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SUPPLEMENTARY SUBSURFACE INVESTIGATION

FORMER SERVISCO FACILITY
OAKLAND, CALIFORNIA

July 90

FOR

2nd Copy

ARATEX SERVICES, INC.
SCHAUMBURG, ILLINOIS

PREPARED BY

RMT, INC.

JULY 1990

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Engineering and Environmental Management Services

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EXECUTIVE SUMMARY

1. Subsurface conditions are typical of the near surface alluvial deposits in the East Bay; ground water was encountered at approximately 15 foot depth.
2. In the area of the former 7,000 gallon tank, the southward extent of previously affected soils appears to be limited to no further than about 30 feet south of location MW-A2 and this at concentrations that are at or below guiding action levels for soils.
3. Hydrocarbons analyses results on the soil samples from MW-4 indicate that this area has been affected by gasoline-type product; concentrations of compounds in samples from borings MW-5 and MW-6 are considered to be below RWQCB-recommended action levels for soils.
4. Ground water flow direction is southwest at a gradient of about 1%.
5. Floating product was detected in ground water monitoring well MW-4.
6. Dissolved hydrocarbon constituents were not detected in the ground water samples from the monitoring wells MW-5 and MW-6.
7. *The latest quarterly ground water monitoring results for wells MW-A1 through MW-A3 continue* the trend for decreasing concentrations in general and with only TPH-G and benzene concentrations in wells MW-A1 and MW-A2, exceeding DOHS's drinking water action levels.
8. The compounds detected in MW-A1 and MW-A2 do not appear to be associated with the free product in MW-4.

1. INTRODUCTION

This report describes the supplementary subsurface investigation (SSI) of Aratex's former laundry facility in north-central Oakland. This investigation was required by Alameda County Health Care Services Agency (AC-HCSA), which is the local enforcement agency governing underground storage tanks and their effect(s) on ground water. The AC-HCSA appraises the San Francisco office of the Regional Water Quality Control Board (RWQCB) of site activities. AC-HCSA's reasons for requesting the SSI are detailed in their letter dated 17 August 1989 (Appendix A).

RMT,Inc (RMT) was retained by Aratex Services, Inc of Schaumburg, Illinois (ARATEX) to complete the supplementary subsurface investigation required by the August 1989 letter. RMT has also been performing the quarterly ground water monitoring of the three existing site wells requested in AC-HCSA's letter of May 8, 1989 (Appendix A). The quarterly ground water monitoring has been on going for the past year. The latest ground water monitoring report is included in Appendix B for reference.

1.1 Historical Background

Servisco previously operated from the leased facility at 958-28th Street in Oakland, California (Figure 1). ARATEX acquired Servisco in 1986. Industrial laundering and vehicle maintenance operations continued at this facility until it was vacated in 1988. As part of ARATEX vacating the leased site, three underground storage tanks (UST) were closed permanently by removal. Permanent closure of the two gasoline and one diesel fuel tanks is documented in the International Technology Corporation (IT Corp.) report dated July 5, 1988. Additional site data is included in the Ground Water Monitoring Well Installation report (IT Corp.; March 29, 1989). Closure of the tanks was observed by Mary Joe Mier of the Alameda County Health, Department of Hazardous Materials Division.

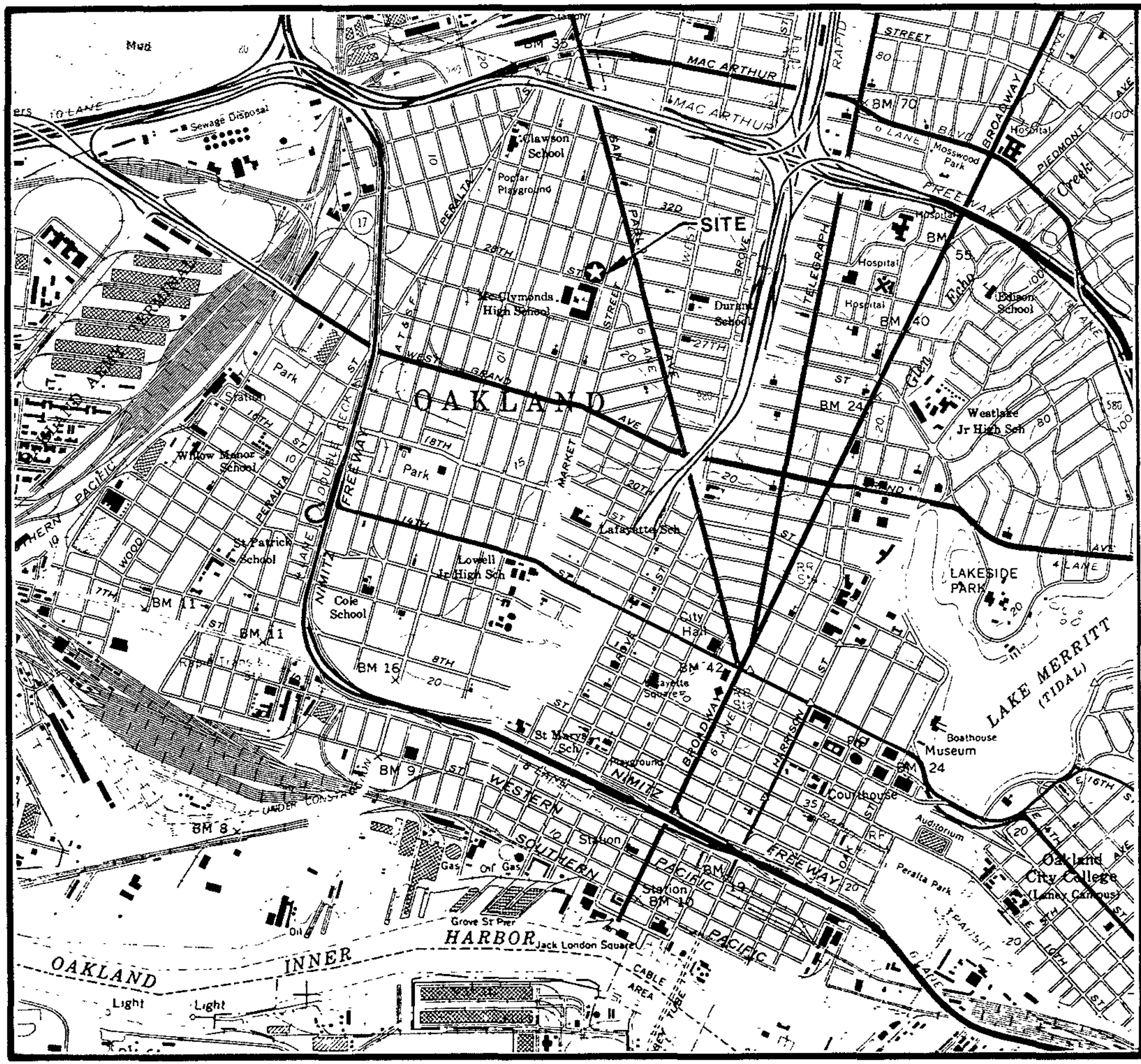
Figure 2 depicts the approximate locations of the removed tanks. Table 1 summarizes the results of subgrade soil sampling performed during tank closure. The soil samples were obtained from the natural soils underlying the tanks following tank removal. Additional tank closure data obtained from the tank closure and post-closure reports (IT Corp., July 1988 and IT Corp., March 1989) are summarized below.

500 Gallon Fuel Oil (#2 Diesel) Tank

Two subgrade samples were tested for high boiling point hydrocarbons (diesel range or TPH-D), TPH-G, and BTX&E. Only "98 ppm" of TPH-D was detected in the one sample obtained from the east end of the tank excavation. The excavation in that area was extended down to about 15 feet and approximately 5 to 7 yards of soil removed. Following review of the tank closure data, the AC-HCSA required testing of a sample from two feet beneath the overexcavation (IT Corp.; March 29, 1989). A confirmation sample was obtained from a depth of 16.5 feet to 17.0 feet and analyzed for TPH-D and BTX&E. Only benzene was detected in the confirmation sample. The benzene concentration was 0.08 ppm. No further action was required by AC-HCSA for this area.

North - 1000 Gallon Gasoline Tank

A sample of the soil subgrade was obtained from each end of the tank during the initial tank removal. Both samples were tested for low boiling point hydrocarbons (gasoline range or TPH-G) and benzene, toluene, xylenes, and ethyl benzene (BTX&E). None were detected in either sample. No additional investigation of this area was required by AC-HCSA following their review of the closure documentation.



QUADRANGLE LOCATION

FIGURE 1

SITE VICINITY MAP OF FORMER SERVISCO SITE OAKLAND, CA FOR ARATEX SERVICES, INC. SCHAUMBERG, IL

SOURCE: USGS OAKLAND WEST QUADRANGLE MAP, 7.5 MIN. SERIES.

NORTH

SCALE: 1"=2000'

RMT INC

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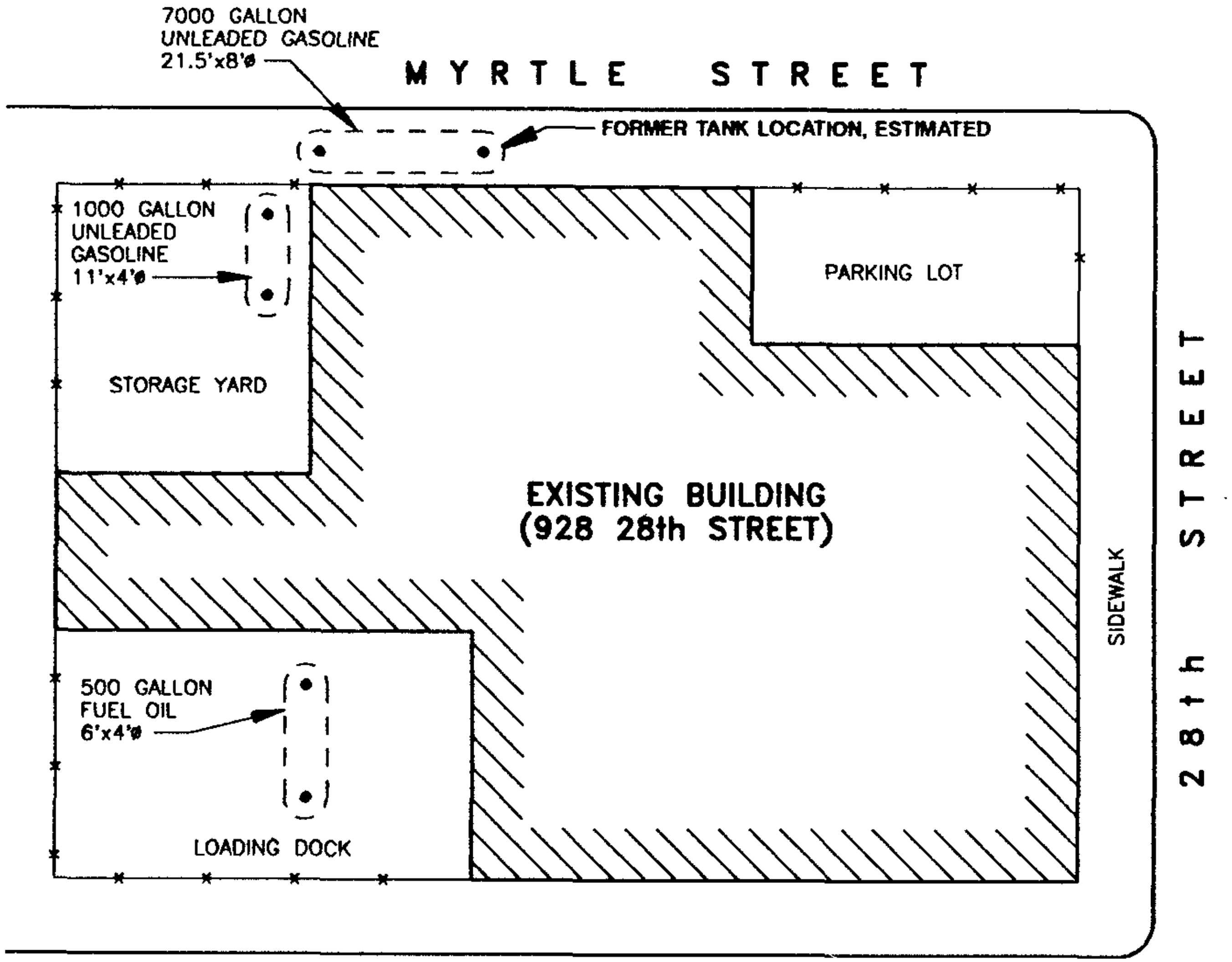

NOT TO SCALE

NOTES:
1. Reproduced from IT Corp. report dated March 29, 1990 and titled "Ground Water Monitoring Well Installation".

2. Depths to tank inverts or amount of soil cover not indicated.

3. Tanks were removed on May 19, 1988 by IT Corp.

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FILE # 1660502

FIGURE 2

TABLE 1

TANK CLOSURE[1]

SUBGRADE SOIL SAMPLES HYDROCARBON ANALYSES[2]

Sample No.	Sample Location and Description	Low Boiling Hydrocarbons	High Boiling Hydrocarbons	Benzene	Toluene	Ethyl Benzene and Xylenes
SB-05-201-05	West End of 500 Gallon Fuel Oil Tank	N.A.	None Detected	N.A.	N.A.	N.A.
SB-05-201-06	East End of 500 Gallon Fuel Oil Tank	N.A.	98 PPM	N.A.	N.A.	N.A.
SB-05-201-01	West End of 1,000 Gallon Tank	N.D.	N.A.	None Detected	None Detected	None Detected
SB-05-201-02	East End of 1,000 Gallon Tank	None Detected	N.A.	None Detected	None Detected	None Detected
SB-05-201-03	South End of 7,000 Gallon Tank	None Detected	N.A.	0.10 PPM	None Detected	None Detected
SB-05-201-04	North End of 7,000 Gallon Tank	None Detected	N A.	0.28 PPM	None Detected	None Detected
SB-05-274-01	South Wall of 7,000 Gallon Excavation	90 PPM	N.A.	0.76 PPM	4.1 PPM	12.0 PPM
SB-05-275-02	North Wall of 7,000 Gallon Excavation	None Detected	N.A.	None Detected	None Detected	None Detected
SB-05-274-03	West Wall of 7,000 Gallon Excavation	530 PPM	N.A.	4.8 PPM	21.0 PPM	53.0 PPM
SB-05-274-04	East Wall of 7,000 Gallon Excavation	5 PPM	N.A.	1.7 PPM	None Detected	None Detected

---

NOTES:

1. Excerpted from Underground Storage Tank Permanent Closure Report by IT Corp. dated July 5, 1988.
2. See Figure 2 for approximate tank locations.
3. Sampling depths not indicated.
4. N.D. = not detected.
5. N.A. = not analyzed.

East - 7000 Gallon Gasoline Tank

Two subgrade samples were taken from each end of the tank and one from each of the tank sidewalls. As shown on Table 1, TPH-G or BTX&E compounds were detected in each of the six samples. The excavation was extended down to 14 feet and an estimated 30 to 40 cubic yards of "contaminated soil" removed. The excavation was backfilled with imported pea gravel. The AC-HCSA required additional investigation of this area to determine if any contaminants remained in the surrounding soil and if ground water had been affected (IT Corp.; March 29, 1989). Three additional borings were drilled in the immediate area of the tank and completed as ground water monitoring wells. Both soil and ground water sample were analyzed for TPH-G and BTX&E.

Detailed descriptions and results of the post-closure investigation are presented in the March 29, 1989 report by IT Corp. Both TPH-G and BTX&E were detected in the soil samples from all three borings. BTX&E at concentrations greater than published action levels were also detected in the ground water samples. As a result of those findings and at the request of AC-HCSA, the three ground water wells have been monitored quarterly for the past year. The latest ground water monitoring report is included in Appendix B.

1.2 Purpose and Scope

This supplementary investigation is in response to the AC-HCSA letter of *August 17, 1989* (Appendix A). The purposes of the SSI is to assess (1) the extent of the affected soils around the East tank's former location, (2) the lateral extent of affected ground water (plume), and (3) a better definition of the ground water gradient. These three primary objectives were achieved by drilling and sampling at six locations in the general area of the tank's former location. Three of these new borings were completed as ground water monitoring wells. The other three borings were terminated at ground water and grouted at completion. The drilling, sampling, laboratory analyses, and interpretation of the results are presented in the balance of this report.

2. SITE LOCATION AND SETTING

2.1 Geology

The former Servisco site is in western Alameda County, Oakland, California; its street address is 958 28th *Street, Oakland, California. Generally, the site area is an older section of the city and zoned for mixed* use. Small commercial and industrial facilities are interspersed throughout the area, which is predominantly residential. There is a public school on the south side of 28th Street. There is a meat packing facility, which doesn't appear to be operational, on the east side of Myrtle Street. Site elevation is estimated to be about 20 feet above mean sea level from the U.S.G.S. Oakland West Quadrangle (7.5 minute series). Topography of the site and vicinity grades toward San Francisco Bay at approximately 0.5%.

Local geology is described in the U.S.G.S. report Areal and Engineering Geology Of The Oakland West Quadrangle, California by Dorothy H. Radbruch (Map I-239). The site area is mapped as Pleistocene-aged Temascal Formation. The formation is characterized as "interfingering layers of moderate yellowish-brown clayey gravel, sandy silty, clay, and various clay-silt-sand mixtures." A gravel layer is at the base where the formation is exposed. Further, "In some places the gravel grades upward into sand and then clay within a few feet...several similar sequences of gravel grading upward into clay may overlie the first sequence." The various layers are characterized as irregularly shaped, discontinuous, and interfingered. The surficial 2 to 4 feet are typically, dark clayey soil. The Temascal formation is estimated to be about 5 feet thick along the bank of the Bay and up to 25 feet thick at its eastern boundary along Temascal Creek.

