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ADDITIONAL WELL INSTALLATION
TOW WAY FUEL FARM
INTERIM CORRECTIVE MEASURE
NAVAL STATION ROOSEVELT ROADS
CEIBA, PUERTO RICO

CONTRACT TASK ORDER 0277

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TABLE OF CONTENTS

Page

LIST OF ACRONYMS ..... **iv**

1.0 SITE LOCATION AND BACKGROUND **1**

2.0 PROJECT OBJECTIVE **1**

3.0 FIELD ACTIVITIES **3**
- 3.1 Subsurface Soil Sampling 3
- 3.2 Monitoring Well Installation 4
- 3.3 Well Development 4
- 3.4 Groundwater Sampling 5
- 3.5 In-situ Hydraulic Conductivity Tests (slug tests) 5

4.0 INVESTIGATIVE DERIVED WASTE MANAGEMENT **6**

5.0 RESULTS **7**
- 5.1 Quality Assurance/Quality Control (QA/QC) 7
- 5.2 Environmental Sample Results 8
  - 5.2.1 Soil Samples 9
  - 5.2.2 Groundwater Samples 9
- 5.3 Aquifer Characteristics 9

6.0 CONCLUSIONS AND RECOMMENDATIONS **10**
- 6.1 Conclusions 10
- 6.2 Recommendations 11

7.0 REFERENCES **11**

ATTACHMENTS

A Test Boring and Well Construction Records
B Well Development Records
C Chain-of-Custody Forms
D In situ Hydraulic Conductivity (Slug Test) Data
E Environmental and Geotechnical Analytical Results

LIST OF TABLES

1 Soil Sampling Summary
2 Summary of Well Construction Details
3 Summary of Groundwater Field Parameters
4 Groundwater Sampling Summary
5 Quality Assurance/Quality Control Analytical Results
6 Subsurface Soil Analytical Results
7 Groundwater Analytical Results
8 Summary of Hydraulic Conductivity Estimates

LIST OF FIGURES

1 Additional Monitoring Well/Recovery Well Locations - Tow Way Fuel Farm
2 Typical Shallow Above Grade Type II Groundwater Monitoring Well Construction Diagram
3 Typical Shallow Below Grade Type II Groundwater Monitoring Well Construction Diagram

LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
IDW	Investigative Derived Waste
NSRR	Naval Station Roosevelt Roads
QA/QC	Quality Assurance/Quality Control
RFI	RCRA Facility Investigation
TPH	Total Petroleum Hydrocarbon
TWFF	Tow Way Fuel Farm
USEPA	United States Environmental Protection Agency
USTs	Underground Storage Tanks

1.0 SITE LOCATION AND BACKGROUND

Naval Station Roosevelt Roads (NSRR) occupies part of the northern side of the east coast of Puerto Rico, along Vieques Passage with Vieques Island lying about 10 miles east of the harbor entrance at NSRR. Traveling from San Juan, the main gate (north entrance) of NSRR is approximately 35 miles east along the coast road (Route 3). The closest large town is Fajardo (population approximately 37,000), which is about 10 miles north of NSRR on Route 3. The town of Ceiba (population approximately 17,000) adjoins the west boundary of NSRR. The base occupies over 33,500 acres at the northeasternmost portion of Puerto Rico. The station has administrative and command responsibilities for operations separated from the main base on Vieques Island. NSRR was commissioned in 1943 as a Naval Operations Base, and finally redesignated a Naval Station in 1957. The primary mission of NSRR today is provision of full support for Atlantic Fleet weapons training and development activities.

The focus of this study was the Tow Way Fuel Farm (TWFF) which is located on a hillside along Forrestal Drive immediately north of Ensenada Honda. Constructed prior to 1957, the fuel farm originally consisted of nine underground storage tanks (USTs) containing diesel fuel marine and jet fuel (JP-5). The number of USTs has since been reduced to seven by the removal of two tanks. Data obtained from previous reports indicate that the USTs have been used solely for the storage of marine and jet fuel since their construction.

