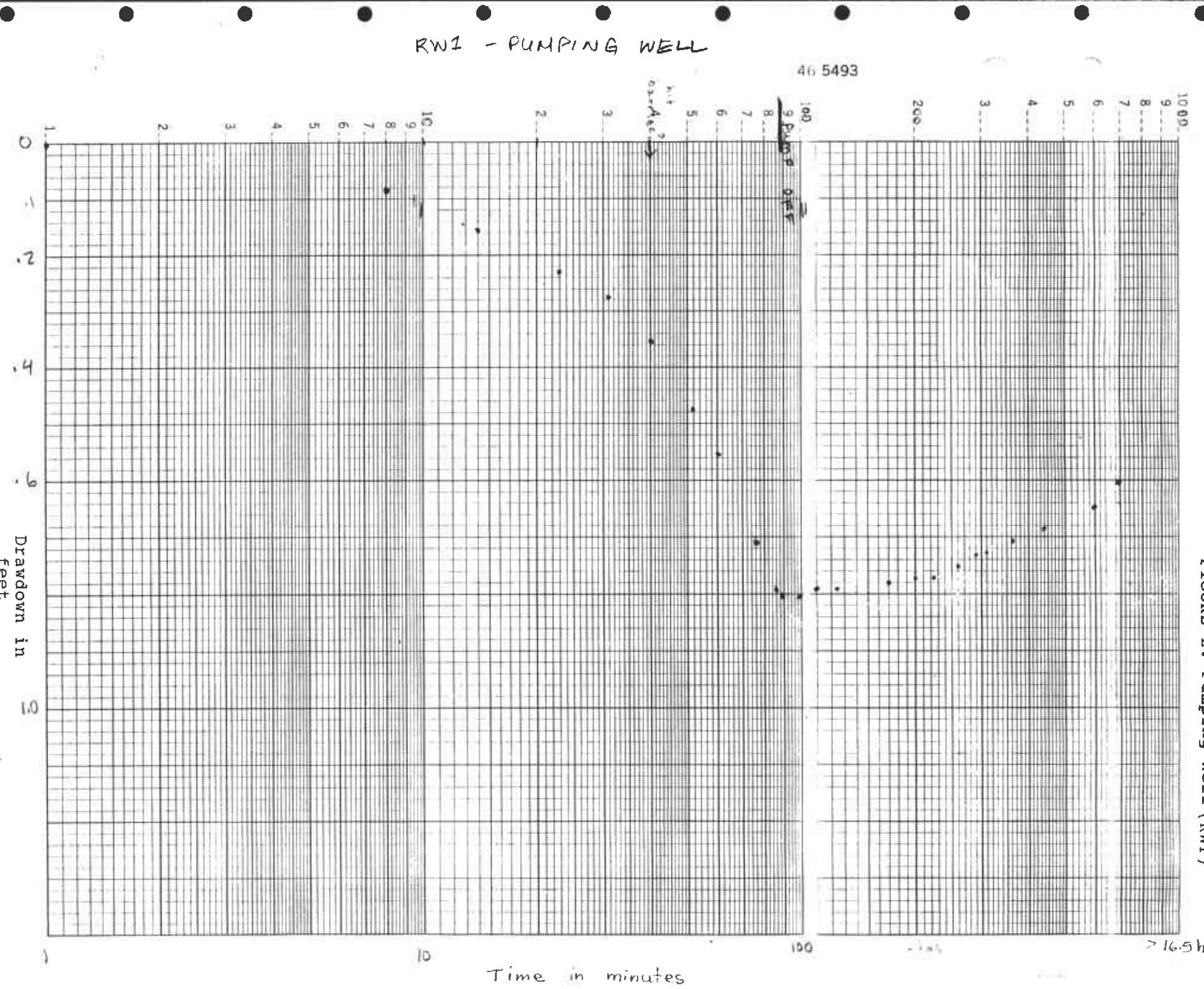


FIGURE 2: Pumping Well (RW1)