The underlying Alameda Formation is several hundred feet thick and sedimentary in origin. Its lithology is described in the above reference:

> "Upper exposed part is clay, sandy, silty, with few pebbles...Olive gray to moderate-yellowish. Consolidation increases with depth, except that the upper portion has been preconsolidated...in places an old soil is exposed at the top of the formation. Overlain by Temascal formation, Merrit sand, or bay mud."

Hickenbottom and Muir (June, 1988) located the site in an area that has been mapped as Quartenary aged Older Alluvium of the Pleistocene Epoch. These deposits are characterized as "layers of poorly consolidated to unconsolidated clay, silt, sand and gravel."

2.3 Hydrogeology

The site is located in the East Bay Plain Area of Alameda County. Ground water within the East Bay Plain is not used for domestic water supply and occurs under both confined and unconfined conditions. Recharge to the reservoir occurs as infiltration from rain and stream and subsurface inflow from adjacent areas. Hickenbottom and Muir (June 1988) indicate the land use for the site area as being commercial with nearby areas being residential. Furthermore, the frequency of ground water wells in this area is less than five per square mile. They identified less than a dozen ground water wells within a mile radius of the site. Additionally, their study noted a fuel leak site at the intersection of San Pablo Avenue with Interstate 580, which is several blocks north [and upgradient] of the former Servisco site.

Based on the logs developed from drilling and sampling at the site, lithology of the site appears to be more consistent with Radbruch's geologic description for the Temascal Formation. The mapping corresponds to Hickenbottom and Muir's Merrit Sand. The Merrit Sand is not considered a primary source of ground water (Hickenbottom and Muir, June 1988).

3. FIELD INVESTIGATION

Drilling, soil sampling, monitoring, well construction, ground water sampling, and environmental protocols followed the procedures outlined in RMT's project proposal, which was submitted to AC-HCSA prior to initiating the supplementary investigation. Field work for this SSI was performed under the direction of a California-registered Civil Engineer. Field work and related activities are discussed below. Monitoring well and ground water related activities are discussed in Section 4. Appendix C is the Health and Safety Plan prepared for RMT's work on site work. Field and laboratory analyses are discussed in Section 5.

3.1 Locations

Monitoring wells MW-A1 through MW-A3 are, as shown on Figure 3, located within 50 feet of the subject area (former location of the 7,000 gallon tank). Based on the ground water gradient calculated during previous quarterly ground water monitoring of the three existing wells, the three new wells were located as follows:

- MW-4 directly upgradient to subject area,
- MW-5 directly downgradient to subject area, and
- MW-6 off-gradient to the subject area.

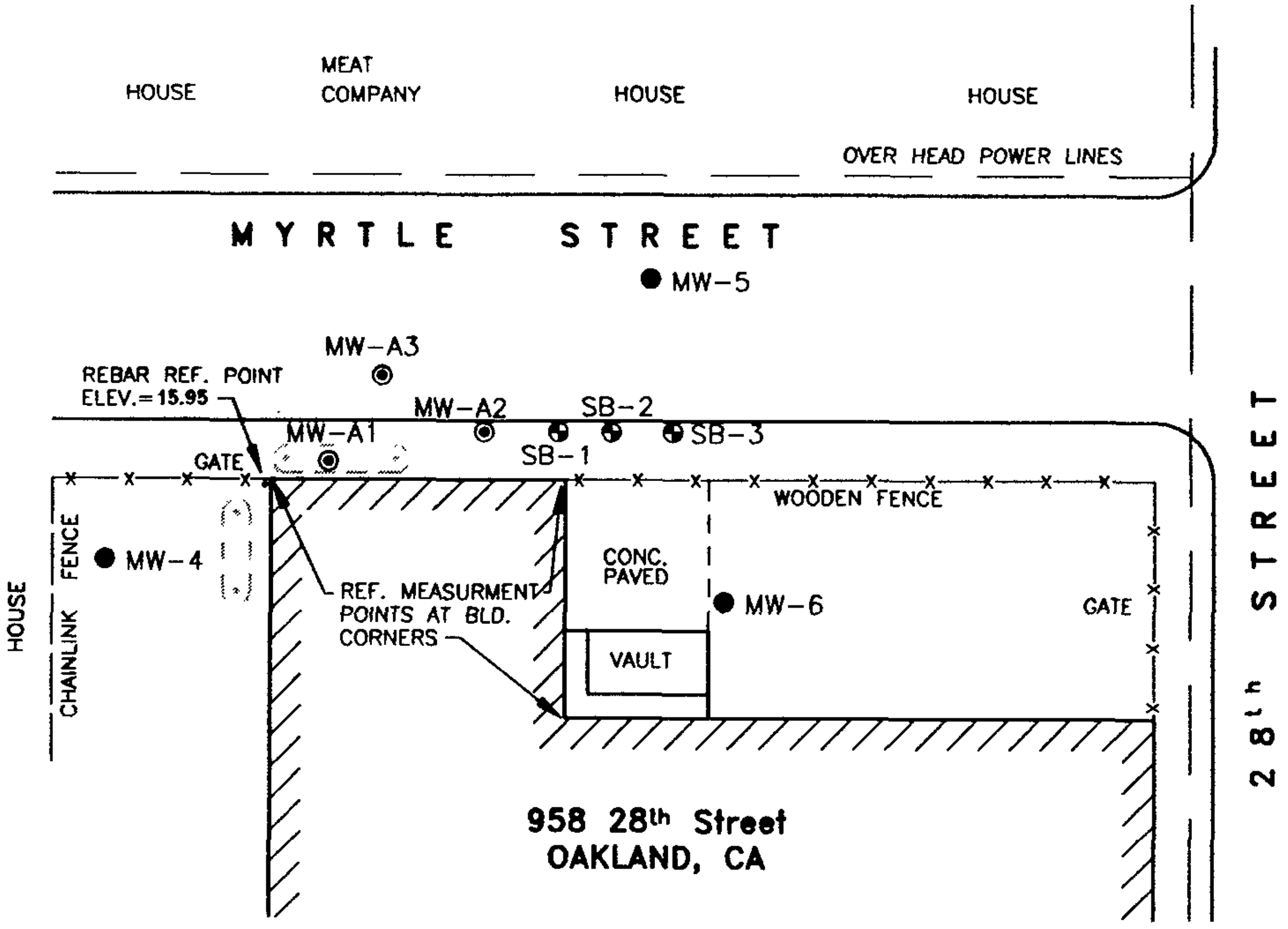
All six ground water monitoring wells and the three soil borings were located in the field relative to existing site features. Horizontal location was by tape measurements off existing structural features. Top of well casings (TOC) elevations were determined by differential leveling with an automatic level. TOC elevations were based on an arbitrary site datum of about 15 feet established during earlier investigation. The site datum was first determined from the three previously existing wells. Then it was carried through to determine the TOC elevations for the three new wells. An on-site reference which is noted on Figure 3 was established for future use. All TOC measurement points were marked for future ground water measurements.

3.2 Drilling

Drilling began on March 5,1990 and was completed the following day. Subsurface conditions in the area around the East tank's former location were investigated by six borings. Boring locations, including existing ground water monitoring wells, are depicted on Figure 3. Drilling was by truck-mounted, hollow stem auger; soils sampling and well construction was through the auger string. Field equipment inspection and decontamination procedures are described in Appendix D.

3.2.1 Vadose Zone Borings

Three shallow (vadose zone) soil borings were drilled south of the known contaminated area to determine the southward extent of the affected area. These borings, SB-1 through SB-3 on Figure 3, were located south of MW-A2 at approximately 10 foot increments. All three were completed at a depth of about 15 feet and backfilled with grout at completion. Completion depths were based on the depth to ground water estimates from the three nearby site wells and field observations made during borings advancement. Although only borings SB-1 and SB-2 were planned originally, a third boring was added in the field. Boring SB-3 was drilled, based on the field monitoring readings recorded for soil samples from SB-1 and SB-2 and a review of this data with ARATEX.



Legend:

◉ Ground water monitoring wells installed by IT corp. February 1989.

● Ground water monitoring wells installed by RMT; March 1990.

⊕ Soil borings installed by RMT, March 1990.

[14.40] Top of well casing elevation

NOTES:

1. Well and soil boring plan locations determined by precission tape measure relative to fixed site points.
2. Top of casing elevations based on survey relative to reference site elevation. **See Table**

Scale: 1" = 30'

Site Investigation Plan
Former Servisco Facility

RMT INC.

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FIGURE 3

3.2.2 Ground Water Monitoring Wells

Borings MW-4 through MW-6 extended down to approximately 30-foot depth and were completed as ground water monitoring wells. Completion depths were based on the depth at which ground water was encountered and obtaining a wetted-screen length of at least 10 feet.

3.3 Sampling

All six boring were sampled at not less than 5-foot intervals during advancement. The purposes of the sampling were: (1) soil classification and lithologic interpretation, (2) testing materials for filter pack and well design, (3) field monitoring, and (4) laboratory hydrocarbon analyses. Typically, samples were obtained through the stem of the augers by Modified California split spoon sampler. A "Standard" split sampler was used at intervals where only lithologic samples were desired. Over each 18-inch sampling interval, the sampler was driven by a 140-pound hammer [tube-type] falling approximately 30 inches; the hammer was actuated via rope operated cat head. Sampling equipment decontamination procedures are described in Appendix D.

Three, 6-inch long brass liners were used with both samplers to obtain compositionally "undisturbed" samples. Of the three liners within the sampler barrel, the uppermost is referred to as #1 and the bottom-most [closest to the "shoe"] as #3. Distinction between the various 6-inch increments is important where a strata break was encountered and or sample recoveries were less than the drive distance. Generally, sample #1 and the soil within the "shoe" were used for classification purposes, sample #2 was used for field monitoring, and sample #3 preserved for laboratory hydrocarbons analyses.

3.3.1 Soil Classification/Lithology

Typically, a representative lithology sample was retained from each sampling interval (#1 or "shoe"). Samples were retained in a clear container for future evaluation and review. RMT's field engineer logged the recovered soils according to the Unified Soil Classification System (USCS). All the retained lithologic samples were reviewed by RMT's geotechnical engineer and field descriptions modified where appropriate. Descriptions of the soils encountered, sampling intervals, sample recoveries, penetration resistance measurements, monitoring measurements, and general drilling observations are presented on the Geologic Logs contained in Appendix E.

3.3.2 Chemical Analyses

The bottom-most and full sample liner [typically #3 or #2] was preserved for laboratory hydrocarbons analyses. Both ends of the soil filled liner were trimmed flush, covered with aluminum foil, capped with tightly-fitting [plastic] end caps, and then sealed with either electric or duct tape. After labeling, the samples were individually sealed in zip lock bags and packed in an ice-filled cooler (sample shuttle). All retained samples destined for laboratory testing were logged onto Chain of Custody forms and delivered to the laboratory by courier.

3.3.3 Field Monitoring

Field monitoring for volatile organic compound (VOC) emissions was performed on a representative sample from each sampling interval. Generally, sample #2 was used for field monitoring purposes. In no instance was the laboratory sample used for field VOC monitoring. The sample was prepared by first sealing the bottom of the liner as noted above, creating an approximately 1/2-inch cavity in the soils at the other end, covering with aluminum foil, securing the foil with tape, and allowing time for equilibration. Field monitoring results are discussed in Section 5.1.

An HNU Systems, Inc., Model PI-101 Photo Ionization Detector (PID) was used for the VOC emissions monitoring. PID readings were used for field screening of the sampled intervals as a qualitative measure of hydrocarbon concentrations. Readings are noted on the Geologic Logs and are in parts per million *(ppm) relative to head space air volume. Recorded readings are the maximums for each sample* surveyed. The Model PI-101 was equipped with a 10 electron-volt lamp. At least 15 minutes was allowed for equilibration to occur in the sample headspace before making readings.

3.3.4 Well Design

Soil samples for well design were obtained from below-ground water sampling intervals. These samples were sealed in clear containers and retained for index properties testing by RMT's soils laboratory. Well design is discussed in Section 4.1.

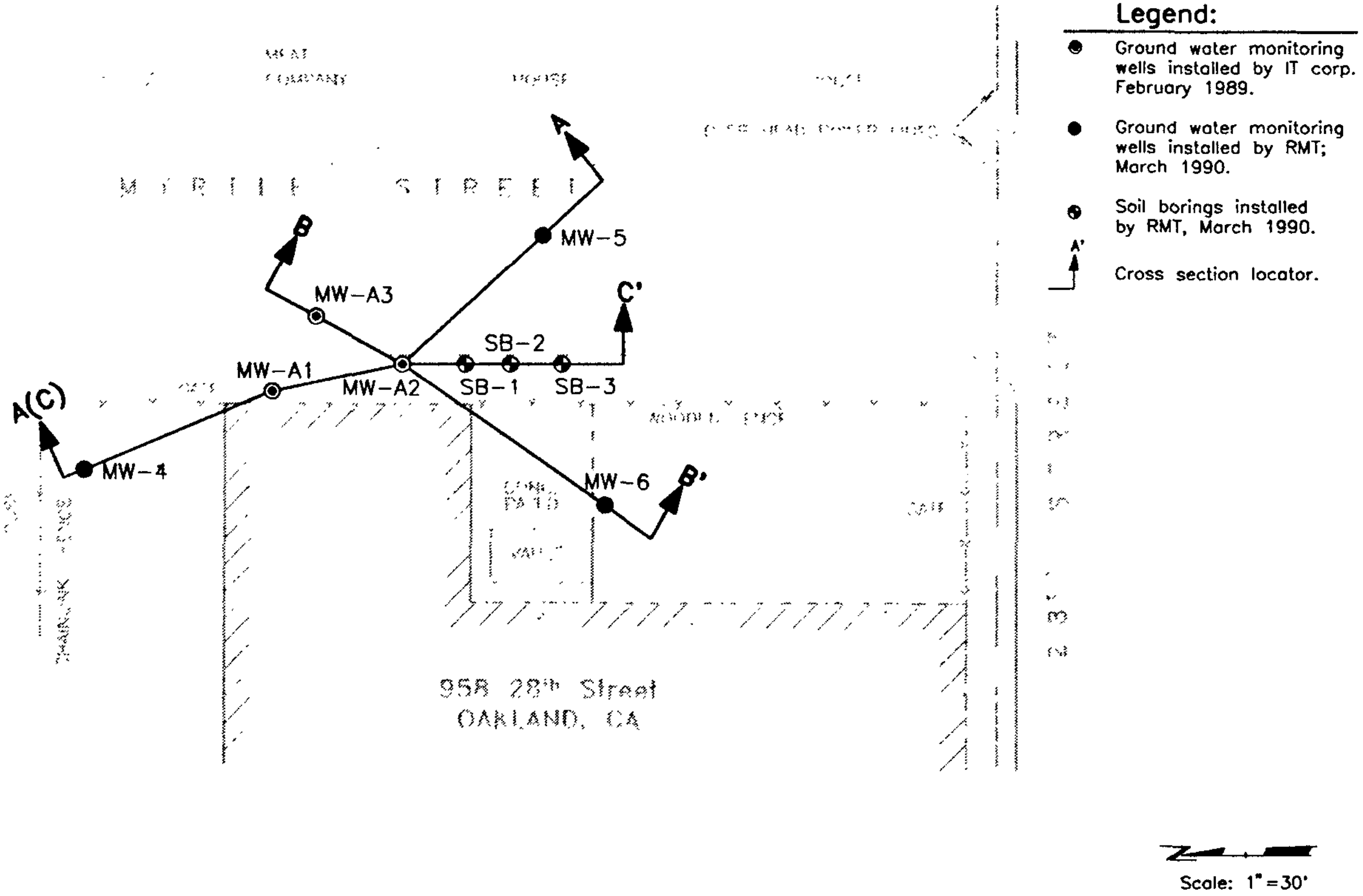
3.4 Subsurface Stratigraphy

Figures 5 through 7 depict subsurface conditions along the three sections indicated on Figure 4. The variation in stratigraphy evident on the three sections is attributed to the nature of alluvial deposition. Generally, fine-grained and cohesive soils overly one or more layers that grade coarser with depth. Projection of stratigraphy between the boring locations is left to the reader's interpretation.

3.5 Wastes Containment and Disposal

All drilling cuttings were drummed in U.S Department of Transportation approved drums (17H). Each drum was sealed and then labeled with date generated, location, depth interval, and wetted condition of the cuttings. The drums were stored in secured areas of the site pending analytical results for disposal.

The drummed [soil cuttings and ground water] wastes were removed from the site for recycling by Romic Chemical Corporation of East Palo Alto, California. The majority of drummed wastes were removed on April 30, 1990; drummed soil cuttings from MW-6 and previously generated sludge were removed from the south storage yard on May 16, 1990. All the drums were picked up by Romic and transported by them under manifest (Appendix F).



Cross Section Locator Map
Former Servisco Facility

RMT INC.