There have been numerous fuel spills and leaks at the TWFF since approximately 1957. The releases at the fuel farm have resulted in free phase hydrocarbons on the watertable surface. Based on the local topography and groundwater flow directions, fuel leaking from the USTs and associated piping flows south from the hillside, toward Ensenada Honda; however, the free-product plume at the site does not extend to Ensenada Honda, instead, it collects at the base of the hill and has migrated east, along Forrestal Drive.

2.0 PROJECT OBJECTIVE

The objective of the most recent phase of field activities at the TWFF was to install a series of wells at the leading edges of the free product plume in response to monitoring results which indicated the possible movement of the plume downgradient. The wells were installed to be included as part of

the continued monitoring efforts at the TWFF, but also be capable of being used for product recovery. As such, three of the wells are 6-inch diameter, suitable for conversion into product recovery wells should the need arise. As part of the well installation process, additional items also were completed at the TWFF during this most recent phase of field operations, including:

- Visual stratigraphic/lithologic logging of the soil column as borings were advanced
- Collection of soil samples from each individual, definable subsurface unit for grain size analysis
- Collection of at least two soil samples from each boring location for total petroleum hydrocarbon (TPH) analysis
- Collection of one groundwater sample from each monitoring well for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX)
- In situ horizontal permeability testing (slug tests)

Figure 1 provides the locations of five additional wells installed at the TWFF between October 21 and 28, 1997. As mentioned above, the five additional wells were installed at locations suitable for detecting any migration of the existing free product plume. Monitoring wells 7MW05 and 7MW06 were installed as two-inch wells positioned to detect migration of free product west of the site. Monitoring well 7MW05 is located immediately north of Forrestal Drive while 7MW06 was installed south of the road to detect the possible presence of product in the area. Monitoring wells 7MW07 and 7MW08 were installed as 6-inch wells to monitor the migration of free phase product east of the site along Forrestal Drive. These wells were designed and installed as potential recovery wells as the free product plume seems to be advancing in this portion of the site. The northern most well, 7MW09, was installed as a 6-inch well positioned south of UGW-2 which has contained measurable thicknesses of free phase product.

3.0 FIELD ACTIVITIES

The following sections describe the various field activities completed at the TWFF during installation of the new wells. Field operations and details of sampling methods are provided for each of the tasks.

3.1 Subsurface Soil Sampling

Standard drilling methods were employed at the site to complete soil borings for monitoring well installation. Soil samples were collected using split-spoon sampling methods in accordance with the procedures outlined in the American Society for Testing and Materials (ASTM) Standard Method for Penetration Test and Split-Barrel Sampling of Soils (Designation D 1586). Split-spoons of 24-inch (nominal) length were used throughout the investigation. Samples were collected at five foot intervals starting at three feet below ground surface (bgs).

Each sample was classified in the field by a geologist using the Unified Soil Classification System in accordance with the visual-manual methods described in ASTM 1993. The field descriptions were recorded in a field logbook and later transferred to boring record forms. Soil classification included characterization of soil type, grain size, color, moisture content, relative density, plasticity, and other pertinent information such as any indication of contamination. The Standard Penetration Test blow counts were also recorded. In addition, a photoionization detector was used to screen the samples to detect the presence of any volatile organic compounds. The test boring records and well construction records are presented in Attachment A. Sample information such as boring number, sample identification, time and date of sample collection, field sampling team, and analytical parameters were recorded for each of the soil samples.

Select subsurface soil samples were submitted for TPH analysis by modified United States Environmental Protection Agency (USEPA) Method 8015 (California Method) and grain size analysis. Table 1 presents a summary of the subsurface sampling program for the TWFF. The summary includes the following: sample location, sample interval, analyzed parameters, and indicates duplicate samples. The analytical results are discussed in Section 5.0.