RECOVERY RW1

4 5493

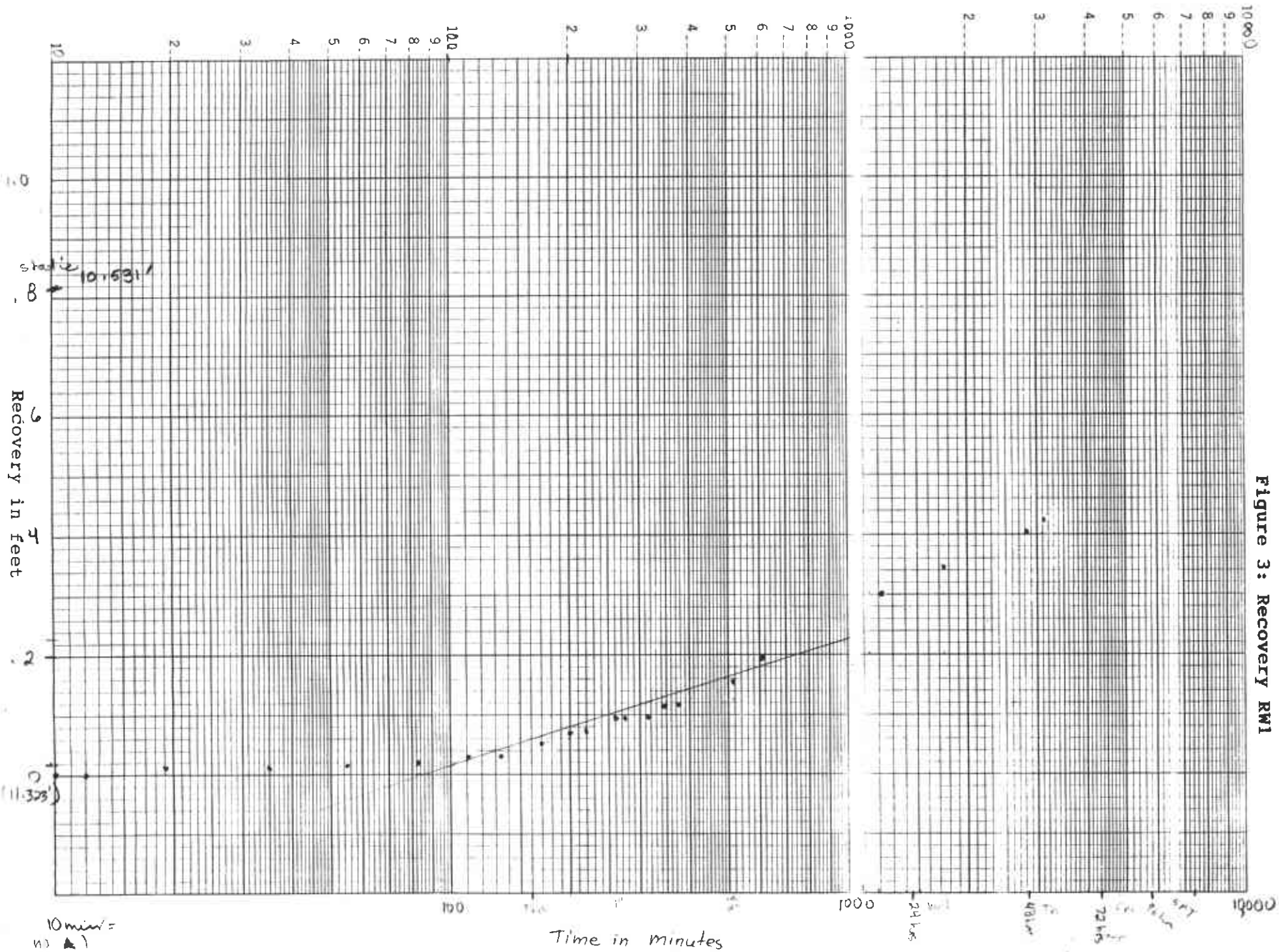


Figure 3: Recovery RW1