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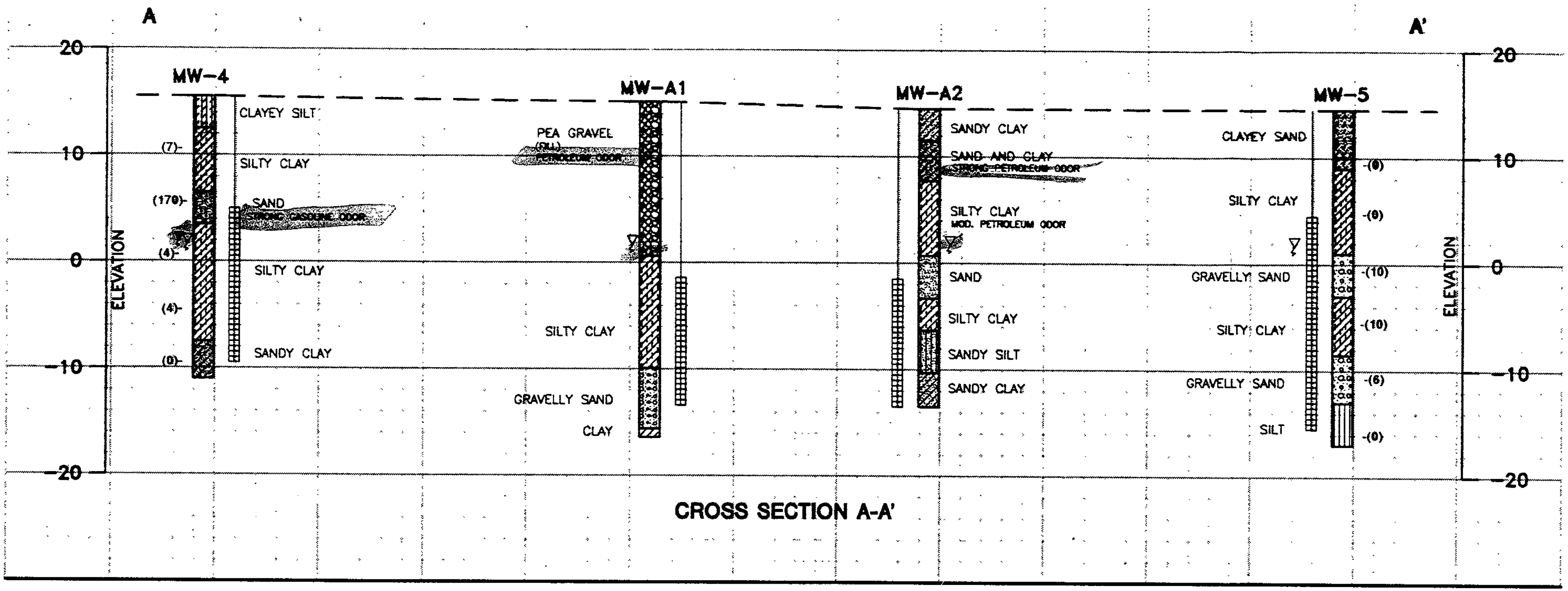
PROJ.# 1660.05
FILE # 16600503

FIGURE 4



CROSS SECTION A-A'

LEGEND

- ▼ FLOATING PRODUCT ELEVATION (WHERE DETECTED)
- ▽ GROUND WATER ELEVATION (MARCH 22, 1990)
- ▦ FILTER PACKED BORING INTERVAL, TOP SEAL NOT SHOWN
- ▥ SILT
- ▨ CLAY
- ▨ SILTY CLAY
- ▦ CLAYEY SILT
- ▦ SANDY SILT
- ░ SANDY GRAVEL
- ▩ GRAVEL
- ░ SAND
- ▨ SANDY CLAY
- (   ) P.I.D. Reading, ppm

NOTES:

1. Lithology for borings MW-A1 thru MW-A3 obtained from IT Corp., report dated March, 1989.
2. Ground water levels indicated measured on March 21, and March 22, 1990.
3. Odor noted where detected else omitted.
4. Elevations are relative to an arbitrary site datum which is within several feet of mean sea level.
5. Photoionization detector (PID) readings noted where applicable; HNU systems,inc., model PI-101 with 10 ev lamp used.

SCALE. 1"=10'

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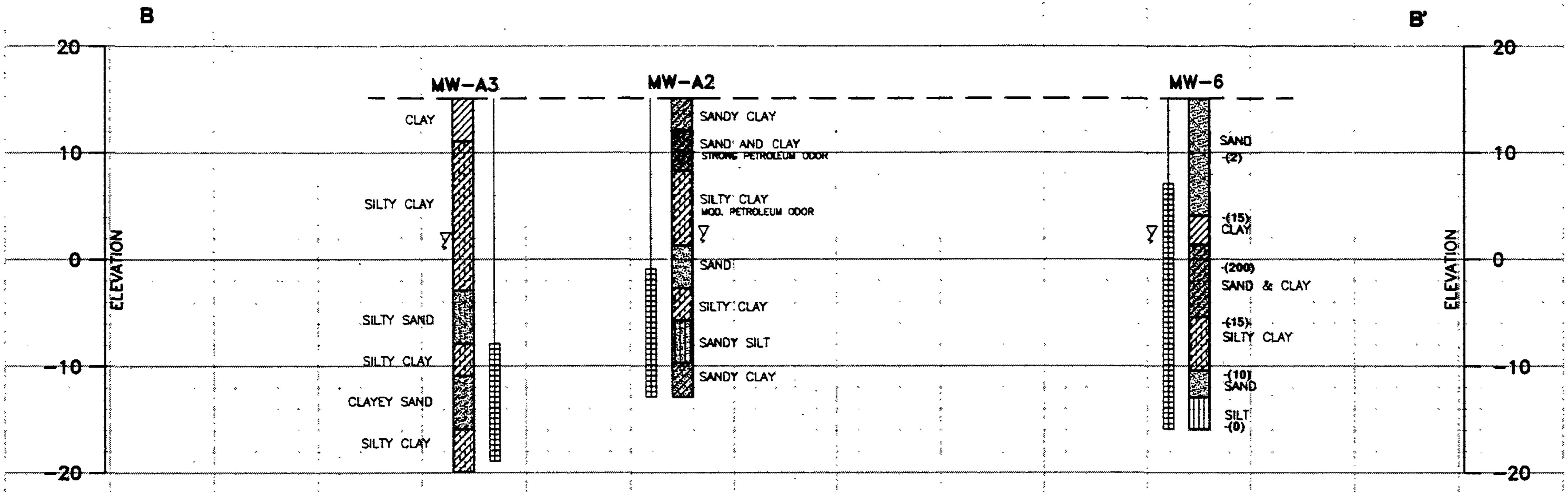
FILE # 1660506

FIGURE 5



CROSS SECTION B-B'

LEGEND

- FLOATING PRODUCT ELEVATION (WHERE DETECTED)
- ∇ GROUND WATER ELEVATION (MARCH 22, 1990)
- ▦ FILTER PACKED BORING INTERVAL, TOP SEAL NOT SHOWN

▥	SILT	▒	SANDY GRAVEL
▨	CLAY	▩	GRAVEL
▨	SILTY CLAY	░	SAND
▦	CLAYEY SILT	▨	SANDY CLAY
▦	SANDY SILT	▒	SILTY SAND
		( )	**P.I.D. Reading, ppm**

NOTES:

1. Lithology for borings MW-A1 thru MW-A3 obtained from IT Corp., report dated March, 1989.
2. Ground water levels indicated measured on March 21, and March 22, 1990.
3. Odor noted where detected else omitted.
4. Elevations are relative to an arbitrary site datum which is within several feet of mean sea level.
5. **Photoionization detector (PID) readings noted where applicable; HNU systems, inc. model PI-101 with 10 ev lamp used.**

SCALE: 1" = 10'

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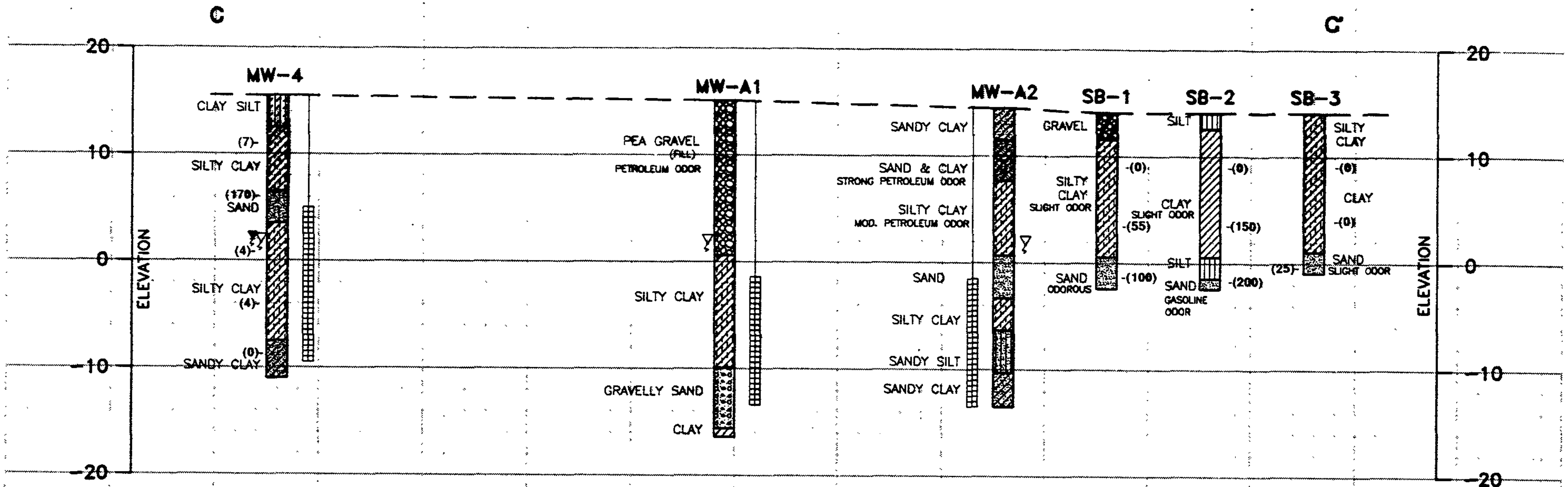
FILE #	16600507

FIGURE 6



CROSS SECTION C-C'

LEGEND

- FLOATING PRODUCT ELEVATION (WHERE DETECTED)
- ▽ GROUND WATER ELEVATION (MARCH 22, 1990)
- ▦ FILTER PACKED BORING INTERVAL, TOP SEAL NOT SHOWN
- ▥ SILT
- ▨ CLAY
- ▨ SILTY CLAY
- ▦ CLAYEY SILT
- ▦ SANDY SILT
- ▦ SANDY GRAVEL
- ▩ GRAVEL
- ░ SAND
- ▨ SANDY CLAY
- ( ) P.I.Q. Reading, ppm

NOTES:

1. Lithology for borings MW-A1 thru MW-A3 obtained from IT Corp., report dated March, 1989.
2. Ground water levels indicated measured on March 21, and March 22, 1990.
3. Odor noted where detected else omitted.
4. Elevations are relative to an arbitrary site datum which is within several feet of mean sea level.
5. **Photoionization detected (PID) readings noted where applicable; HNU systems, inc. model PI-101 ev lamp used.**

SCALE: 1" = 10'

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DATE	JUNE, 1990
PROJ.#	1660.05
FILE #	16600505

FIGURE 7

4. GROUND WATER MONITORING WELLS

The three approximately 30-foot deep borings were completed as ground water monitoring wells. The two primary reasons for these locations were: (1) evaluate the extent of the affected ground water plume attributed to the East tank's former location and (2) supplement existing site hydrogeologic data. Well completion/construction diagrams are included in Appendix G along with the well construction permits.

4.1 Well Design

The three ground water monitoring wells were designed as required by the RWQCB using current-practice procedures to minimize the infiltration of fines and maximize flow rates. A detailed description of filter pack and well screen sizing design, including laboratory particle size distributions, are presented in Appendix H. Because of the observed heterogeneity in subgrade soils over the proposed screened length, a "# 1C" monterey sand was used for the well screen filter pack. Table 2 summarizes the filter pack and well screen sizes for all six site wells.

4.2 Well Construction

The wells were constructed by the drilling subcontractor, through the hollow stem augers. After centering the assembled well casing, the annular space was filled with the materials indicated on the Well Construction diagrams of Appendix G. Construction proceeded in small increments to prevent binding of the backfill materials with the well casing during auger extraction. Monitoring well construction was observed by RMT's engineer.

Monitoring wells MW-5 and MW-6 were constructed with a 20-foot wetted screen length; MW-4 was constructed with a 15-foot wetted screen length. Screened intervals extend from 5 feet above the prevailing static water level to at least 10 feet below. Static water levels were based on depth measurements made in the open boreholes just prior to well construction. Table 2 summarizes well construction details for all six on site wells.

Well MW-4 was constructed of 2-inch diameter (nominal), schedule 40, PVC screen and casing. Wells MW-5 and MW-6 were also constructed from Schedule 40, PVC but using 4-inch diameter stock. All connections were threaded; no glues or other foreign fasteners were used in assembling the wells. The well diagrams in Appendix G summarize all pertinent well construction measurements, material types, and well development data.

The well screen sections were packed with "# 1C" sand to 2 feet above the top of screen. The filter pack was overlain with 2 feet of bentonite pellets. The bentonite was hydrated before proceeding with the remainder of the seal. The annular space was sealed to within 6 inches of the ground surface with neat cement grout. The wells were finished by installation of a traffic-rated, well cover set into concrete. Well covers were raised about 1/4-inch from the surrounding grade to minimize surface water ponding. Locking, expansion plug-type casing covers were installed in the casing to control access.

4.3 Well Development

Monitoring wells MW-4 through MW-6 were developed on March 6, 1990, which was approximately 24 hours after the completion of well construction. Depths to ground water were measured before the start of development. Development was by the drilling contractor under the direction of RMT's engineer. Four-

TABLE 2

MONITORING WELLS CONSTRUCTION SUMMARY

SUPPLEMENTARY SUBSURFACE INVESTIGATION

958-28TH STREET; OAKLAND, CALIFORNIA

	MW-A1	MW-A2	MW-A3	MW-4	MW-5	MW-6
CNSTR BY:	IT Corp.	IT Corp.	IT Corp.	RMT	RMT	RMT
DATE:	2-17-89	2-17-89	2-17-89	3-05-90	3-06-90	3-05-90
WELL DIA:	4-inch	4-inch	4-inch	2-inch	4-inch	4-inch
FILTER:	#3 Sand	#3 Sand	#3 Sand	#1C Sand	#1C Sand	#1C Sand
From	16-ft	16.5-ft	23.5-ft	8-ft	8-ft	8-ft
To	28-ft	28-ft	34.5-ft	25-ft	30-ft	30-ft
SCREEN:	0.02-inch	0.02-inch	0.02-inch	0.01-inch	0.01-inch	0.01-inch
From	16.5-ft	18-ft	24.5-ft	10-ft	10-ft	10-ft
To	26.5-ft	28-ft	34.5-ft	25-ft	30-ft	30-ft
T.O.C.:	15.03 ft	14.40 ft	14.48 ft	15.65 ft	14.40 ft	14.46 ft

---

NOTES:

1. International Technology Corporation: March 29, 1989; Ground Water Monitoring Well Installation [958-28th Street; Oakland, California]; by John P. McGuire.
2. Details of well construction for wells installed by IT Corp. obtained from Boring Logs included in above 1.
3. Well top of casing (T.O.C.) surveyed by RMT on March 21, 1990. Reference datum established bolt at northeast building corner having reference elevation 15.95 feet.

inch wells MW-5 and MW-6 were developed by bailing with the drill rig; 2-inch well MW-4 was bailed by hand. Development waters were drummed, labeled, and stored as described previously for the drill cuttings. Surge blocks and bailers were steam cleaned before each use.

The screened intervals of each well were surged by swabbing in overlapping 2- to 3-foot increments. This was done to 'set the filter pack and facilitate development of the natural filter zone along the filter pack. After surging, the wells were bailed with a suitably-sized, PVC bailer. Bailed waters were monitored for changes in coloration or noticeable odors. Bailed volumes were estimated from the height to which the 55-gallon containment drums were filled or number of 5-gallon buckets that were filled. Well development was terminated when it was judged that no discernible change in the turbidity was being achieved.

Approximately 110 gallons were bailed from each of the 4-inch wells [MW-5 and MW-6]; no appreciable drawdown was observed nor was there any odor noted during development. Approximately 35 gallons was bailed from 2-inch well MW-4; this well would drawdown about 5 feet after several gallons were bailed. *Because of the drawdown, MW-4 couldn't be bailed continuously and periodically required about 15* minutes for recovery. Although a strong organic odor was noted throughout its bailing, no free product was observed during development.

4.4 Ground Water Sampling

Monitoring wells MW-4 through MW-6 were sampled on March 22, 1990. Wells MW-A1 through MW-A3 were sampled [as part of the quarterly monitoring] on March 21, 1990. Purge waters were drummed, labeled, and sealed as described previously. Purge equipment and sampling bailer were decontaminated before each use and at the completion of the days work as described in Appendix D. Samples were collected in accordance with RWQCB guidelines.

4.4.1 Pre-sampling Purging

The two, 4-inch [nominal] wells were purged of about 55 gallons prior to sampling. Monitoring well MW-4 [nominal 2-inch diameter] was purged of 25 gallons before sampling. Pre-sampling purging was done manually by either 3.5-inch or 1.5-inch diameter, PVC bailer. Purge volumes were measured in a 5 gallon bucket that was emptied into an appropriately labeled 55 gallon, DOT-approved drum. As a minimum, *each 5 gallons of purge water was monitored for temperature, specific conductance, and Ph using a* Yellowline digital meter. The turbidity of the purge water was monitored for discernible changes. The wells were judged to be sufficiently purged when the following conditions were achieved:

1. At least three casing volumes and one filter pack volume of water were evacuated. [A void ratio of 0.5 was assumed for the filter pack.]

2. Monitored parameters show less than 10% deviation between three successive readings. [Readings taken at least once every 5 gallons for 4-inch wells and about 3 gallons for the 2-inch well.]

3. Appearance of purge water judged to be stabilized.

4.4.2 Sampling

Ground water samples were obtained using a 4-foot long and 1.5-inch diameter bottom filling, teflon bailer. The bailer was decontaminated before each use. A clean nylon rope was used to slowly lower the 4-foot long bailer three to five feet below the standing water level. After extraction from the well, a stop cock was inserted into the bottom of the bailer to prevent aeration of the sample during sample bottle filling.