3.2 Monitoring Well Installation

A total of five permanent wells were installed at the TWFF between October 21, 1997 and October 28, 1997. This included two 2-inch monitoring wells and three 6-inch monitoring wells. The wells utilized 20 feet of No. 20 (i.e., 0.020 inch) slot screen sections. A sand pack consisting of clean, uniform, medium grained sand, was placed inside of the annulus between the screen/riser and the borehole wall from the bottom of the well to two feet above the top of the screen. A 2-foot thick bentonite seal was placed above the sand pack. Above the bentonite seal, the annular space was filled with cement-bentonite grout to the ground surface. Monitoring wells 7MW05, 7MW07, and 7MW09 were completed above-ground with a 3-foot x 3-foot concrete pad. Additionally, four protective steel bollards were installed in the pad to prevent damage to the well and protective casing. Monitoring wells 7MW06 and 7MW08 were completed below ground surface as flush-mount wells with a protective steel casing finished at grade. The flush mount cover for monitoring well 7MW06 was set in a 3-foot x 3-foot concrete pad while 7MW08 was finished even with the existing road surface of Forrestal Drive. Table 2 provides the details of the well construction information for the newly installed wells at the TWFF. Figures 2 and 3 illustrate typical construction for above and below ground wells.

3.3 Well Development

All of the monitoring wells were developed prior to sampling with the exception of monitoring well 7MW08. This well did not require development as it was constructed in fractured bed rock and produced significant amounts of water during installation. The well was installed using air rotary drilling methods which evacuates cuttings and water to the surface as the borehole is advanced through rock. The water produced from the well during drilling was very clear and sediment free, demonstrating very good hydraulic connection between the monitoring well and formation.

The remaining monitoring wells were developed using a Brainard-Kilman positive displacement hand pump. During development procedures, visual observations and water quality readings including specific conductance, pH, and temperature were recorded. The wells were developed until the water was relatively clear and water quality readings were observed to be stable. Monitoring well development records are included in Attachment B.

3.4 Groundwater Sampling

Groundwater samples were collected from the monitoring wells to assess whether product was present at the monitoring points. Based upon previous investigative results, the constituents of potential concern were primarily BTEX.

A water level measurement was obtained from each well prior to groundwater purging. The total well depth was also recorded from each well to the nearest 0.1-foot prior to sampling. The static water level, well depth and well diameter measurements were used to calculate the volume of water in each well.

A minimum of three well volumes were purged from each well prior to sampling. Measurements of pH, specific conductance, and temperature were taken after each volume was purged to ensure that the groundwater quality had stabilized before sampling. These measurements were recorded in a field logbook and are provided on Table 3.

Upon completion of purging activities, a bottom loading, polyethylene, disposable, bailer was lowered into the well for sample collection. Once the bailer was filled, it was removed from the well and groundwater was slowly poured from the bailer directly into laboratory supplied glass containers.

Sample information, including well number, sample identification, time and date of sample collection, analytical parameters, and required laboratory turnaround time, was recorded in a field logbook and on sample labels. Chain-of-custody documentation, provided in Attachment C, accompanied the samples to the laboratory. Immediately following collection, the samples were placed on ice in appropriate coolers. Table 4 provides a summary of the requested analytical procedures for the groundwater samples.

3.5 In-situ Hydraulic Conductivity Tests (slug tests)

The shallow aquifer in the vicinity of the newly installed wells was characterized by performing in situ rising and falling head slug tests. The tests were performed on October 31 and November 1, 1997. A solid Teflon slug was quickly inserted into, or removed from, the well to displace the water in the well. An electronic data logger (In-Situ Hermit Model SE2000) and pressure transducer assembly

were used to record the recovery of water in the monitoring well to static level. All data was recorded on logarithmic scale to more closely monitor the initial changes in groundwater elevation. The data resulting from the slug tests were converted into time (in minutes) and the corresponding change in water level displacement (in feet). Results from the rising head tests were analyzed using Geraghty & Miller=s AQTESOLV computer program for performing quantitative groundwater assessments. The monitoring wells were analyzed for both rising and falling head tests, however in some cases, falling head tests are influenced by conditions associated with unconfined aquifers. Since these conditions cast uncertainties on the results, some rising head tests were omitted in the assessment of the site conditions.