RW2 (observation well)
80 feet from pumping well

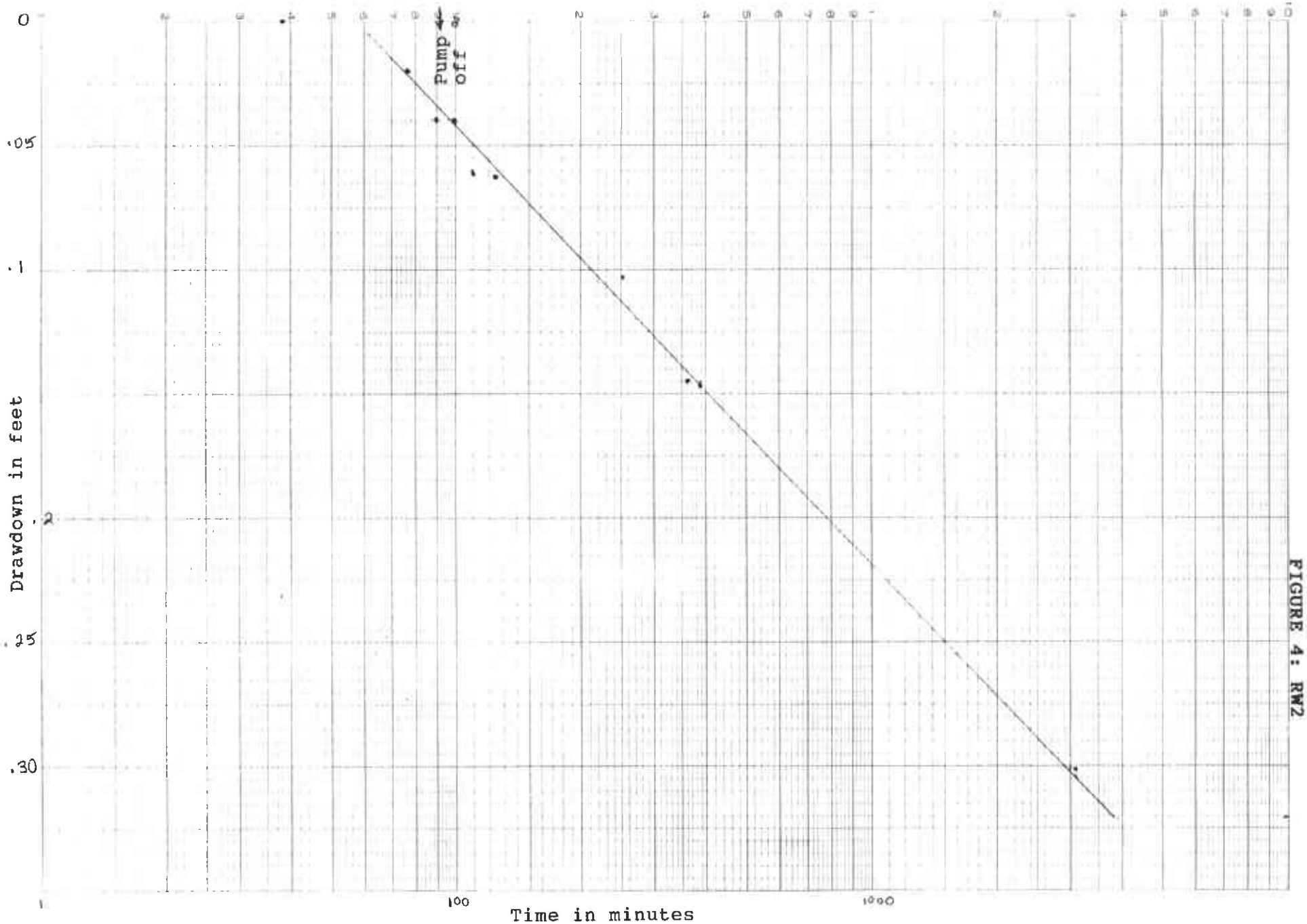