The ground water monitoring wells were purged and sampled in the order indicated on the Chain of Custody forms. Generally, sampling progressed from the least to greatest known hydrocarbon concentrations. For the three existing wells the order was MW-A3 first, then MW-A2, and MW-A1 finally. The three new ground water monitoring wells were sampled in a like sequence starting with wells MW-5 and MW-6 and finishing off with MW-4.

Sampling consisted of filling at least two, 40 milliliter (ml) clear "VOA" vials for each of the planned analytical procedures. A clear 1-liter vial was used to obtain a bulk sample of floating product that accumulated in well MW-4. The 40 ml glass vials were over-filled, covered with a teflon septum, tightly capped, checked for air bubbles, and then labeled. After labelling the vials were placed in a clear zip lock bag and stored in a separate ice-filled cooler for preservation until transport to the laboratory. Chain of Custody forms were completed for all the collected ground water samples and both the field and trip blanks. Separate shuttles were used for ground water samples obtained from the existing and new wells.

4.4.3 Quality Control

Field sampling quality control included a trip blank and field blank. The 40 ml trip blank was provided by the testing laboratory and remained in the sample cooler along with the collected water samples until delivered to the laboratory. Field blanks were prepared after sampling both MW-6 and MW-4.

4.5 Ground Water Measurements

The March 1990 and mid-May 1990 ground water measurements for all six wells are summarized in Tables 3a and 3b. The construction and development of wells MW-4 through MW-6 was completed on March 6, 1990. Table 3a summarizes measurements obtained on March 21st, 1990 [initial sampling of the *three new wells]. Table 3b summarizes measurements obtained about two months later on May 16. The* elevations noted in the Tables are based on an arbitrary datum of 15 feet. This datum approximates actual site elevation.

An ORS Environmental Equipment interface probe was used for the March 21, 1990, ground water measurements. The instrument is capable of measuring a product thickness of less than 0.01 foot. A surveyor's tape having 0.01-foot graduations was used for the May 16, 1990, measurements. Chalk was used for all but MW-4. McCabe's Gasoline Level Indicator paste was used for measuring the depth to liquids in MW-4.

Excepting MW-4, the ground water table elevation declined about one foot from the March readings. Over this same period, in MW-4, the top of product elevation increased about 0.4 feet. The general decline in ground water table elevation is attributed to seasonal variation. The March readings were at the end of the local "wet period" and likely reflect upgradient ground water infiltration. The following eight weeks were presumably dry allowing [site] ground water levels to approach dry season levels.

The water table elevation contours shown on Figure 8 are interpreted from the measurements of March 21, 1990 (Table 3a). The water table elevation at MW-4 is based, as explained in the following section, on the measurements made on the day after well purging and sampling. From this figure, the water table is estimated to have a gradient of 1% to the south-southwest.

TABLE 3a

WATER TABLE ELEVATIONS

MARCH 21, 1990

Well ID	Top of Casing Elevation(ft)[1]	Depth (ft) To Water	Depth (ft) To HC Product	Top of Water Table Elevation (ft)	Top of Liquid Elevation (ft)	FP Thickness (ft)
MW-A1	15.03	13.64	ND	1.39	1.39	ND
MW-A2	14.40	13.13	ND	1.27	1.27	ND
MW-A3	14.58	13.26	ND	1.22	1.22	ND
MW-4[2]	15.65	14.48	13.83	1.17	1.82	.65
MW-5	14.40	13.26	ND	1.14	1.14	ND
MW-6	14.46	13.69	ND	0.77	0.77	ND

NOTES:

1. Reference elevation is to site standard and not referenced to mean sea level; depth measurements by interface probe.

2. Free [floating hydrocarbon] product = (FP) detected in MW-4.

ND = Not detected.

TABLE 3b

WATER TABLE ELEVATIONS

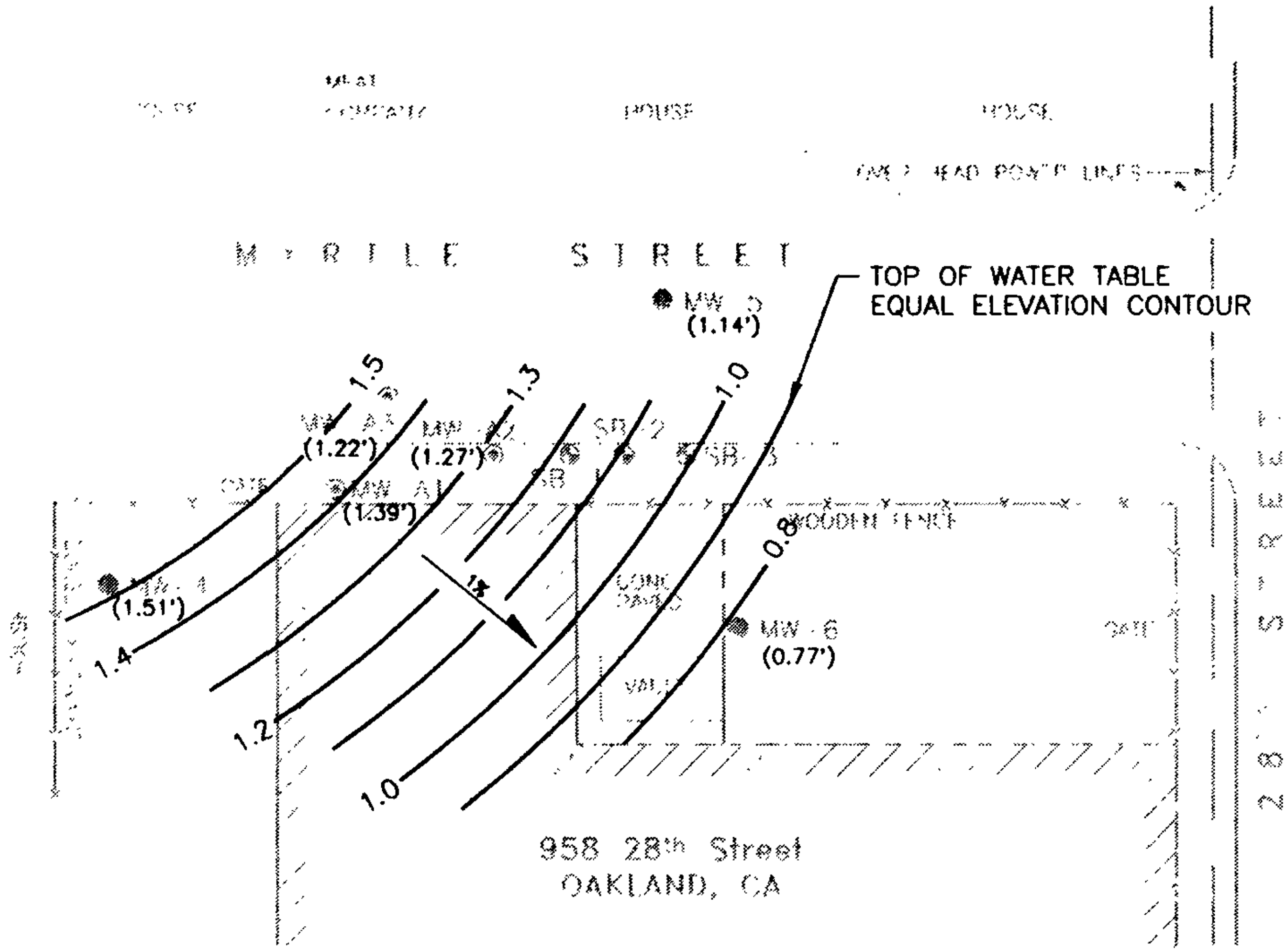
MAY 16, 1990

Well ID	Top of Casing Elevation(ft)[1]	Depth (ft) To Water	Depth (ft) To HC Product	Top of Water Table Elevation (ft)	Top of Liquid Elevation (ft)	FP Thickness (ft)
MW-A1	15.03	14.71	ND	0.32	0.32	ND
MW-A2	14.40	14.18	ND	0.22	0.22	ND
MW-A3	14.58	14.33	ND	0.15	0.15	ND
MW-4[2]	15.65	-.-[3]	13.43	-.-	2.22	--[3]
MW-5	14.40	14.29	ND	0.11	0.11	ND
MW-6	14.46	14.71	ND	-0.25	-0.25	ND

NOTES:

1. Reference elevation is to site standard and not referenced to mean sea level; depth measurements by precision tape and chalk or gasoline level indicator paste.
2. Free [floating hydrocarbon] product = (FP) detected in MW-4.
3. Product-water interface indistinguishable.

ND = Not detected



Legend:

- ⊤ Ground water monitoring wells installed by IT corp. February 1989.
- ● Ground water monitoring wells installed by RMT; March 1990.
- ✱ Soil borings installed by RMT, March 1990.
- (1.10') Ground water table elevations

NOTES:

1. Elevations are relative to an arbitrary site datum.

2. G.W. elevation for MW-4 based on March 23, 1990 measurment; one day after free product removal

3. See table for top of casing elevations and ground water measurements.

Scale: 1" = 30'

Ground Water Gradient – March 21, 1990
Former Servisco Facility

RMT INC.

DWN. BY:	DRB
DATE:	JUNE, 1990
PROJ.#	1660.05
FILE #	16600504

FIGURE 8

4.6 Floating Product Measurements

Free product was detected in monitoring well MW-4 during the March ground water sampling and subsequent measurements. On March 21st, the depth to product and ground water were measured with an interface probe at depths of 13.83 feet and 14.48 feet below TOC, respectively. The March 22nd pre-sampling measurements were 14.02 feet and 14.47 feet, respectively. Approximately 25 gallons of fluids were removed from MW-4 during purging and sampling. The depth to ground water at the completion of sampling was 14.19 feet with no product indicated. By the following day, March 23rd, product accumulation was 0.02 feet; ground water was 14.15 feet below TOC. By the March 24th measurement, product level had risen to 14.08 feet and ground water dropped to 14.25 feet below TOC. For purposes of defining ground water gradient, depth to ground water at location MW-4 is assumed to be the average of the March 23rd readings, i.e., 14.14 feet below TOC; that is reference elevation 1.51 feet

The above data on product recovery indicates that the detection of free product in MW-4 is not a one time occurrence and that the recovery/build up rate is slow. Based on measurements made in the two days following sampling, the rate of product buildup averages less than 0.1 foot per day. The rate of build up is less than .05 feet per day based on the amount that accumulated in the 16 days following well development. This discounts the notion of a uniform product recovery rate.

5. FIELD AND LABORATORY ANALYSES

Analyses were performed on representative samples for field screening, as a basis for well design, and, most importantly, evaluated for hydrocarbon contamination. Soil samples were screened in the field as a qualitative measure of VOC emissions. Physical properties tests were performed on soil samples obtained from beneath ground water levels to verify well design. Laboratory analyses for hydrocarbons residuals were performed on both soil and ground water samples obtained during the investigation.

5.1 Field Screening

Soil samples were screened in the field for VOC emissions with a PID. These results were used as a qualitative indicator of possible hydrocarbon contamination and as an aid in selecting soil samples for analysis in the laboratory. Procedures are described in Section 3.3.3. The results are summarized on the Logs in Appendix E and on the sections presented on Figures 5 through 7.

In soil borings SB-1 and SB-2, soil samples from 10- and 15-foot sampling depths were monitored in the field. PID readings of the CLAY from 10-foot depth were 55 ppm and 150 ppm, respectively. Readings for the Sand at 15-foot depth were 100 ppm and 200 ppm, respectively. These readings were interpreted in the field as indicating that the affected area extended south of boring SB-2. Clay and Sand samples that were obtained from similar depths at location SB-3 measured 5 ppm and 25 ppm, respectively. These readings were interpreted as being the southern limit of the affected area.

For borings MW-4 through MW-6, PID screening extended from the 5 foot deep sample through the completion sample. Static ground water in these borings was at about 15 feet below ground. Generally, in the surficial 5 feet, PID readings were minimal (less than 7 ppm) and there was not any odor noted. Readings varied at greater depths. In boring MW-5, the PID readings for samples from 10-,15-, and 20-foot depth were uniformly about 10 ppm; a slight organic odor was also noted. At location MW-6, the recorded PID readings ranged from 15 ppm for the clay sample from 11 feet to 200 ppm in the Sand and Clay sample from 15-foot depth. Readings for the samples from 21-foot and 26-foot depths (silty Clay and Sand, respectively) were less than 15 ppm. At location MW-4, except for the Sand sample from 10-foot depth, PID readings were less than 10 ppm. A reading of 170 ppm was recorded for the sample from 10 feet.

5.2 Soil Physical Properties Testing

Physical properties testing consisted of particle size distribution (gradation) analyses and index properties testing for well design. Gradations were performed on three soil samples representing the range of aquifer materials observed. A hydrometer analysis was performed on a fourth sample that was predominantly fine grained and the percentage of fines [percent passing the number #200 sieve] determined for two additional soil samples. Atterberg Limits [plasticity] was determined for one typical SAND and CLAY soil sample.

5.2.1 Gradation Analyses

The gradations, percent fines, and hydrometer analyses show the variation in particle size distributions of the in situ soils over the screened intervals. As shown on the individual gradation curves of Appendix H, in situ materials range from predominantly silt and clay sizes to almost equal parts of gravel and sand sizes with less than 10% fines. These gradations were used for the well designs.

5.2.2 Permeability

Permeability testing was beyond the scope of work required at this time. However, in situ permeability for the various materials can be estimated from the gradations and approximated from the geologic descriptions (Terzaghi, K. and R.B.Peck, 1948; and H.R.Cedergren, 1977). For the range of soils observed, permeability for the gravelly SANDs is estimated to be on the order of 0.1 cm/sec in both the vertical and horizontal directions. The permeability for the other sands is estimated, within an order of magnitude, to be on the order of 1 x 10^{-3} cm/sec. The finer grained materials [inorganic silts and clays] can be approximated from test data at other bay area sites as 1 x 10^{-6} cm/sec and, because of macro-features, the vertical rate probably approaches that for the horizontal direction.

5.3 Laboratory Hydrocarbons Analyses - Soil Samples

Soil samples were collected from each boring, as described previously, and transported under Chain of Custody to Thermo Analytical Inc. (TMA) Richmond, California laboratory for hydrocarbons analyses. TMA is California DOHS-certified for the soil matrix analyses performed.

5.3.1 General

Two samples from each of the six borings were analyzed for total petroleum hydrocarbons (TPH) and aromatic volatile organic (AVO) compounds. The tested samples were from 10 and 15 feet below grade. These depths generally correspond with the highest field monitoring readings. Testing was performed by TMA within one week of sampling. Analytical results are summarized in Table 4. The laboratory report is presented in Appendix I along with completed Chain Of Custody forms and chromatagrams.

5.3.2 TPH Analyses

TPH testing was by EPA Test Method 8015M. Two samples from each boring were analyzed for both low and high boiling point hydrocarbons. Preparation for TPH-G analyses was by EPA Method 5030; TPH-D preparation was by EPA Method 3510.

Generally, diesel range hydrocarbons were not detected -- that is the concentration, if any, was below the detection limit -- in eleven of the twelve samples tested. The exception was 145 mg/kg of TPH-D in the 10 foot deep sample from MW-4. The results of the TPH-G analyses are summarized in Table 4.

5.3.3 AVO Analyses

The AVO analyses generally parallel the above gasoline range analyses results in detection of benzene, toluene, xylenes, and ethyl benzene (BTX&E). Neither chlorobenzene nor 1,2-, 1,3-, and 1,4-dichlorobenzenes were detected in any of the 12 samples tested. Method detection limit for these four compounds was 10 μg/kg. The analyses results are presented in Table 4.

TABLE 4
ANALYTICAL RESULTS OF SOIL SAMPLES ANALYSES

Date: 4/04/90

Supplementary Subsurface Investigation
958 28th Street; Oakland, California

TEST METHOD	PREP METHOD	TEST/Coumpound	REPORT UNIT	DETECT LIMITS	SB-1 10-#3	SB-1 15-#2	SB-2 10-#3	SB-2 15-#3	SB-3 9.5	SB-3 13-#2	MW-4 10-#3	MW-4 15-#3	MW-5 10-#2	MW-5 15-#2	MW-6 10-#2	MW-6 15-#3	METHOD BLANK
8015M	3510	TPH as diesel-soil matrix	mg/kg	10	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	145	n.d.	n.d.	n.d.	n.d.	n.d.	n.a.
8015M	5030	TPH as gasoline-soil matrix	mg/kg	10	145	n.d.	18	260	n.d.	n.d.	3,300	12	n.d.	n.d.	38	44	n.d.
8020	5030	AVO's by GC/MS															
		Benzene	ug/Kg	5	13	10	n.d.	11	n.d.	n.d.	350	29	n.d.	n.d.	5.5	26	n.d.
		Toluene	ug/Kg	5	10	6.2	8.5	290	n.d.	n.d.	570	22	8.2	6.2	74	80	n.d.
		Ethylbenzene	ug/Kg	5	n.d.	37	n.d.	n.d.	n.d.	n.d.	1,500	66	n.d.	n.d.	n.d.	n.d.	n.d.
		m-Xylene	ug/Kg	5	35	n.d.	47	510	n.d.	n.d.	3,100	160	n.d.	n.d.	130	95	n.d.
		o/p-Xylenes	ug/Kg	10	n.d.	68	n.d.	n.d.	n.d.	n.d.	1,500	79	n.d.	n.d.	n.d.	n.d.	n.d.
		TOTAL AVO	ug/Kg		58	151	55	811	n.d.	n.d.	7,020	356	8.2	6.2	210	201	n.d.