Following is a tabulation of the monitoring wells for which slug tests were performed:

- 7MW02A (Existing Monitoring Well)
- 7MW05 (Newly Installed Monitoring Well)
- 7MW06 (Newly Installed Monitoring Well)
- UGW16 (Existing Monitoring Well)

The AQTESOLV computer program applies the Bouwer and Rice solution for slug tests in unconfined aquifers. This method was used to evaluate all test data. A complete report of the raw data and solution analysis is provided in Attachment D. The results of the in situ slug tests and hydrogeologic conditions in the vicinity of the newly installed wells are discussed in Section 5.0.

4.0 INVESTIGATIVE DERIVED WASTE MANAGEMENT

The field investigation activities at the TWFF resulted in the generation of investigative derived waste (IDW). The IDW included soil cuttings and purge/development water. The general management techniques utilized for the IDW were:

- Collection and containerization of IDW material
- Temporary storage of IDW while awaiting analytical data
- Final disposal of aqueous and solid IDW material

None of the development/purge water contained free phase product, therefore all of the generated liquids were disposed of on-site at the fuels area oil/water separator system. The IDW soil was temporarily stored in 55-gallon drums at a secure location on the base. Pending appropriate laboratory analysis, the drums were properly disposed.

5.0 RESULTS

The following sections discuss the results of the analytical data collected at the TWFF. Each of the soil samples were analyzed for TPH and grain size, while the groundwater samples were analyzed for BTEX. In addition to the environmental samples, quality assurance/quality control (QA/QC) samples were collected.

5.1 Quality Assurance/Quality Control (QA/QC)

Analytical data generated during the investigation was submitted for third-party validation to Heartland Environmental Services, Inc. of St. Charles, Missouri. Procedures used were from the approved RCRA Facility Investigation (RFI) workplan and represent the specific USEPA Region II guidelines. Validation of the analytical data serves to reduce the inherent uncertainties associated with its usability. Data qualified as AJ@ were retained as estimated values. Estimated analytical results within a data set are common and considered usable by the USEPA. Data may be qualified as AJ@ for several reasons, including an exceedance of holding times, high or low surrogate recovery, or intra-sample variability. In addition, values may be assigned an estimated AJ@ qualifier if the reported value is below the Contract Required Detection Limit (CRDL) or the Contract Required Quantitation Limit (CRQL). Additional data qualifiers were employed during the validation of data. For example, those results which are estimated to be present are qualified with a AUJ@. In addition, compounds which were not detected were assigned the AU@ qualifier with the corresponding detection limit.

Field QA/QC samples were collected during the investigation at the TWFF. The samples were obtained to 1) ensure that decontamination procedures were effective (equipment rinsate samples); 2) evaluate field methodologies (duplicate samples) and 3) evaluate whether cross-contamination occurred during sampling and shipping (trip blanks). A brief summary of the QA/QC samples collected during this investigation is provided below.

- Duplicate Samples: Duplicate were obtained at frequencies equal to or greater than ten percent of the total number of samples collected. The duplicate samples were collected at the same time, using the same techniques as the planned original environmental samples. Four duplicate samples were collected during the investigation.

- Equipment Rinsate Blanks: Equipment rinsate blanks were prepared for sampling equipment utilized to collect environmental samples. Rinsate samples were analyzed for parameters associated with the sampling event. Two rinsate samples were collected at the TWFF, one for the soil sampling and another for groundwater sampling.

- Trip Blanks: Trip blanks were prepared prior to the sampling event, placed in sample storage containers, and kept with the investigative samples throughout the sampling event. The trip blanks were then packaged for shipment with the environmental samples and sent for analysis. Trip blanks were used to determine if samples were cross-contaminated during storage and transportation to the laboratory. A total of five trip blanks were analyzed during the investigation.

Results of the QA/QC samples are provided on Table 5. All of the QA/QC sample results were recorded as non-detect, except equipment rinsate sample 7ER01 collected from a split spoon sampler. This rinsate sample detected TPH Gasoline Range Organics (GRO) at an estimated concentration of 38J µg/l. The detection of TPH in the sample may be due to inadequate decontamination procedures or exposure of the sampling equipment to media prior to sampling collection. Although, it is preferred to obtain non-detectable levels from sampling equipment, this concentration does not significantly impact the soil environmental sample results.