FIGURE 4: RW2

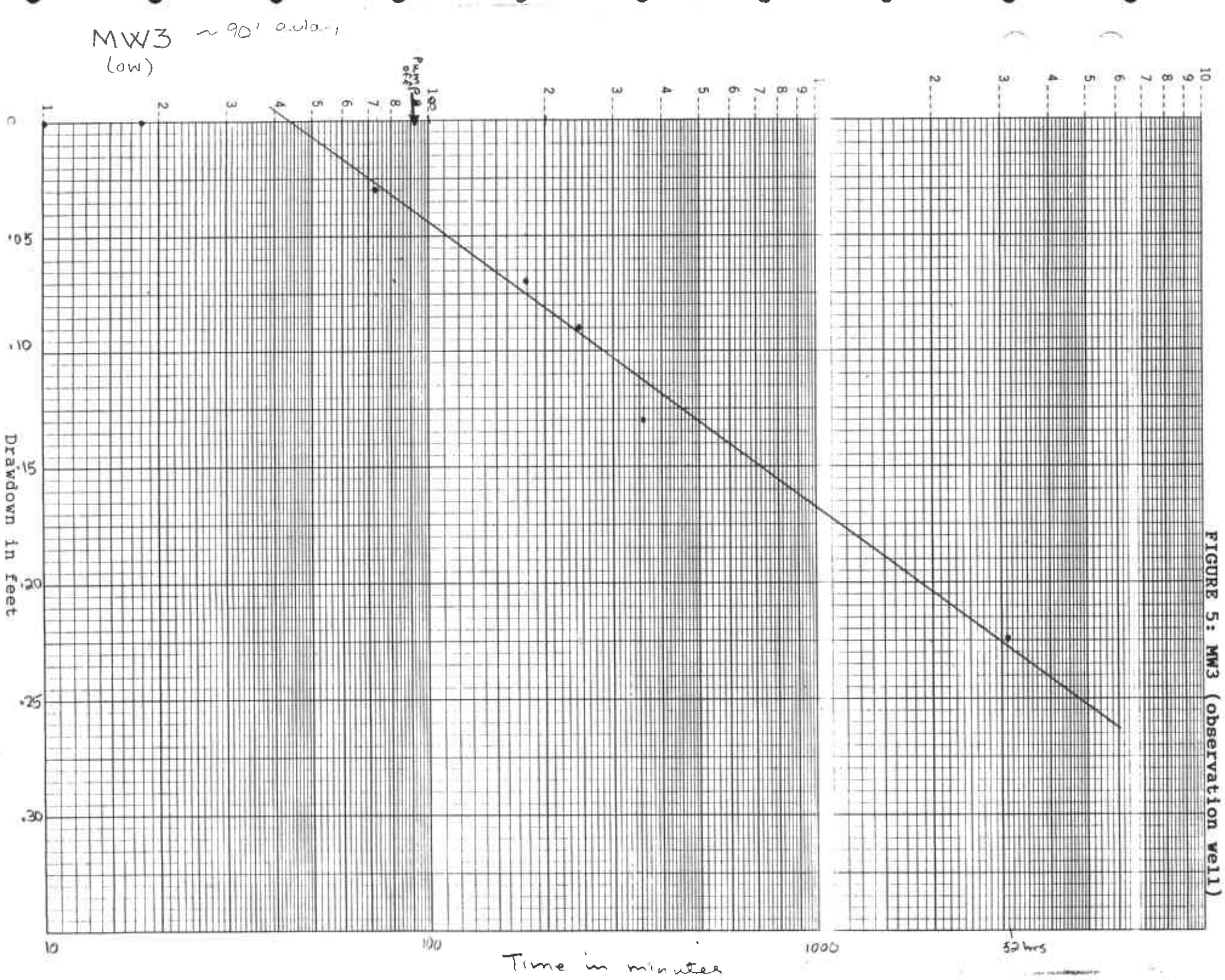
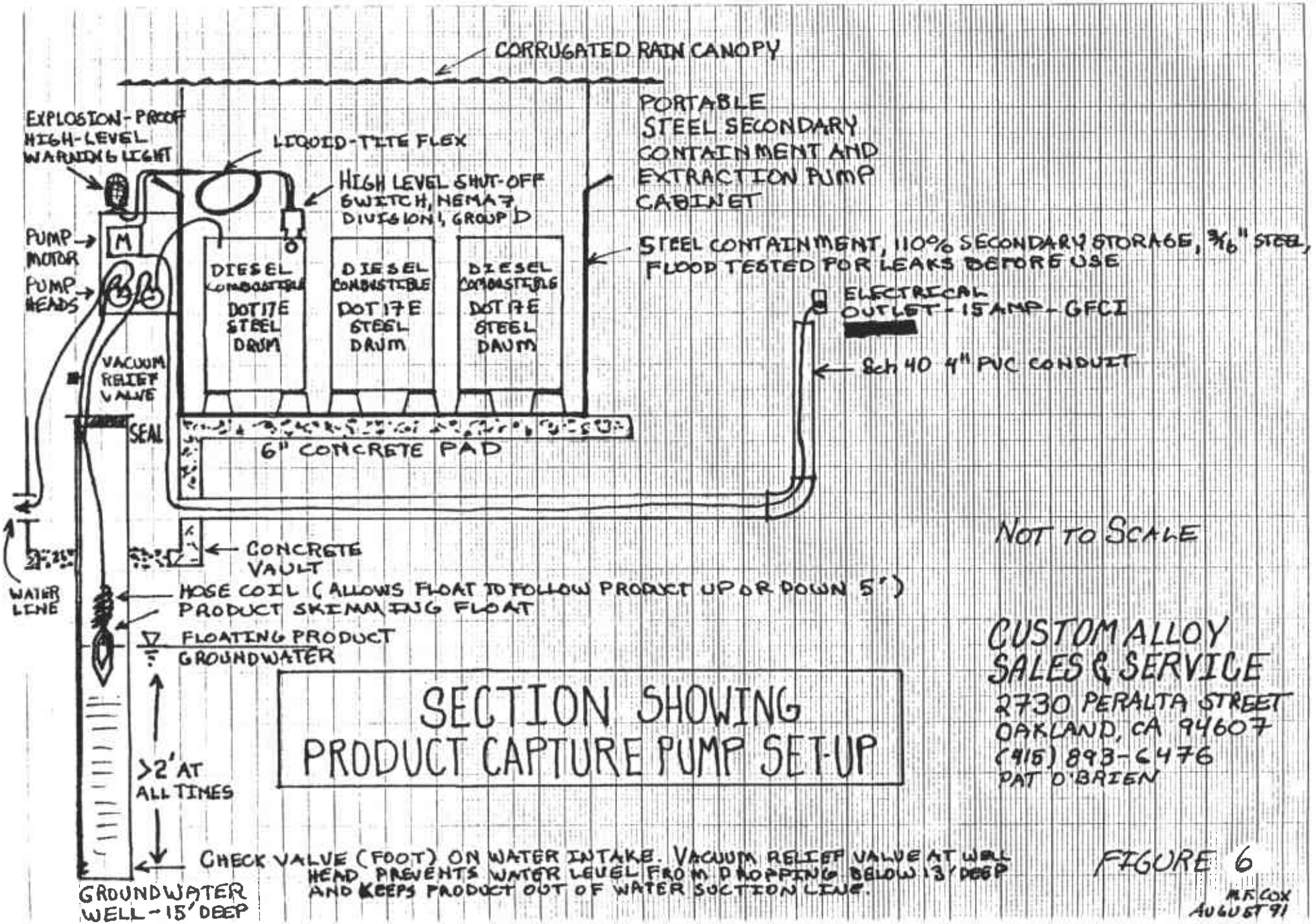