Concentrations of BTX&E for the 10 and 15 foot deep samples from boring SB-1 were generally below 40 μg/kg and totaled to less than 100 μg/kg. At location SB-2, only toluene and meta-xylene were detected in the two samples. Concentrations in the sample from 10 feet were 8.5 μg/kg and 47 μg/kg, respectively, and 290 μg/kg and 510 μg/kg for the 15 foot deep sample. Only toluene was detected in both samples from MW-5; concentrations were less than 10 μg/kg. Benzene, toluene, and meta-xylene were detected in the two samples from MW-6. Cumulative concentrations total about 200 μg/kg. At location MW-4, both samples contained the full range of BTX&E components. As shown in Table 4, the BTX&E concentrations in MW-4's SAND layer [10-foot depth] were at least an order of magnitude greater than detected in the underlying CLAY strata.

5.3.4 Analyses Results

Gasoline range hydrocarbons or BTX&E were detected at varying concentration in the samples from all but location SB-3. The TPH-G and AVO analyses indicate the extent of the affected soils associated with the former 7,000 gallon gasoline tank and the presence of a new problem north of the former 1,000 gallon gasoline tank. The RWQCB [Los Angeles office] has suggested using ten times their Maximum Contamination Level (MCL) for ground water as guidance for soil action levels (SAL). The following presumes these guidelines for the discussion.

In the former 7,000 gallon tank area, BTX&E was detected in the 10 foot and 15 foot deep samples from SB-1 and SB-2. TPH-G concentrations were below 260 mg/kg. Further, only benzene at a maximum of 12 μg/kg exceeds the suggested SAL [10 μg/kg], albeit only slightly. Neither TPH nor BTX&E were detected in either of the two samples from SB-3. This data limits the extent of affected soils to north of SB-3 up to the former tank location, which is about 30 feet north.

Benzene, toluene, and meta-xylene were detected in both the 10 foot and 15 foot deep samples obtained at MW-6. About 40 mg/kg of gasoline range hydrocarbons were detected in the two soil samples tested. Although the analytical data indicates the area has been impacted by hydrocarbons. Only benzene exceeds the RWQCB's ground water MCL and all concentrations fall below the recommended SALs.

Only toluene was detected in the two samples from MW-5. The detected concentrations are below MCL for ground water.

Subsurface hydrocarbon concentrations in the area investigated by MW-4 [especially the sample from 10 feet] are greater than in the former 7,000 gallon tank area. BTX&E levels in the sample from 10 feet exceed the recommended SALs; levels in the 15 foot deep sample are below recommended SALs. This area, as verified by the presence of free product, has been affected by gasoline discharge. The source of the free product is not known at this time. Sampling and analyses performed during closure of the former 1,000-gallon gasoline tank, which was located about 20 feet south of MW-4, did not indicate that a release had occurred.

5.4 Laboratory Hydrocarbons Analyses - Ground Water Samples

All six ground water monitoring wells were sampled in late March 1990. Wells MW-A1 through -A3 were sampled on March 21, 1990 as part of the ongoing quarterly ground water monitoring (Appendix B). Wells MW-4 through MW-6 were sampled as part of this supplementary subsurface investigation. Chemical analyses were performed in accordance with AC-HCSA's letter of May 8, 1989 (Appendix A). Analyses results are for both groups of wells are tabulated in Table 5 and summarized in the following paragraphs.

Date:

TABLE 5
ANALYTICAL RESULTS OF GROUND WATER SAMPLE ANALYSES
Supplementary Subsurface Investigation
958 28th Street; Oakland, California

TEST METHOD	TEST/Coumpound	DETECT LIMITS	G W MCL (ppb)	MW-1	MW-2	MW-3	MW-5	MW-6	FIELD BLANK	MW-4	FIELD BLANK	TRIP BLANK	MW-4-A1 [Prod+H2O]
8015M	LOW BOILING Pt. [5030]	0.5 mg/L		1.3	1.1	n.d.	n.d.	n.d.	0.7	20	n.d.	n.d.	37,500
8015M	HIGH BOILING Pt.[3510]	0.5 mg/L		n.d.	n.d.	n.d.	n.d.	n.d.	-	n.d.	-	-	-
602	AROMATIC VOCs									<5 x>			<50,000 x>
	Benzene	0.2 ug/L	1.0	3.6	35	n.d.	n.d.	n.d.	n.d.	1,500	0.28	n.d.	980,000
	Toluene	0.2 ug/L		n.d.	2.4	n.d.	n.d.	n.d.	n.d.	17	n.d.	n.d.	240,000
	Ethylbenzene	0.2 ug/L	680.0	4.7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	3.3	n.d.	2,300,000
	m-Xylene	0.5 ug/L	Note 5	3.3	3.9	n.d.	n.d.	n.d.	1.0	1,200	22.0	n.d.	11,000,000
	o/p-Xylenes	1.0 ug/L	Note 5	21	15	n.d.	n.d.	n.d.	0.9	820	12	n.d.	6,400,000

NOTES:

1. "n.d." indicates not detected subject to noted detection limit.

2. MCL concentrations are in ug/L. Obtained from RWQCB, LA Office.

3. Dissolved constituents sample MW-4 obtained after removing floating products and purging 25 gallons of well water. Concentrations noted may not be representative of actual dissolved constitiuents in ground water.

4. Floating product sample MW-4-A1; intermixed with well water during sampling; noted concentrations are considered to be minimums.

5. MCL for total Xylenes is 1750 Mg/L.

5.4.1 General

Ground water samples were analyzed for dissolved TPH constituents and AVO compounds. TPH testing was by EPA Method 8015M and AVO analyses by EPA Method 602. Samples for TPH-D and TPH-G testing were prepared by EPA Method 5030 and EPA Method 3510, respectively. Trip and field blanks were analyzed for quality control purposes. Samples were collected from each well as described in Section 5. Samples were collected in accordance with the California Regional Water Quality Control Board San Francisco Bay Region (RWQCB) guidelines and analyzed by a DOHS certified California Laboratory. The analyses results are summarized in Table 5 and discussed below. The laboratory report is presented in Appendix J.

5.4.2 Wells MW-4 through MW-6

Neither TPH-G nor TPH-D components were detected in the ground water samples from MW-5 and MW-6. No aromatic components were detected in the ground water samples from MW-5 and MW-6. Method 8015M and 602 detection limits are indicated in Table 5.

Free [hydrocarbons] product was detected in monitoring well MW-4. A pre-purging and ground water sampling specimen of the free product was analyzed by the same methods being used for ground water. The test sample contained approximately equal amounts of free product [lightly colored] and what was apparently water [clear]. These analyses results are included in Table 6. However, it should be noted that the analyzed results are not comparable. Analyses of this sample was to characterize the free product and as such was intended to test the free phase rather than dissolved phase. The results of the post-purging sample was to analyze for dissolved constituents. Due to dilution, the reported results are minimum concentrations. The laboratory characterized the free phase as gasoline from the chromatograms.

5.4.3 Wells MW-A1 through MW-A3

The results of the March 1990 quarterly ground water monitoring indicate that BTX&E and TPH-G are still present in wells MW-A1 and MW-A2, and non-detect for well MW-A3. Appendix B contains the complete report for the past four quarters of monitoring.

5.4.4 Discussion

Petroleum hydrocarbons were not detected in the ground water samples of wells MW-5 and MW-6, which are hydraulically downgradient from the former location of the 7,000 gallon tank. These results indicate that ground water in these two areas is not affected by past site operations. The latest quarterly monitoring results for the three wells surrounding the tank's former location continue to detect dissolved gasoline type hydrocarbons in ground water samples from wells MW-A1 and MW-A2 only. Generally, concentrations of both gasoline range hydrocarbons and BTX&E in both wells have decreased from the March 1989 levels. For the March 1990 sampling and analyses, only benzene and TPH-G exceed the California DOHS drinking water action levels. The gasoline-type free product observed in well MW-4 does not appear to be affecting any of the other monitoring wells on site.

The source of the free product is not readily apparent. As noted previously, Hickenbottom and Muir (June 1988) identified a former fuel leak site that is within several blocks of this site and upgradient.

Based on the interpreted ground water contours shown on Figure 8, it appears that the former 7,000 gallon tank area is off-gradient to MW-4. Based on a comparison of the compounds detected and their respective concentrations, it seams unlikely that the product at MW-4 is the source for hydrocarbons being detected in wells MW-A1 and MW-A2. The results of quarterly monitoring for the past year show steadily decreasing TPH-G and BTX&E concentrations for MW-A1 and MW-A2 [Appendix B]. This consistent trend for decreasing concentrations is not consistent with the free product being detected at MW-4 and therefore the two areas do not appear to be connected.

5.5 Interpretation

Analyses results for soil samples obtained from vadose zone borings SB-1 through SB-3 limit the extent of the affected area to north of SB-3, which is about 35 feet south of MW-A2. Additionally, the hydrocarbons analyses results for soil samples from intermediate locations SB-1 and SB-2 indicate that concentrations of the detected compounds are generally below RWQCB action levels for soil.

The free product detected at MW-4 identifies a new problem area on site. Based on the gradient shown on Figure 8, the free product has not yet reached MW-6. Based on the subsurface stratigraphy depicted in the geologic sections, it is possible that the free product may be localized to the SAND strata encountered at about 10-foot depth in MW-4.

The area around MW-4 is contaminated with gasoline-like product. Free product accumulations were noted in the well during its initial sampling and in the days following sampling. Both soil and ground water samples analyses indicate the presence of gasoline range hydrocarbons at this location.

Figures 2 and 3 of Appendix B show the interpreted TPH and benzene concentrations interpreted from the soil and ground water data.

6. FINDINGS AND CONCLUSIONS

1. Subsurface conditions observed during drilling are consistent with previous observations (IT Corp.; March 29, 1989). Predominantly fine grained soils were observed to the 30-foot depth explored. Variously textured sand strata of varying thickness were also encountered in each of the six borings completed by RMT. Ground water was encountered at approximately 15 foot depth.

2. The extent of affected soils in the area of the former 7,000 gallon tank appears to be limited to no further than 25 feet south of location MW-A2. Vadose zone soil samples from locations SB-1 and SB-2, which are within this 25 foot zone, contained low boiling point hydrocarbons (gasoline range or TPH-G) concentrations ranging from non-detect to several hundred mg/Kg. BTX&E concentrations were also detected in the four samples tested. Concentrations were greater for the 15-foot deep samples. No high boiling point (diesel range or TPH-D) or BTX&E compounds were detected in the tested soil samples from location SB-3.

3. Analytical results for shallow soil samples from the three additional ground water monitoring well locations (MW-4 through MW-6) show that: 1) the area around location MW-4 has been affected by gasoline-type product; 2) only toluene at a concentration of less than 10 μg/Kg was detected in the vadose zone at location MW-5; and 3) at location MW-6 both TPH-G and aromatic volatiles were detected in the near surface soil samples. Detected compound concentrations in the vadose zone samples from MW-5 and MW-6 are considered to be below RWQCB action level guidelines for soils.

4. The results from the on-going ground water monitoring program for existing wells MW-A1 through MW-A3 are consistent with earlier findings. Low boiling point hydrocarbon and several BTX&E constituents were detected in samples from wells MW-A1 and MW-A2. The previously noted trend of decreasing concentrations continues. The ground water sample from MW-A3 continues to be "non detect" for the TPH-D, TPH-G, and BTX&E testing.

5. Ground water samples from the three newly installed monitoring wells (MW-4, MW-5 and MW-6) were analyzed for the same constituents as the previously installed wells: TPH-G, TPH-D, and aromatic volatile organic compounds (BTX&E). None of these constituents were detected in ground water samples obtained from MW-5 and MW-6. In the sample from MW-4, BTX&E concentrations exceed action levels.

6. A Product thickness of 0.65 feet was measured in well MW-4 about two weeks after well development and just prior to the initial sampling. Recharge was 0.2 feet in the two days following the initial sampling. The floating product was characterized by the analytical laboratory as gasoline.

7. The ground water gradient is southwest rather than southeast, based on the expanded well configuration.

8. The compounds in the three ground water monitoring wells with detectable concentrations are similar. However, the concentrations in MW-A1 and MW-A2 are orders of magnitude less than what was measured for MW-4. Additionally, the continued decline in detected concentrations for wells MW-A1 and MW-A2 [localized on the former 7,000 gallon tank] distinguishes them from MW-4 in which floating product was detected. Furthermore, the [revised] ground water gradient corroborates the field data in this regard.

7. REFERENCES

Alameda County Health Care Services Agency; 17 August 1989; Groundwater Monitoring Wells at 958 28th Street, Oakland; Letter to Beatrice Slater, Owner; Rafat A Shahid, Chief Hazardous Materials Division.

ARATEX SERVICES, Inc; January 26, 1989; RE: Groundwater Monitoring Well Installations at 958 E. 28th St. Oakland, CA; Letter to Mrs. Mary Jo Meyers-Barnes; Phillip Krejci, Director of Environmental Management.

ARATEX SERVICES, Inc; February 6, 1989; RE: 958 E. 28th St. Oakland, California; Letter to Mr. Harvey Stein; Phillip Krejci, Director of Environmental Management.

International Technology Corp.; July 5, 1988; UNDERGROUND STORAGE TANK PERMANENT CLOSURE REPORT, 958 EAST 28TH STREET, OAKLAND, CALIFORNIA [IT PROJECT NUMBER 190260]; Letter to Mr. Phil Krejci; John P. McQuire, Supervisor UST Engineering.

International Technology Corp.; March 29, 1989; Ground Water Monitoring Well Installation; Letter to Mr. Philip [sic] Krejci; John P. McQuire, Supervisor UST Engineering.

H.R. Cedergren; 1977; "Seepage, Drainage, and Flow Nets"; John Wiley & Sons; New York.

Terzaghi, K. and R.B. Peck; 1967; "Soil Mechanics in Engineering Practice"; John Wiley & Sons; New York.

Corps of Engineers; March 1963; Comprehensive Survey of San Francisco Bay and Tributaries, California - Appendix "E"- Barrier Plans: Geology, Soils and Construction Materials; U.S. Army Engineer District, San Francisco; San Francisco, California.

Hickenbottom, K. and Muir, K.; June 1988; Geohydrology and Groundwater-Quality Overview, of the East Bay Plain Area, Alameda County, California - 205 (j) Report;" Submitted to: California Regional Water Quality Control Board, San Francisco Bay Region, Alameda County Flood Control and Water Conservation District

APPENDIX A

AC-HCSA CORRESPONDENCE

OUNTY
ALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

348

DEPARTMENT OF ENVIRONMENTAL HEALTH
Hazardous Materials Program
80 Swan Way, Rm. 200
Oakland, CA 94621
(415) 271-4320

8 May, 1989

ohn C. Drachenberg
LCB Associates
Dufwin Towers
19 17th Street
uite 700
Oakland, Ca. 94612

Subject: Groundwater monitoring well installation at 958 28th Street, Oakland.

Dear Mr. Drachenberg:

Thank you for the IT Corporation report dated 29 March, 1989, oncerning the groundwater monitoring well installation conducted at he above location (IT Project #190452). A review of the report indicates that the wells were installed in accordance with guidelines stablished by the San Francisco Bay Regional Water Quality Control oard.

Data derived from these wells indicates that there is a groundwater ontamination problem associated with this site. Consequently, a uarterly monitoring program is required. Samples should be collected and analyzed by a certified laboratory for Total Petroleum ydrocarbons-Low Boiler (EPA Method GCFID 5030), Total Petroleum ydrocarbons-High Boiler (EPA Method GCFID 3510), and Benzene, Toluene, Xylene and Ethylbenzene (EPA Method 602 or 624).

-8020

uarterly monitoring will be required for a minimum of one year. At the end of this period a decision regarding the frequency and duration of further sampling will be made. Please submit the results of each quarterly analysis to this office and to the San Francisco Bay Regional Water Quality Control Board.

If you have any questions or require further clarification concerning this matter, please contact, Dennis Byrne, Hazardous Materials Specialist, at (415) 271-4320.

Sincerely,

Edgar B Howell for

Rafat A. Shahid, Chief,
Hazardous Materials Division

Lester Feldman
1111 Jackson St
Oakland CA
94612

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

DEPARTMENT OF ENVIRONMENTAL HEALTH
Hazardous Materials Program
80 Swan Way, Rm 200
Oakland, CA 94621
(415)

17 August 1989

Beatrice Slater
P.M. Land and Investment
599 Loganberry Street
San Rafael, CA 94903

Subject: Groundwater Monitoring Wells at 958 28th Street, Oakland.

Dear Ms. Slater:

The San Francisco Bay Regional Water Quality Control Board has expressed concerns regarding the groundwater monitoring program being implemented at this site. Part of the preliminary site assessment process is to clearly define the direction of groundwater flow and the extent of any lateral spread of a contaminant plume. The three wells currently at this site leave some question as to these matters.

In the IT Corporation report of 29 March, 1989, groundwater contamination was measured in wells 1 and 2, but not in well 3, which is oriented east-southeast relative to well 1 and northeast relative to well 2. On the basis of this measurement, the report concludes that groundwater flow direction is southwest. This may be so, but there are ways by which this fact can be demonstrated.

Defining any lateral orientation to the contaminant plume may be achieved through the installation of additional wells located a short distance from areas of known contamination (wells 1 and 2). In the absence of this information, it will be impossible to offer a qualified opinion that the groundwater contamination problem at this site will ever be adequately addressed.

We request that at least two additional groundwater monitoring wells be installed at this site to gauge the extent of any lateral contamination. One installed north of well 1 and another south of well 2 would seem good areas for placement. In addition, groundwater flow direction must be determined with greater certainty.

Concerning the quarterly monitoring program being implemented at this site. This office has not yet received any data regarding what has been measured at 958 28th Street, Oakland, other than what is documented in the IT report of 29 March, 1989. As the lead agency overseeing the program, our effectiveness is greatly reduced when nobody keeps us informed. Please ensure that a copy of any analytical data derived from this program is submitted to this office for review.

Please direct all further correspondence or questions you may have regarding this matter to Dennis Byrne, Hazardous Materials Specialist, at (415) 271-4320.