5.2 Environmental Sample Results

Investigative activities at the TWFF included the collection of soil and groundwater samples. Soil samples were analyzed for TPH and grain size and groundwater samples were analyzed for BTEX. Figure 1 illustrates the locations of the newly installed monitoring wells and corresponding sample points. Each of the media sampled are presented separately, including soil and groundwater samples.

5.2.1 Soil Samples

A total of 34 soil samples were collected from the soil borings at the TWFF. This includes 30 environmental samples and four duplicate environmental samples. Each of the samples were analyzed for TPH (EPA modified 8015). Eleven of the samples contained detectable TPH. Table 6 provides a list of positive detections for the soil samples. The positive detections ranged from 7.9 NJ mg/kg Diesel Range Organics (DRO) in sample 7MW08-02 to 620 µg/kg (GRO) at 7MW09-05. The majority of the positive detections occurred in samples collected from boring location 7MW09. This is expected, as this sampling point is located in the center of the TWFF where the majority of site contamination exists. The complete set of analytical data is included in Attachment E.

Fourteen of the soil samples were analyzed for grain size. Samples colleted for geotechnical analyses were taken from each definable stratigraphic unit. The results of the geotechnical testing vary from boring to boring, however the subsurface is generally classified as a silty/clayey sand with occasional gravel and shell fragments. This is consistent with the general conceptual model of the TWFF, which is silty/clayey sands overlying a fractured bedrock base. A complete report of the geotechnical lab results are included in Attachment E.

5.2.2 Groundwater Samples

Each of the newly installed monitoring wells were sampled for BTEX, this included five environmental samples and one duplicate sample collected from monitoring well 7MW08. None of the samples collected contained detectable petroleum compounds. Table 7 provides a list of the sample data and corresponding detection limits.

5.3 Aquifer Characteristics

The hydrogeological conditions in three areas of the site were characterized by performing in situ hydraulic conductivity (slug tests). The three areas where slug tests were performed include the northern portion of the site at monitoring well location 7MW02A, the western portion of the site at monitoring wells 7MW05 and 7MW06, and the eastern portion of the site at monitoring well UGW16. Table 8 lists the hydraulic conductivity (K values) obtained from the data analysis. The K values obtained are within the typical range for silty sands, and gravel (Fetter, 1980). The hydraulic gradient

in the three areas of the TWFF was estimated from existing potentiometric maps of the site. Published effective porosity values indicate a range of approximately 3 to 8 percent for clays and silts (Roscoe Moss Co., 1990). Using the various hydraulic gradients at the site, the slug tests and an estimated effective porosity of 0.30, the average linear groundwater flow velocity was estimated in three areas of the site by using a variation of Darcy=s equation:

$$V=Ki/n_e$$

Where: V = groundwater flow velocity

K = hydraulic conductivity

i = hydraulic gradient

n_e = effective porosity

The estimated flow velocity in the northern portion of the site was determined by using the hydraulic conductivity measured at monitoring well 7MW02A (0.2631 ft/d) a hydraulic gradient of 0.01 and an effective porosity of 0.30. Using these variables, the groundwater flow velocity (V) in the northern area of the TWFF is estimated to be 8.77×10^{-3} ft/day. In the eastern portion of the site, velocity was determined by using the hydraulic conductivity from monitoring well UGW16 (0.2493 ft/d), a hydraulic gradient of 0.03 and an effective porosity of 0.30. Using these variables, groundwater flow velocity in the eastern portion of the site is estimated to be 2.49×10^{-2} ft/d. In the western portion of the site the hydraulic conductivity measured at monitoring well 7MW06 (86.6 ft/d) was used along with a hydraulic gradient of 0.008 and an effective porosity of 0.30 to estimate the flow velocity. These variables give a value of 2.31 ft/day in the western portion of the TWFF.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The laboratory analytical data suggest minimal impact to the soil at the sampling points. TPH was detected in nine of thirty-four soil samples analyzed. Most of these detections occurred at soil boring location 7MW09 which is located in the center of the TWFF site. Analysis of the five groundwater samples did not detect any compounds associated with petroleum hydrocarbons.