FIGURE 5: MW3 (observation well)



NOT TO SCALE

SECTION SHOWING PRODUCT CAPTURE PUMP SET-UP

CUSTOM ALLOY SALES & SERVICE
2730 PERALTA STREET
OAKLAND, CA 94607
(415) 893-6476
PAT O'BRIEN

FIGURE 6

M.F. COX
AUGUST 91

Superior Precision Analytical, Inc.
825 Arnold Drive, Ste. 114 • Martinez, California 94553 • (415) 229-1512 / fax (415) 229-1526

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 83665
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: 3-4TER
Third Quarter

DATE RECEIVED: 08/08/91
DATE REPORTED: 08/15/91

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/L) Benzene	Toluene	Ethyl Benzene	Xylenes
4	W6	12000	20000	2200	12000

ug/L - parts per billion (ppb)

Method Detection Limit in Water: 0.3 ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery =93 %: Duplicate RPD = <2

Richard Srna, Ph.D.

Laboratory Manager

Superior Precision Analytical, Inc.
825 Arnold Drive, Ste. 114 • Martinez, California 94553 • (415) 229-1512 / fax (415) 229-1526

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 83665
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: 3-4TER
Third Quarter

DATE RECEIVED: 08/08/91
DATE REPORTED: 08/15/91

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

LAB #	Sample Identification	Concentration (mg/L) Gasoline Range
4	W6	120

mg/L - parts per million (ppm)

Method Detection Limit for Gasoline in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = <15
MS/MSD Average Recovery = 92 %: Duplicate RPD = 0

Richard Srna, Ph.D.

Laboratory Manager

Superior Precision Analytical, Inc.
825 Arnold Drive, Ste. 114 • Martinez, California 94553 • (415) 229-1512 / fax (415) 229-1526

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 83665
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: 3-4TER
Third Quarter

DATE RECEIVED:08/08/91
DATE REPORTED:08/15/91

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/L) Benzene	Toluene	Ethyl Benzene	Xylenes
1	W3	8.6	ND<0.3	ND<0.3	0.4
2	W4	ND<0.3	ND<0.3	ND<0.3	ND<0.3
3	W5	ND<0.3	ND<0.3	ND<0.3	ND<0.3

ug/L - parts per billion (ppb)

Method Detection Limit in Water: 0.3 ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 93%: Duplicate RPD = <2

Richard Srna, Ph.D.