Sincerely,

Edgar B Howell

for Rafat A. Shahid, Chief,
Hazardous Materials Division

RAS:DB

cc: Scott Huegenberger, SFBRWQCB
Rebecca Whitsett, Aratex Services Inc.
1834 Walden Office Square, Suite 450
Schaumberg, IL 60173-4299
Paul Valva, Valva Realty Company, 673 14th St. Oakland, 94607
Richard Rifkin, Rifkin Investments, 81 Lansing St. Suite 106
San Francisco, CA 94101

APPENDIX H

WELL DESIGN

FILTER PACK/SCREEN DESIGN

Representative soil samples from below observed ground water levels were obtained from each of the borings/wells. Particle size distribution (gradation) analyses were performed by RMT's soils laboratory on selected samples from screening interval. Particle size distribution curves used for the analyses are presented at the end of this appendix. Based on the range of in situ conditions a fine, uniformly graded sand was selected to filter the natural soils from migration into the well. This commercially available sand is known as "# 1C sand." Vendor supplied specifications for the filter pack are included in the attached table.

1. Filter Pack Design

The design ratios presented were obtained from several sources and date back to investigative work performed by the Soil Conservation Service, U.S Army Corps of Engineers, and U.S. Bureau of Reclamation (Sherman, 1977 and Sherard et.al., 1984). The two criteria used for filter pack were the so-called permeability ratio and piping ratio methods. These are based on comparisons of filter and base material sizes for specific percents passing:

2. Well Screen Slot Sizing

Well screen size selection was based on the ratio of the selected filter pack D_{85} size to the slot width. A minimum ratio of 1.2, as recommended by Sherman (1977) was used to check for excessive movement of the filter pack into the well casing.

A well screen slot size of .01 inch was selected to retain the filter pack and yet maximize ground water in flow rates. This screen size was recommended by the sand supplier based on both their experience and their in-house testing. The suppliers recommendations were checked using the design guidelines indicated above and determined to range from 2.4 to 3.5 which are acceptable.

WELL FILTER PACK AND SCREEN SIZING SUMMARY

958-28 Street; Oakland, CA

					Design Criteria[2,3]		
Boring No.	Sample Depth	U.S.C.S.	$D_{85,Base}$[1] (mm)	$D_{15,Base}$[1] (mm)	Piping Ratio	Permeability Ratio	Comment
MW-4	15-15.5	CL	< 0.074	<<0.074	n.a.	n.a.	See note 4.
MW-5	16-16.5	SW-GW	10.84	0.17	0.05	3.24	Acceptable
MW-5	26-26.5	SW	7.59	0.19	0.07	2.89	Acceptable
MW-6	20.5-26	SC-CL	7.08	<0.074	0.08	>7.4	Design basis*

*"#1C" Sand Specification

U.S. Std. Sieve	Percent Finer Max.	Min.	
#12	100	-	
#16	99	94	$D_{85,filter} \sim 0.9$ mm
#20	70	50	
#30	25	10	$D_{15,filter} \sim 0.55$ mm
#40	5	-	

Notes:

1. Individual particle size distributions attached; Dnn,base particle size for percent finer. Dnn,base particle size for percent finer.
2. Gradation of "# 1C" sand obtained from Diversified Well Products.
3. Design Criteria Basis:
   Piping Ratio: To guard against migration of base material into filter: $D_{15,filter}/D_{85,base} < \sim 5$.
   Permeability Ratio: To have a filter material which is more permeable than base material being filtered; $D_{15,filter}/D_{15,base} > \sim 5$.
4. Design criteria ratios not directly applicable for predominantly fine grained soils.

RMT, INC.
F-286 (R1/84:SL-1)

SUMMARY OF SOILS LAB ANALYSES

QC CHECKED BY : GTF DATE : 3-28-90 SHEET 1 OF 1
QA CHECKED BY : RH DATE : 3 28 90

PROJECT: Avatex Serviseco
PROJECT #: 1660.05
W.O. #: 900323-16605
DATE: 3-28-90
REQUESTER: Zoran Batchk
TECHNICIAN:

SAMPLE # / PARAMETER	MW-4 sample 1 15.0'	MW-4 sample 2 25.5'	MW-5 sample 3 15.0'	MW-5 Sample 3 25.0	MW-6 sample 2 20.5'	MW-5 sample 3 30.0'
Natural Moisture (%)		16.9 %				
Specific Gravity						
Grain Size (%)[1]	C | — / 23.0 53.1 / 23.9	D | — / — 68.5 / 31.5	B | 31.3 59.5 9.2 / —	B | 25.7 62.6 11.7 / —	B | 22.8 38.8 38.4 / —	D | — / — 47.7 / 52.3
Atterberg Limits[2]	LL = PI =	LL = 28 (SC) PI = 10	LL = PI =	LL = PI =	LL = PI =	LL = PI =
Moisture/ Density (Std)[3]	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %
Moisture/ Density (Mod)[3]	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %	Y max = Pcf Opt. M. = %
Density[4]	Y D = Pcf @ @ % M	Y D = Pcf @ @ % M	Y D = Pcf @ @ % M	Y D = Pcf @ @ % M	Y D = Pcf @ @ % M	Y D = Pcf @ @ % M
Permeability (cm/sec)[5]	X 10⁻	X 10⁻	X 10⁻	X 10⁻	X 10⁻	X 10⁻
Organic Content (%)						
Shrinkage Limit						
Unconfined Strength						

[1] GRAIN SIZE
- A – Gravel/Sand/Silt/Clay (Sieve and Hydrometer)
- B – Gravel/Sand/Silt-Clay (Sieve only)(Sieve and P200)
- C – Gravel-Sand/Silt/Clay (Hydrometer Only)(Hydrometer and P200)
- D – Gravel-Sand/Silt-Clay (P200 Only)

[2] ATTERBERG LIMITS
- LL = Liquid Limit
- PI = Plasticity Index

[3] MOISTURE/ DENSITY
- Y max = Maximum Density
- Opt. M. = Optimum Moisture

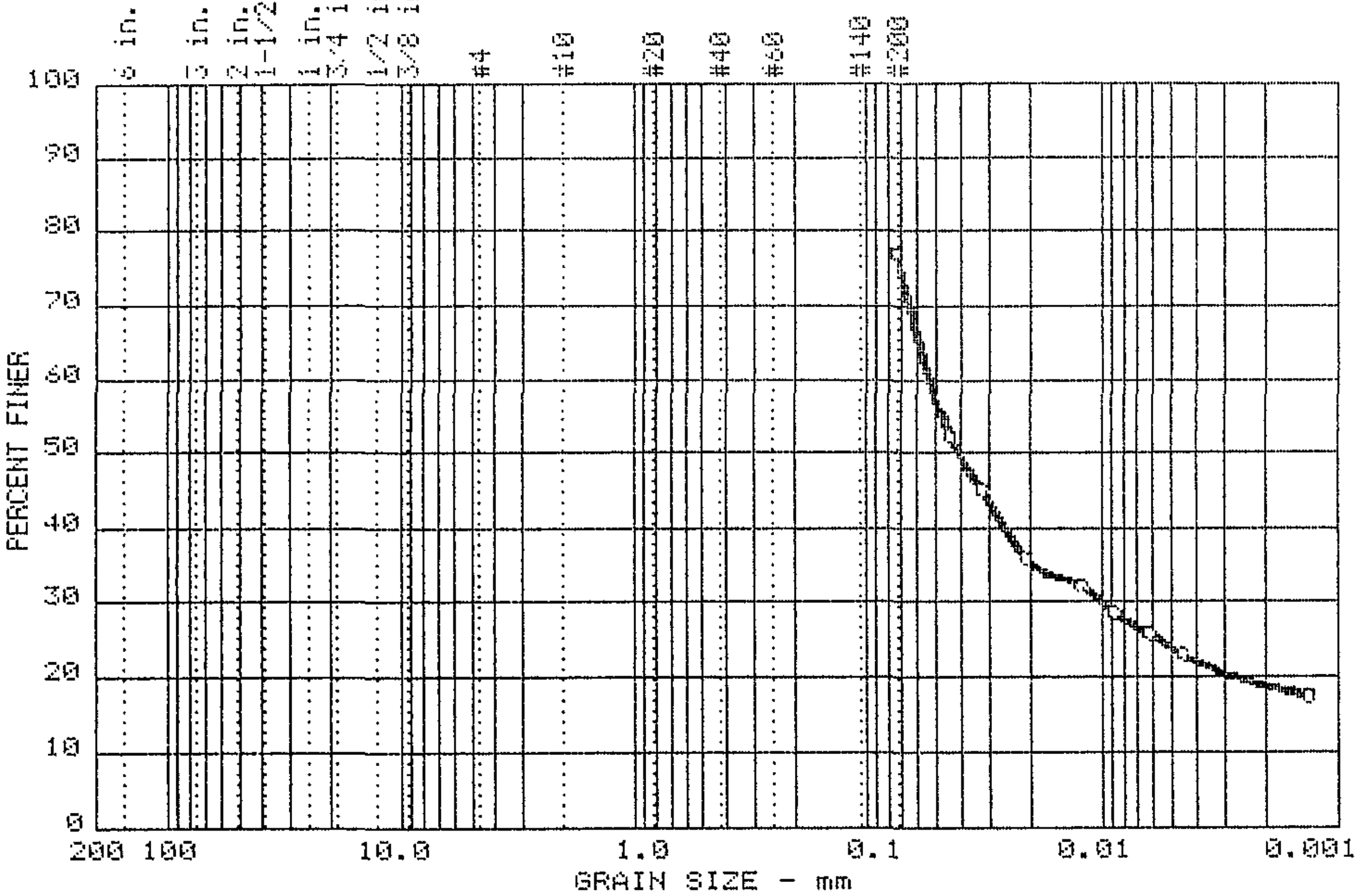
[4] DENSITY
- Y D = Dry Density (lb/ft^3)
- @ % Compaction
- @ % Moisture (M)

[5] PERMEABILTY
- N = Non-recompacted
- R = Recompacted

COMMENTS:

3-28-90 / JCH 3-28-90

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
○	8	0.0	0.0	23.0	53.1	23.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○					0.04	0.010				

MATERIAL DESCRIPTION	USCS	AASHTO
○		

Project No.: 1660.05
Project: ARATEX SERVISCO
○ Location: MW-4, SAMPLE 1, 15.0'

Date: 3-23-90

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

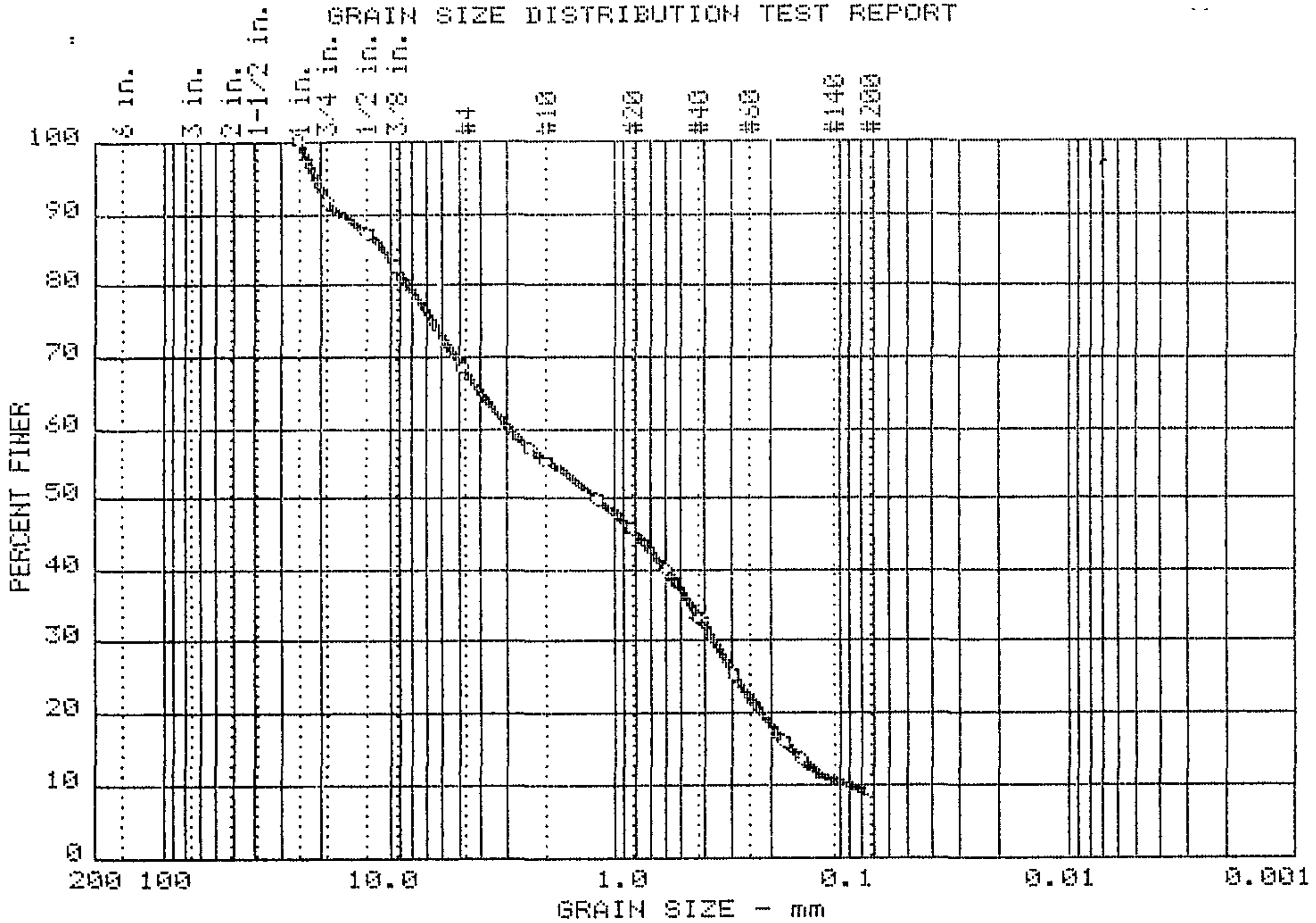
RMT, INC.

Figure No.

```
RMT Soils Laboratorv - Atterberg Limit Determination


PROJECT: ARATEX SERVISCO                                          Bv       Date
                                  Tech:  HJW        03/23/90 QC  HJW      3-28-90
  JOB #: 1660.05                  Input: HJW        03/28/90 QA  JPK      3-28-90


------------------------------------------------------------------------+------------------------+
PROJECT: ARATEX SERVISCO                JOB #:    1660.05               | BORING     MW-4        |
                                                                        | DEPTH      25.5'       |
 BORING: MW-4                     DEPTH:      25.5'                     | % WATER          16.9  |
                                                                        | LL                 28  |
             Natural        LIQUID             OVEN    PLASTIC          | PL                 18  |
             Moisture   |---LIMIT----|           LL      LIMIT          | PI                 10  |
                                                                        | CLASS              CL  |
TARE          114.56    115.02 115.21                   115.00          +------------------------+
BLOWS                       25     27
WET WT        161.27    140.06 140.24                   167.05
DRY WT        154.51    134.54 134.75                   159.13

% WATER         16.9      28.3   28.4                     17.9

------------------------------------------------------------------------+------------------------+
```

MW ✓ JFH
3-26-91 3-28-90

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
○	6	0.0	31.3	59.5	9.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			10.84	2.92	1.22	0.363	0.1660	0.0933	0.48	31.3

MATERIAL DESCRIPTION	USCS	AASHTO
○		

Project No.: 1660.05
Project: ARATEX SERVISCO
○ Location: MW-5, SAMPLE 3, 15.0'

Date: 3-23-90

GRAIN SIZE DISTRIBUTION TEST REPORT

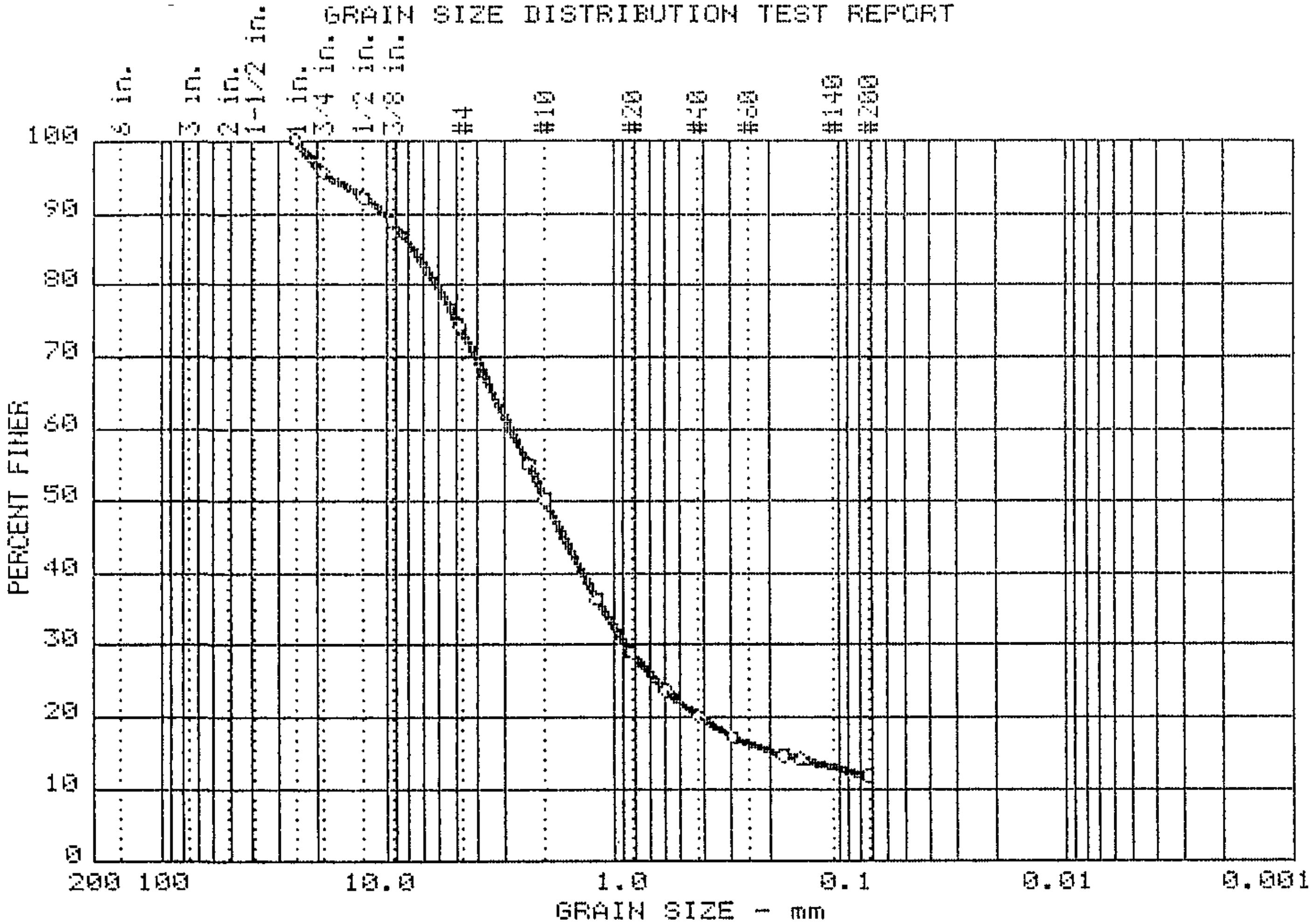
RMT, INC.