6.2 Recommendations

The additional monitoring wells installed at the TWFF have been positioned and installed to provide monitoring points at critical locations associated with the free product plume. Several of the wells are capable of serving as product recovery points should it be necessary. At the present time the wells will be incorporated into the monitoring program at the TWFF. If monitoring activities detect free product in the wells, actions will be taken to install the necessary equipment so that they may be included into the Interim Corrective Measure product recovery system currently in operation at the TWFF.

7.0 REFERENCES

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TABLES

TABLE 1

SOIL SAMPLING SUMMARY
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION, ROOSEVELT ROADS, CTO-0277
PUERTO RICO

Sample Location	Media	TPH Mod. 8015 - DRO/GRO[1]	Grain Size	Depth (ft bgs)	Sample Identification
7MW05	Soil	X	X	3.0 to 5.0	7MW05-01
7MW05	Soil	X	X	8.0 to 10.0	7MW05-02
7MW05	Soil	X		13.0 to 15.0	7MW05-03
7MW05	Soil	X		18.0 to 20.0	7MW05-04
7MW05	Soil	X		28.0 to 30.0	7MW05-06
7MW06	Soil	X	X	3.0 to 5.0	7MW06-01
7MW06	Soil	X		8.0 to 10.0	7MW06-02
7MW06	Soil	X	X	13.0 to 15.0	7MW06-03
7MW06	Soil	X	X	18.0 to 20.0	7MW06-04
7MW06	Soil	X	X	23.0 to 25.0	7MW06-05
7MW06	Soil	X	X	28.0 to 30.0	7MW06-06
7MW07	Soil	X	X	8.0 to 10.0	7MW07-02
7MW07	Soil	X	X	13.0 to 15.0	7MW07-03
7MW07	Soil	X		18.0 to 20.0	7MW07-04
7MW07	Soil	X		23.0 to 25.0	7MW07-05
7MW07	Soil	X		28.0 to 30.0	7MW07-06
7MW08	Soil	X	X	3.0 to 5.0	7MW08-01[2]
7MW08	Soil	X		8.0 to 10.0	7MW08-02[2]
7MW09	Soil	X	X	3.0 to 5.0	7MW09-01
7MW09	Soil	X		8.0 to 10.0	7MW09-02
7MW09	Soil	X		13.0 to 15.0	7MW09-03
7MW09	Soil	X		18.0 to 20.0	7MW09-04
7MW09	Soil	X	X	23.0 to 25.0	7MW09-05
7MW09	Soil	X		28.0 to 30.0	7MW09-06
7MW09	Soil	X		33.0 to 35.0	7MW09-07
7MW09	Soil	X		38.0 to 40.0	7MW09-08
7MW09	Soil	X		43.0 to 45.0	7MW09-09
7MW09	Soil	X	X	48.0 to 50.0	7MW09-10
7MW09	Soil	X		53.0 to 55.0	7MW09-11[2]
7MW09	Soil	X	X	58.0 to 60.0	7MW09-12[2]

Notes:

[1] Total Petroleum Hydrocarbons by EPA Method Modified 8015 (California Method) Diesel Range Organics/Gasoline Range Organics
[2] Duplicate Sample Collected

x = Requested Analysis

TABLE 2

SUMMARY OF WELL CONSTRUCTION DETAILS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION, ROOSEVELT ROADS, CTO-0277
PUERTO RICO