Laboratory Manager

Superior Precision Analytical, Inc.
825 Arnold Drive, Ste. 114 ▪ Martinez, California 94553 ▪ (415) 229-1512 / fax (415) 229-1526

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 83665
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: 3-4TER
Third Quarter

DATE RECEIVED: 08/08/91
DATE REPORTED: 08/15/91

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/L) Diesel Range
1	W3	ND<0.05
2	W4	0.130
3	W5	ND<0.05
4	W6	26

mg/L - parts per million (ppm)

Method Detection Limit for Diesel in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 200mg/L: RPD Gasoline = NA
RPD Diesel = 15
MS/MSD Average Recovery = 103/103%: Duplicate RPD = 0

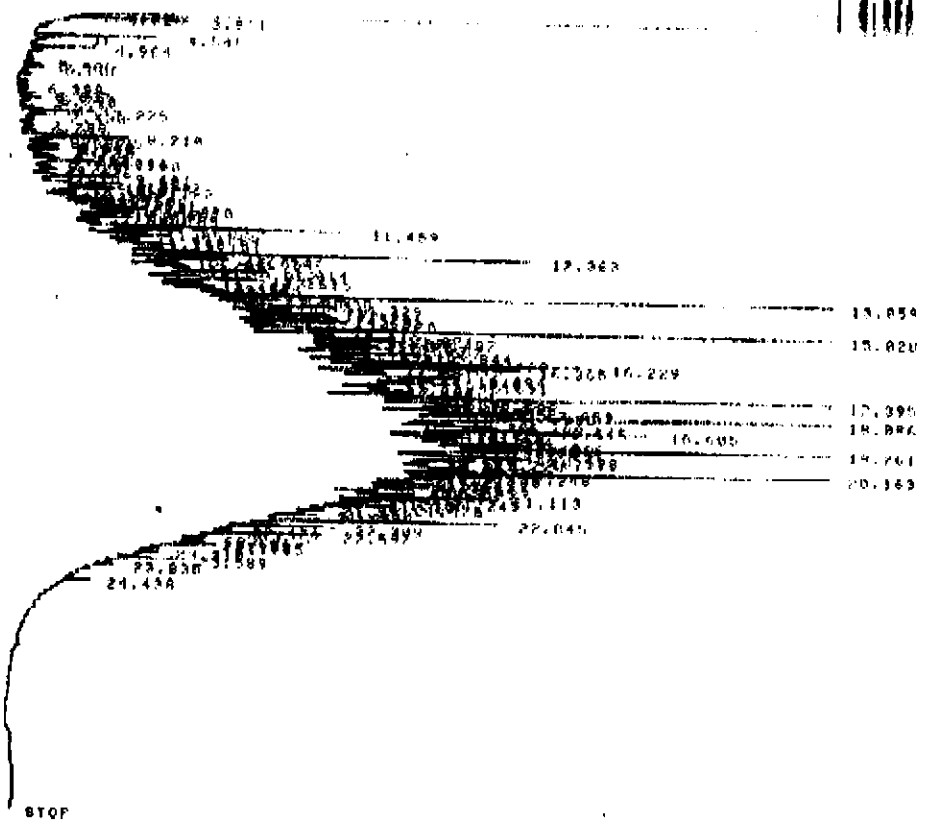
Richard Srna, Ph.D.

Laboratory Manager

Diesel chromatogram
W6

SUPELMICR ANALYTICAL
TOTAL PETROLEUM HYDROCARBON ANALYSES
AUG 14, 1991

Waiting for System Readiness
RUN # 3736 AUG 14, 1991 11:09:11
START



****

RUNNUM: 3736

BOTTLE #: 6

669-4 WOK

GASOLINE----------
RT
4.09 TO
10.5

AREA*UM = 19839.
CONCENTRATION 2.19581

MRP SUM----------
THIS IS DC 1
RT
5 TO
20

AREASUM = 324872.
CONCENTRATION 15.1207

DIESEL----------
RT
10.5 TO
24

AREASUM = 361992.
CONCENTRATION 26.4164

OK

26000 PPB

MULTIPLICATION FACTOR =
0.1328

Superior Precision Analytical, Inc.
825 Arnold Drive, Ste. 114 • Martinez, California 94553 • (415) 229-1512 / fax (415) 229-1526