Remarks:

Figure No.____

3-28-9, ✓ JPK 3-28 90

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
○	5	0.0	25.7	62.6	11.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.59	2.82	1.97	0.881	0.1862			

MATERIAL DESCRIPTION	USCS	AASHTO
○		

Project No.: 1660.05
Project: ARATEX SERVISCO
○ Location: MW-5, SAMPLE 3, 25.0'

Date: 3-23-90

GRAIN SIZE DISTRIBUTION TEST REPORT

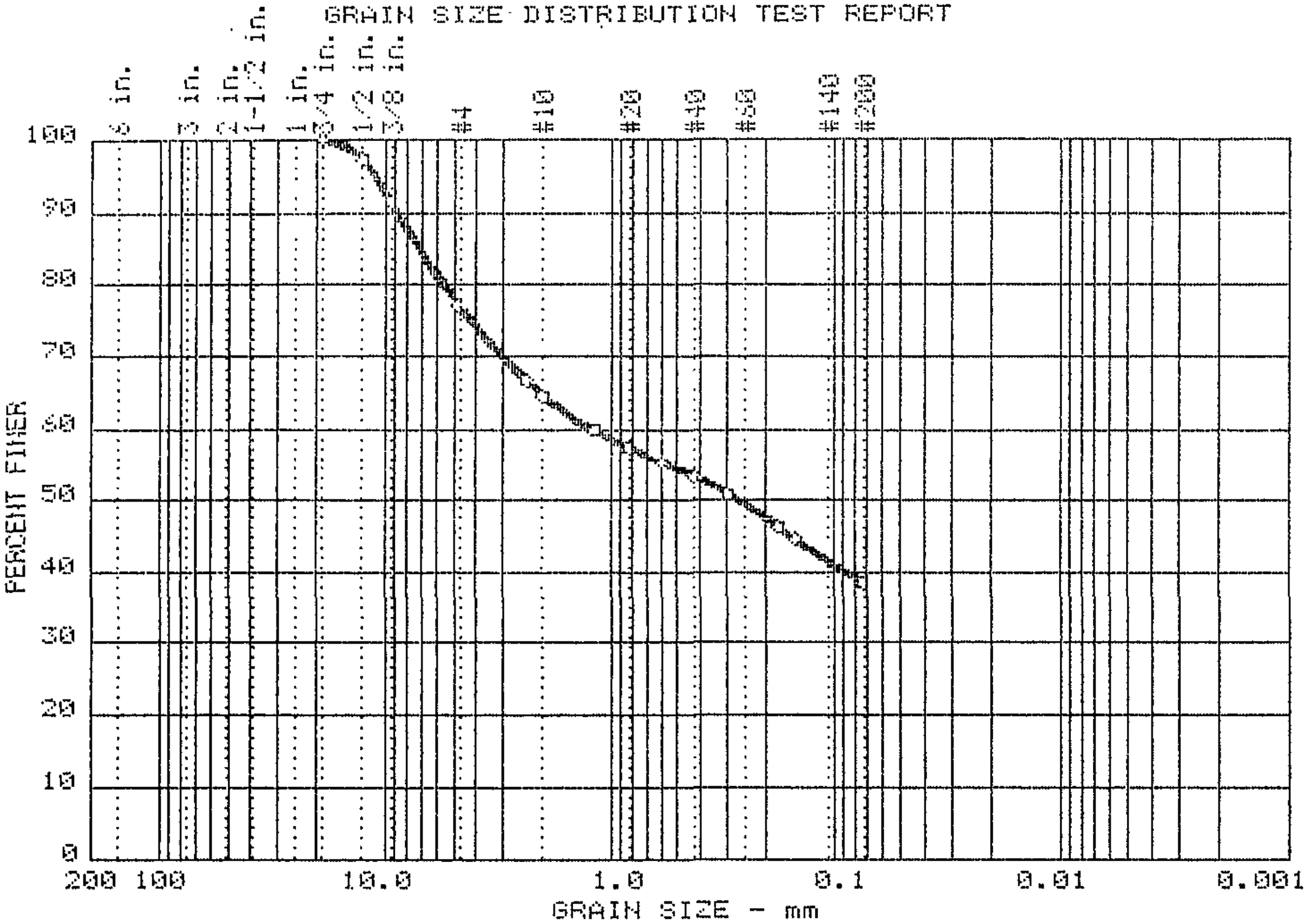
RMT, INC.

Remarks:

Figure No.______

✓ HJW 3-28-90 ✓ SK 3-28-90

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
○	4	0.0	22.8	38.8	38.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.08	1.19	0.27					

MATERIAL DESCRIPTION	USCS	AASHTO
○		

Project No.: 1660.05
Project: ARATEX SERVISCO
○ Location: MW-6, SAMPLE 2, 20.5'

Date: 3-23-90

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT, INC.

Figure No. ______

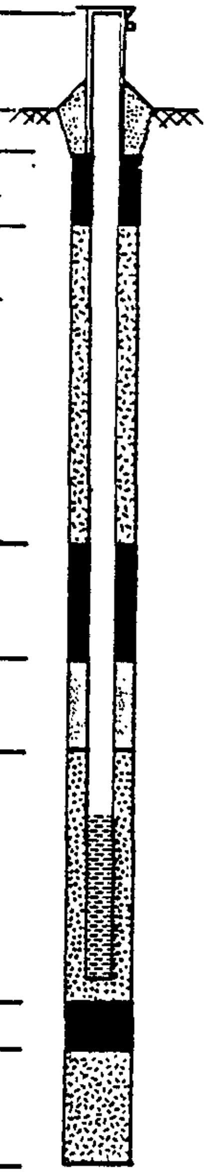
APPENDIX G

MONITORING WELL DIAGRAMS AND PERMITS

Well Diagram
F-17 (R 11-85)

WELL NO. MW-4

DATE INSTALLED 3-06-90



ELEV. (T.O.C.)

GROUND SURF. ELEV.

DEPTH FROM GROUND SURFACE 0.5 FT.

BENTONITE PELLETS/GRANULAR/POWDER

n.a. FT.

BACKFILL MATERIAL cement grout

LENGTH OF SOLID PIPE 10 FT.

BACKFILL METHOD
PIPE TREMIE/AUGER TREMIE [✓ GRAVITY FILLED]

BOREHOLE DIA. 8.5 IN.

5 FT.

BENTONITE PELLETS/GRANULAR/POWDER

8. FT.

SILICA SAND

FT.

FILTER PACK MATERIAL

10 FT.

WELL SCREEN LENGTH 15 FT.

WELL BOTTOM ELEV.

25 FT.

FT.

SEAL MATERIAL

X FT.

BACKFILL MATERIAL

n.a FT.

1) CASING DETAILS

A) TYPE OF PIPE:
[✓ PVC] STAINLESS, TEFLON, OTHER
PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;
COUPLINGS, [✓ THREADED] W/TAPE?), OTHER

C) WAS SOLVENT USED? YES OR [✓ NO]

D) TYPE OF WELL SCREEN:
[✓ PVC] STAINLESS, TEFLON, OTHER

E) WELL SCREEN SLOT SIZE 0.01-inch

F) PIPE DIA: ID IN. ____ OD IN. 2

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO
PROTECTOR PIPE DIA. 12 IN.

2) WELL DEVELOPMENT

A) METHOD
[✓ BAILING] PUMPING, SURGING, COMPRESSED AIR
OTHER
(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2 hrs

C) APPROXIMATE WATER VOLUME: REMOVED ~35 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, [✓ OPAQUE]

E) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, [✓ SLIGHTLY TURBID,] TURBID, OPAQUE

F) ODOR? [✓ YES] OR NO

3) WATER LEVEL SUMMARY

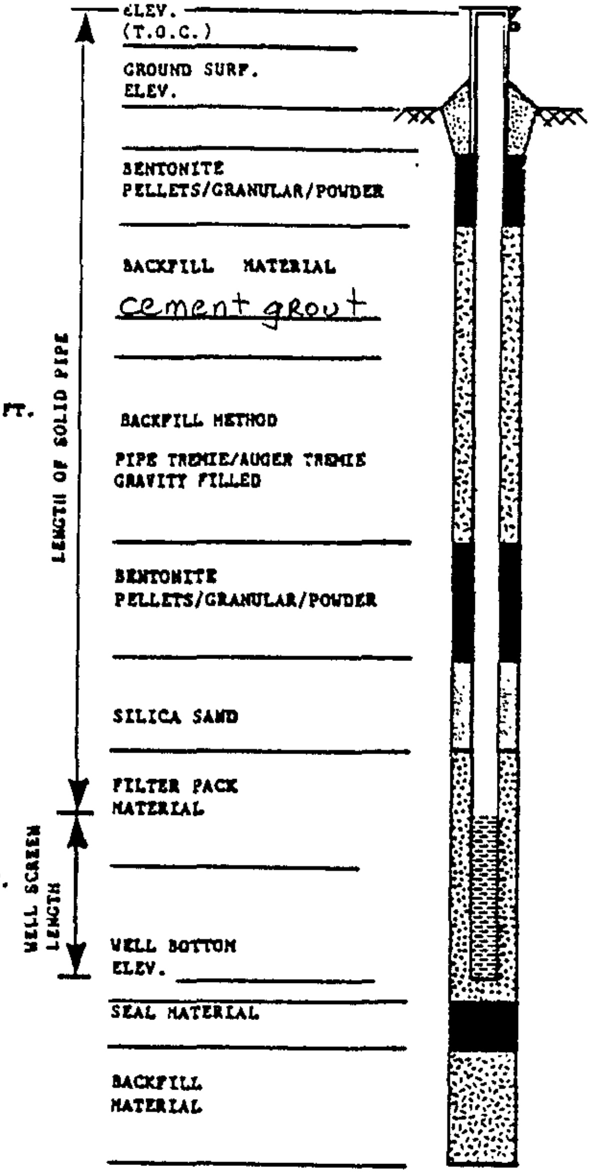
A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?
15.4 FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):
DATE/TIME ____ FT.
DATE/TIME ____ FT.
DATE/TIME ____ FT.

ADDITIONAL COMMENTS: FREE product detected on pre-sampling water level measurement. Traffic-rated, christy box-type protective well cover; mounted flush with surface.

Well Diagram
F-17 (R 11-85)

NO. 1660.05
WELL NO. MW-5
DATE INSTALLED 3-06-90



ELEV. (T.O.C.)
GROUND SURF. ELEV.
DEPTH FROM GROUND SURFACE 0.5 FT.
BENTONITE PELLETS/GRANULAR/POWDER
n.a FT.
BACKFILL MATERIAL cement grout
10 FT.
BACKFILL METHOD
PIPE TREMIE/AUGER TREMIE
GRAVITY FILLED
BOREHOLE DIA. 10.5 IN.
6 FT.
BENTONITE PELLETS/GRANULAR/POWDER
8 FT.
SILICA SAND
FT.
FILTER PACK MATERIAL
10 FT.
20 FT.
WELL BOTTOM ELEV.
30 FT.
FT.
SEAL MATERIAL
X FT.
BACKFILL MATERIAL
n.a. FT.

1) CASING DETAILS

A) TYPE OF PIPE:
[✓ PVC], STAINLESS, TEFLON, OTHER
PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;
COUPLINGS, [✓ THREADED] (W/TAPE?), OTHER

C) WAS SOLVENT USED? YES OR [✓ NO]

D) TYPE OF WELL SCREEN:
[✓ PVC], STAINLESS, TEFLON, OTHER

E) WELL SCREEN SLOT SIZE 0.01-inch

F) PIPE DIA: ID IN. ____ OD IN. 4

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO
PROTECTOR PIPE DIA. 12 IN.

2) WELL DEVELOPMENT

A) METHOD
[✓ BAILING], PUMPING, SURGING, COMPRESSED AIR
OTHER
(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 1.5 hRS

C) APPROXIMATE WATER VOLUME: REMOVED 165 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, [✓ TURBID], OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, [✓ SLIGHTLY TURBID], TURBID, OPAQUE

F) ODOR? YES OR [✓ NO]

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?
15.7 FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):
DATE/TIME — FT.
DATE/TIME — FT.
DATE/TIME — FT.

ADDITIONAL COMMENTS: TRAFFIC-Rated christy box protective well cover; mounted flush with surface

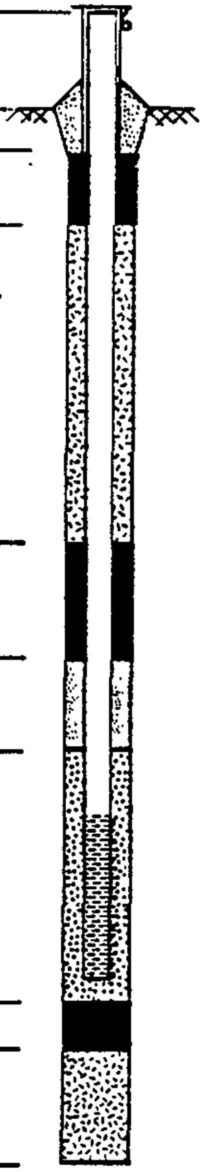
Well Diagram
F-17 (R 11-85)

WELL NO. MW-6

DATE INSTALLED 3-06-90

ELEV. (T.O.C.) ____

GROUND SURF. ELEV. ____



DEPTH FROM GROUND SURFACE 0.5 FT.

BENTONITE PELLETS/GRANULAR/POWDER ____ n.a FT.

BACKFILL MATERIAL cement grout

LENGTH OF SOLID PIPE 10 FT.

BACKFILL METHOD
PIPE TREMIE/AUGER TREMIE
GRAVITY FILLED

BOREHOLE DIA. 10.5 IN.

6 FT.

BENTONITE PELLETS/GRANULAR/POWDER ____ 8 FT.

SILICA SAND ____ FT.

FILTER PACK MATERIAL ____ 10 FT.

WELL SCREEN LENGTH 20 FT.

WELL BOTTOM ELEV. ____ 30 FT.

____ FT.

SEAL MATERIAL ____ X FT.

BACKFILL MATERIAL ____ n.a FT.

1) CASING DETAILS

A) TYPE OF PIPE:

[✓ PVC], STAINLESS, TEFLON, OTHER ____

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;

COUPLINGS, [✓ THREADED] (W/TAPE?), OTHER ____

C) WAS SOLVENT USED? YES OR [✓ NO]

D) TYPE OF WELL SCREEN:

[✓ PVC], STAINLESS, TEFLON, OTHER ____

E) WELL SCREEN SLOT SIZE 0.01-inch

F) PIPE DIA: ID IN. ____ OD IN. 4

G) INSTALLED PROTECTOR PIPE W/LOCK? [✓ YES] OR NO
PROTECTOR PIPE DIA. 12 IN.

2) WELL DEVELOPMENT

A) METHOD

[✓ BAILING], PUMPING, SURGING, COMPRESSED AIR

OTHER ____

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 1 hr

C) APPROXIMATE WATER VOLUME: REMOVED ~110 gal

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, [✓ TURBID], OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, [✓ SLIGHTLY TURBID], TURBID, OPAQUE

F) ODOR? YES OR [✓ NO]

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

~20 FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME ____ FT.

DATE/TIME ____ FT.

DATE/TIME ____ FT.

ADDITIONAL COMMENTS: Traffic-Rated christy box protective well cover mounted flush to surface.

FILE COPY

ZONE 7 WATER RESOURCES MANAGEMENT

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

L CATION OF PROJECT 958 28th Street
OAKLAND CALIFORNIA

C IENT
Name ARATEX SERVICES, INC.
A ress 1834 WALDEN OFFICE SQ Phone (708) 397-9500
C y Schaumberg ILL. Zip 80123

A PLICANT
N e RMT, INC.
Suite 370, 3250 Ocean Park Blvd.
A dress Phone (213) 452.5078
C y SANTA MONICA, CA Zip 90405

TYPE OF PROJECT
W l Construction
Cathodic Protection ___
ter Supply ⊗
.itoring ___
Geotechnical Investigation
General ___
Contamination ⊗
Well Destruction ___

PROPOSED WATER SUPPLY WELL USE
D estic ___ Industrial ___ Other Monitoring
M icipal ___ Irrigation ___

DR LLING METHOD:
M Rotary ___ Air Rotary ___ Auger ⊗
Cable ___ Other ___

D LLER'S LICENSE NO. C57 554979

WELL PROJECTS
Drill Hole Diameter 9 7/8 / 6 3/4" in. Maximum
Casing Diameter 4/2 in. Depth 30 ft.
Surface Seal Depth 5/5 ft. Number 1/2
OR→ 1-4" diam well
2-2" diam wells

G TECHNICAL PROJECTS
Number of Borings 2 Maximum
Hole Diameter 6 3/4 in. Depth 15 ft.

ESTIMATED STARTING DATE JAN. 29, 1990
ESTIMATED COMPLETION DATE FEB 28, 1990

I ereby agree to comply with all requirements of this
t and Alameda County Ordinance No. 73-68.

A LICANT'S
SIGNATURE Date 1/16/90

FOR OFFICE USE

PERMIT NUMBER 90032
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

Ⓐ GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

Ⓑ WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

Ⓒ GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

No Bort

Approved Date 18 Jan 90
Todd N. Wendler

121989

CITY OF OAKLAND

LETTER OF TRANSMITTAL

APR 2 5 90

TO RMT
3250 Ocean Park Blvd
Santa Monica, CA 90405
Suite 370

DATE 4/19/90
JOB NO. 1660.05
ATTENTION Zoran Batchke
RE
Encroachment Permit
#958 - 28th Street
Monitoring wells

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1			Copy of minor Encroachment Permit
1			Procedure for permits for ground-
			water monitoring wells.

THESE ARE TRANSMITTED as checked below:

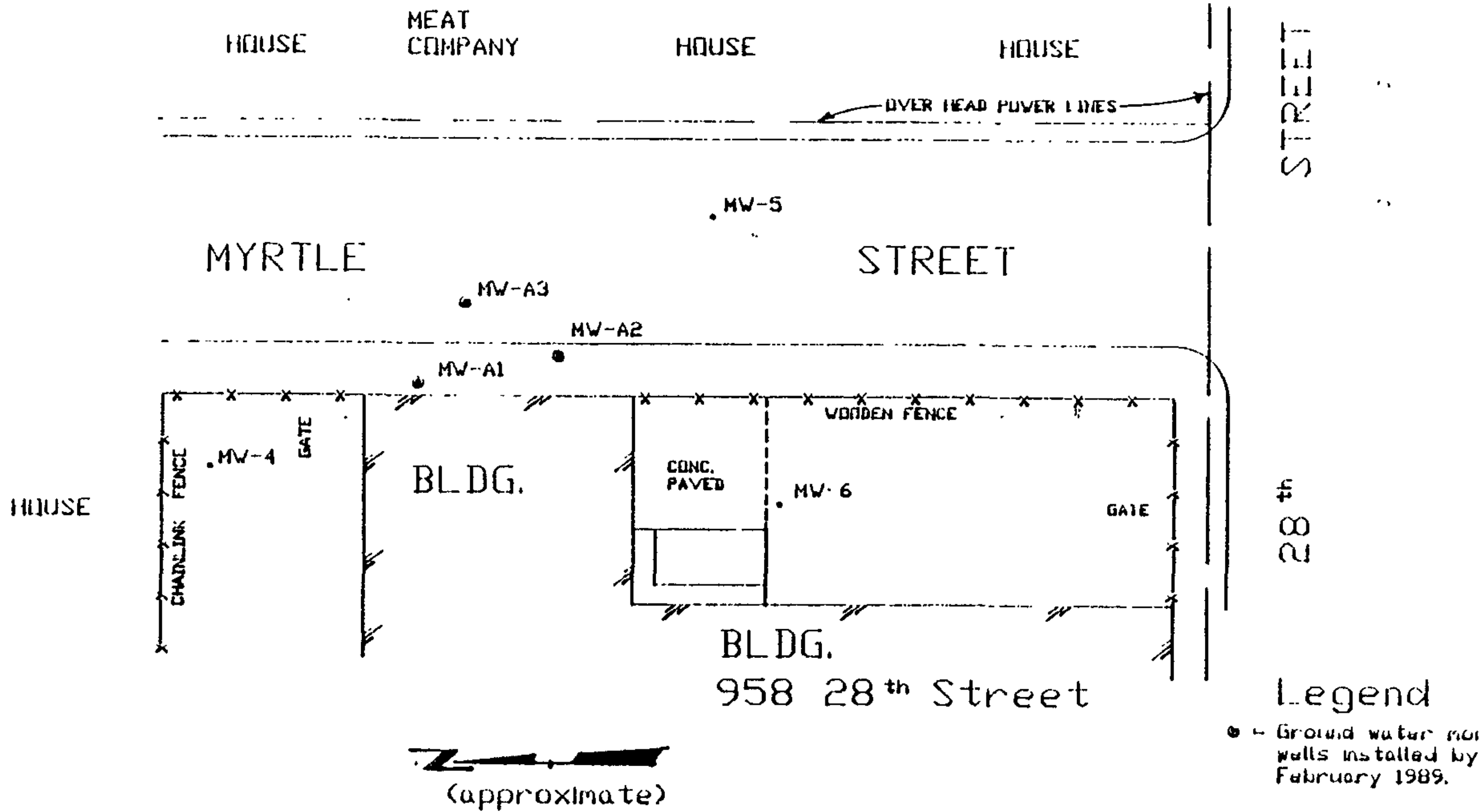
☐ For approval ☐ Approved as submitted ☐ Resubmit ______ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit ______ copies for distribution
☒ As requested ☐ Returned for corrections ☐ Return ______ corrected prints
☐ For review and comment ☐ ______
☐ FOR BIDS DUE ______ 19 ______ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Enclosed for your records as requested in the approved encroachment permit.
But please note that the City would no longer approve after the fact the locations of wells that do not meet the requirements on the enclosed procedure for encroachments or the conditions of approval of the encroachment permit itself.

COPY TO ______

SIGNED: Ana Gonsalves
273-2259

If enclosures are not as noted, kindly notify us at once.



Legend

● = Ground water monitoring wells installed by IT corp. February 1989.

• = Ground water monitoring wells installed by RMT; March 1990.

Scale: 1"=30'

Site Investigation Plan
Former Servisco Facility

EXHIBIT "A"

RMT INC

Dwn by: RAS
Date: MARCH 28,1990
Proj # 1660.05/06

APPENDIX J

CHEMICAL ANALYSES RESULTS

GROUND WATER SAMPLES

TMA
Thermo Analytical Inc.

TMA/Norcal
2030 Wright Avenue
P O Box 4040
Richmond, CA 94804-0040

(415) 235-2633 Fax No (415) 235-0438

APR 23 90

April 16, 1990

RMT, Incorporated
3250 Ocean Park Boulevard
Suite 370
Santa Monica, CA 90405

Attention: Mr. Zoran Batchko

TMA/Norcal I.D. Number: 6607-6
RMT, Incorporated Project Number: 1660.05 and 1660.06

Dear Mr. Batchko:

Enclosed are the results for seven water samples, three field blanks, and one trip blank received on March 22, 1990.

TMA/Norcal identification number 6607-6-11 (client identification number MW-4-A1) was the sample in the half-full one-liter jar from Project Number 1660.06. This sample had a floating product/water layer and the analysis showed that an extremely high amount of gasoline was present. The chromatogram for this sample is enclosed.

If you have any questions please call Robert Fox at (415) 235-2633 extension 254.

Submitted by:

Julie Wose
Gas Chromatography
Supervisor

Prepared by:

Nahid Mahani For

Robert Fox
Program Manager/Chemist

Attachments:
- Gasoline Results (2 pages)
- Chromatogram (4 pages)
- Diesel Results (1 page)
- EPA Method 602 Results (11 pages)
- Chain-of-Custody Forms (2 pages)

/

PETROLEUM HYDROCARBONS ANALYSIS RESULTS REPORT

Lab Name: TMA/Norcal
Client: RMT, INCORPORATED
Matrix: Water

Date Received: 3-22-90
Date Analyzed: 3-27-90

Analysis/Method: MODIFIED - 8015

TMA/Norcal ID	Client ID	Gasoline (mg/L)	Detection Limit (mg/L)
6607-6-11	MW-4-A1 ✓	37,500	0.5

Renee Doherty
Analyst

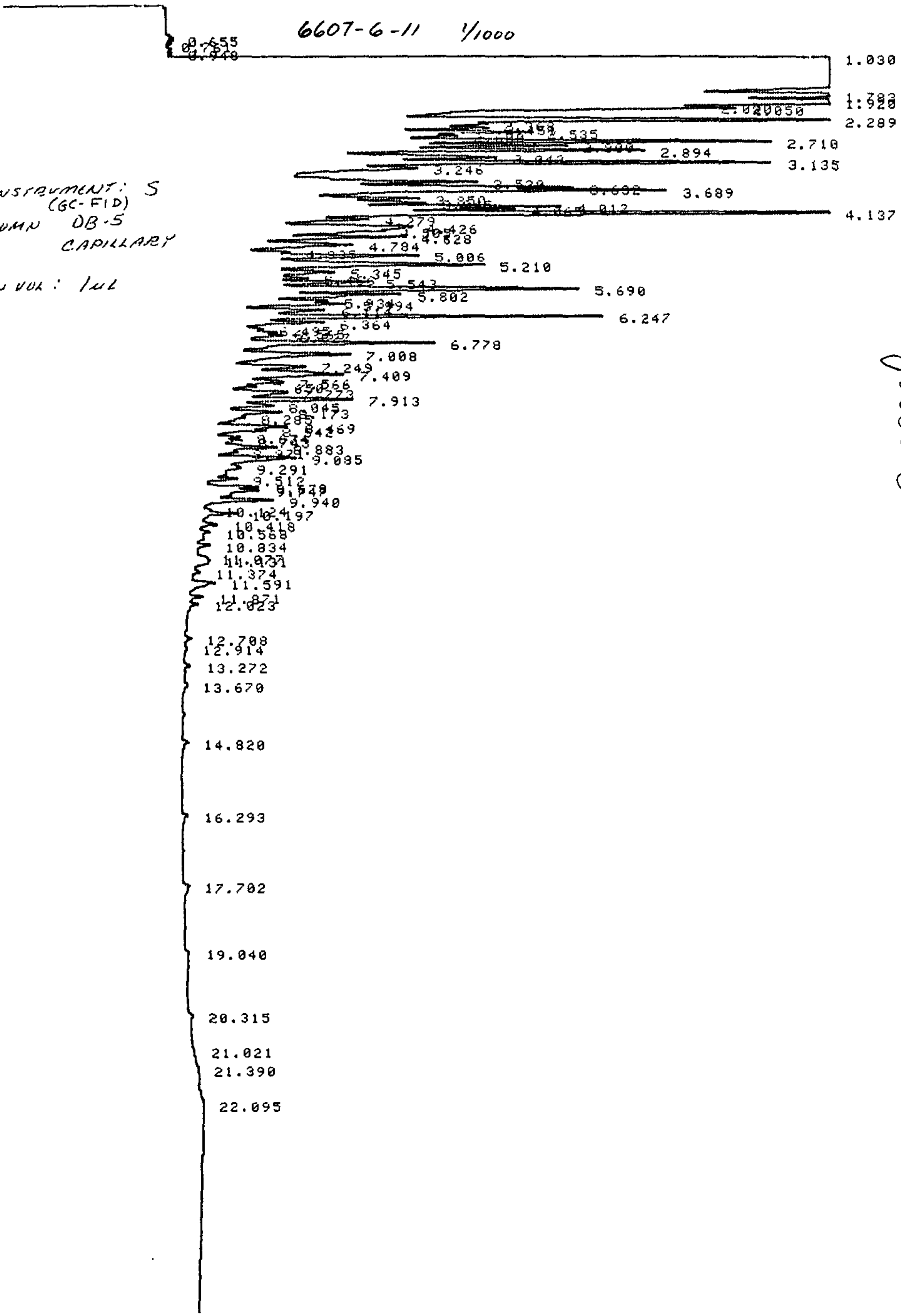
Data Release Authorized By

RUN # 2694 MAR 31, 1990 10:37:54

3520 - Preparation

START

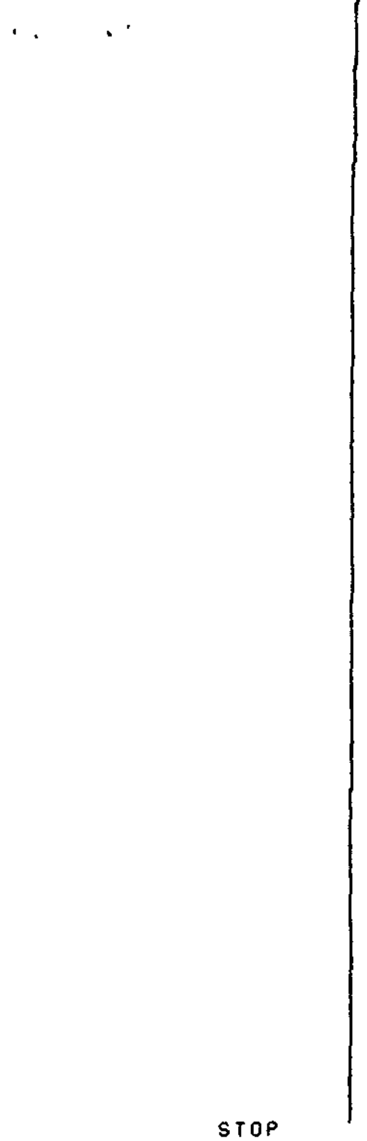
6607-6-11 1/1000



INSTRUMENT: S
(GC-FID)
COLUMN DB-5
CAPILLARY

INJ VOL: 1uL

Gasoline



```
          STOP


RUN#  2694          MAR 31, 1990  10:37:54

                              SAMPLE#   27

AREA%
     RT        AREA TYPE  WIDTH       AREA%
   .655        1019   PP   .052      .00014
   .948         296   PP   .021      .00004
  1.030 745880000  SPB   .114    99.74093
  1.783       52065  TBV   .086      .00696
  1.920      240731  TVV   .077      .03219
  2.020       12225  TVV   .026      .00163
  2.050       30965  TVP   .051      .00414
  2.289       78146  TPV   .065      .01045
  2.368       13776  TVV   .054      .00184
  2.451       14520  TVV   .053      .00194
  2.535       22463  TVV   .055      .00300
  2.600       13287  TVV   .057      .00178
  2.710       62443  TVV   .058      .00835
  2.800       32663  TVV   .058      .00437
  2.894       44428  TVV   .056      .00594
  3.043       34776  TVV   .078      .00465
  3.135       74680  TVV   .063      .00999
  3.246       26126  TVP   .090      .00349
  3.530       31586  TPV   .065      .00422
  3.632       41649  TVV   .057      .00557
```

```
    3.945      25234   TVV   .070      .00337
    4.012      32896   TVV   .046      .00440



RUN # 2694-002

    4.065      26238   TVV   .044      .00351
    4.137     124634   TVV   .064      .01667
    4.279      13735   TVP   .064      .00184
    4.426      23391   TPV   .083      .00313
    4.505       5406   TVB   .034      .00072
    4.628      16196    PP   .051      .00217
    4.784      20175    PP   .083      .00270
    4.935       4782    PH   .046      .00064
    5.006      31747    HH   .072      .00425
    5.210      55475    HH   .091      .00742
    5.345      17420    HV   .079      .00233
    5.466      11051    VV   .071      .00148
    5.543      20836    VV   .066      .00279
    5.690      74779    VV   .086      .01000
    5.802      29713    VV   .073      .00397
    5.934      12725    VV   .058      .00170
    5.994      14583    VV   .054      .00195
    6.114      15966    VV   .074      .00214
    6.247      52254    VV   .055      .00699
    6.364      15024    VV   .068      .00201
    6.495       3611    VV   .054      .00048
    6.565       5912    VV   .056      .00079
    6.627       7551    VV   .062      .00101
    6.778      39932    VV   .077      .00534
    7.008      32056    VV   .104      .00429
    7.249      16056    VV   .082      .00215
    7.409      33814    VV   .113      .00452
    7.566      12761    VV   .087      .00171
    7.650       4509    VV   .055      .00060
    7.773      16894    VV   .103      .00226
    7.913      25593    VV   .076      .00342
    8.045      11182    VV   .082      .00150
    8.173      13026    VV   .081      .00174
    8.285       4128    VV   .060      .00055
    8.469      12633    PV   .068      .00169
    8.542       7514    VV   .058      .00100
    8.674       3408    VV   .051      .00046
    8.743       4155    VV   .058      .00056
    8.883      13196    VV   .079      .00176
    8.971       4225    VV   .063      .00056
    9.085      23825    VV   .109      .00319
    9.291       9505    VV   .113      .00127
    9.512       4558    VP   .057      .00061
    9.678       7571    PV   .054      .00101
    9.747      10587    VV   .075      .00142
    9.940      12900    VV   .071      .00173
   10.124       1079    VV   .046      .00014
   10.197       6263    VV   .068      .00084
   10.418       3315    VV   .070      .00044
   10.568       1957    VV   .063      .00026
   10.834       2363    VV   .062      .00032
   11.077       1994    VV   .059      .00027
   11.131       2914    VV   .067      .00039
   11.374       1715    VP   .079      .00023
   11.591       6947    VP   .104      .00093
   11.871       2476    PV   .063      .00033
```

```
  12.914        760   VP    .075      .00010
  13.272       1570   PV    .084      .00021



 RUN # 2694-003

  13.670       1097   BP    .096      .00015
  14.820       1469   PV    .077      .00020
  16.293       1394   VV    .074      .00019
  17.702       1018   BV    .067      .00014
  19.040        970   PV    .080      .00013
  20.315       1084   PV    .108      .00014
  21.390       1570   VV    .257      .00021
  22.095       3649   VV    .464      .00049

TOTAL AREA=7.4782E+08
MUL FACTOR=1.0000E+00
```