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 83493
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: B10-791

DATE RECEIVED: 07/10/91
DATE REPORTED: 07/18/91

Bioremediation

ANALYSIS FOR TOTAL OIL AND GREASE
by Standard Method 5520F

LAB #	Sample Identification	Concentration (mg/Kg) Oil & Grease
1	COMP (71,72)	200
2	COMP (73,74)	82

mg/Kg - parts per million (ppm)

Method Detection Limit for Oil and Grease in Soil: 50mg/Kg

QAQC Summary: Duplicate RPD : 12
MS/MSD average recovery 76%

Richard Srna, Ph.D.
Laboratory DIrector

Superior Precision Analytical, Inc.
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C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 83493
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: B10-791
Bioremediation

DATE RECEIVED: 07/10/91
DATE REPORTED: 07/18/91

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/Kg) Diesel Range
1	COMP (71,72)	70
2	COMP (73,74)	42

mg/Kg - parts per million (ppm)

Method Detection Limit for Diesel in Soil: 10 mg/Kg

Type of Integration used in Calculating Concentrations of Samples was the IS-HB Method.

QAQC Summary:

Daily Standard run at 200mg/L: RPD Diesel = 0
MS/MSD Average Recovery = 88%: Duplicate RPD = 5

Richard Srna, Ph.D.
Laboratory Manager

Lab No. 83633

CHAIN OF CUSTODY AND ANALYSIS REQUEST

MACKINNON ENVIRONMENTAL CONSULTING

WALNUT CREEK, CA

415-930-9272

PROJECT MANAGER Cinda MacKinnon _ LABORATORY DESTINATION Superior

PROJECT NO. RWE-891 SAMPLER'S NAME Cinda

Sample ID	Matrix Soil/ Water	TPH Diesel Low/ High	TPH Gas+BTXE	Oil & Grease	8010 Halogen-ated	Metals (Zn,Cr, Cd,Pb)	Others	Date Collected	Containers	NOTES
RW1	water	↓						8-2-91	amber	sheen on stagnant
TANK	↓	↓						~1630	↓	water ∴ probably
										[moderate] level.

Relinquished by Mark Organization MEC	Date/Time	Received by Organization	NOTES Custom Alloy Project (pumping/development RWs)
Relinquished by Rick Cayon Organization Express It	Date/Time 8/5 1025	Received by Organization	

Lab.Analysis/Custody

Superior Precision Analytical, Inc.
825 Arnold Drive, Ste. 114 • Martinez, California 94553 • (415) 229-1512 / fax (415) 229-1526

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 83653 — DATE RECEIVED: 08/05/91
CLIENT: Mackinnon Environmental — DATE REPORTED: 08/08/91
CLIENT JOB NO.: RWE-891

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/L) Diesel Range
1	RW1	2.1
2	TANK	0.96

mg/L - parts per million (ppm)

Method Detection Limit for Diesel in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 200mg/L: RPD Gasoline = NA
RPD Diesel = 14
MS/MSD Average Recovery = 140/128%: Duplicate RPD = 9

Richard Srna, Ph.D.
Laboratory Manager (for)

Lab No. 83665

CHAIN OF CUSTODY AND ANALYSIS REQUEST

MACKINNON ENVIRONMENTAL CONSULTING

WALNUT CREEK, CA

415-930-9272

PROJECT MANAGER Cinda MacKinnon

LABORATORY DESTINATION Superior

PROJECT NO. 3-4TER

SAMPLER'S NAME Cinda

Sample ID	Matrix ~~Soil~~/ Water	TPH Diesel Low/ ~~High~~	TPH ~~Gas~~/BTXE	Oil & Grease	8010 Halogenated	Metals (Zn, Cr, Cd, Pb)	Others	Date Collected	Containers Glass	NOTES
W3	↓	↓	↓	Also TPH-gasoline (W6 only)			BTEX	8-7-91	3 ambers	sl. cloudy, sl. odor
W4									1 ambers	sl. cloudy
W5									2 VOAs	W5 "clean",
W6										sheen, odor
		4 ambers	8 VOAs						12	

Relinquished by MEC C MacKinnon	Date/Time 9:06 8-8-91	Received by Paul Stanford	NOTES Quarterly Sampling Jan 8-14
Relinquished by J. Stanford	Date/Time 8/8/91 0911	Received by Peter Mott Superior MT	
Organization Express-it		Organization Express-it	

Lab.Analysis/Custody