Monitoring Well Number	Date Installed	Top of Casing Elevation (feet, msl)	Ground Surface Elevation (feet, msl)	Boring Depth (feet, bgs)	Well Depth (feet, bgs)	Screen Interval Depth (feet, bgs)	Depth of Sand Pack (feet, bgs)	Depth to Bentonite (feet, bgs)	Stick-Up (feet, ags)	Well Diameter (inches)
7MW05	10/23/97	NA	NA	30.0	25.0	5.0 to 25.0	3.0	1.0	2.5	2
7MW06	10/23/97	NA	NA	30.0	25.0	5.0 to 25.0	3.0	1.0	-0.5	2
7MW07	10/22/97	NA	NA	30.0	25.0	5.0 to 25.0	3.0	1.0	2.5	6
7MW08	10/28/97	NA	NA	30.0	28.0	8.0 to 28.0	6.0	4.0	-0.5	6
7MW09	10/25/97	NA	NA	60.0	58.7	38.7 to 58.7	37.0	35.0	2.5	6

Notes:

msl = Mean Sea Level
bgs = Below Ground Surface
NA = Information not available
ags = Above Ground Surface

Monitoring wells 7MW06 and 7MW08 are flush mount wells.
The monitoring wells are scheduled to be surveyed during the next investigative activity at the station.

TABLE 3

SUMMARY OF GROUNDWATER FIELD PARAMETERS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION, ROOSEVELT ROADS, CTO-0277
PUERTO RICO

Well Number	Measuring Time	Well Volumes	Field Parameters		
			Specific Conductance µmhos/cm	Temperature (EC)	pH (S.U.)
7MW05	1708	0.40	2,154	30.0	7.86
	1711	0.80	2,660	29.8	7.76
	1712	1.00	2,659	29.8	7.76
	1713	1.20	3,040	29.7	7.71
	1715	1.40	3,025	29.6	7.72
	1716	1.60	3,024	29.6	7.72
	1716	1.80	3,500	29.5	7.66
	1717	2.00	3,874	29.4	7.60
	1720	2.20	3,391	29.5	7.65
	1722	2.40	3,630	29.4	7.66
	1724	2.60	3,505	29.4	7.66
	1726	2.80	3,523	29.6	7.67
	1729	3.0	3,604	29.1	7.59
7MW06	1320	1.0	6.73	30.5	17.13
	1325	2.0	6.12	30.3	17.71
	1337	3.0	6.78	30.1	17.82
	1342	4.0	6.79	30.1	17.84
	1345	4.3	6.91	30.2	17.69
	1347	4.67	6.93	30.2	17.78
	1350	5.0	6.92	30.2	17.81
7MW07	0944	0.29	1,334	31.0	7.74
	0950	0.59	1,310	30.5	7.78
	0954	0.88	1,313	30.3	7.79
	0955	1.0	1,327	30.0	7.79
	0958	1.18	1,315	30.0	7.81
	1001	1.47	1254	30.0	7.82
	1006	1.76	1,323	29.9	7.79
	1010	2.0	1,350	29.9	7.77
	1015	2.35	1,374	29.8	7.79
	1056	2.65	1,423	30.4	7.76
	1144	2.94	1,450	30.3	7.74
	1145	3.0	1,449	30.3	7.72

Well Number	Measuring Time	Well Volumes	Field Parameters		
			Specific Conductance µmhos/cm	Temperature (EC)	pH (S.U.)
7MW08	1548	0.17	4,180	30.3	7.12
	1556	0.33	5.44	29.7	7.09
	1600	0.5	6.24	29.8	7.04
	1602	0.57	7.51	29.8	7.01
	1604	0.67	7.57	29.8	6.95
	1608	0.83	7.74	29.7	7.01
	1611	1.0	8.25	29.7	6.95
	1612	1.13	8.38	29.5	6.95
	1615	1.17	8.39	29.5	6.94
	1620	1.33	8.29	29.7	7.01
	1623	1.5	8.30	29.5	7.05
	1627	1.67	8.30	29.3	7.03
	1628	1.70	8.31	29.5	7.03
	1631	2.0	8.30	29.3	7.03
	1633	2.33	8.31	29.3	7.03
	1635	2.67	8.30	29.3	7.04
	1640	3.0	89.3	29.3	7.04
7MW09	0740	0.33	4,380	28.1	7.08
	0745	0.67	4,350	28.3	7.24
	0753	1.0	4,424	28.6	7.19
	0800	1.33	4,147	28.4	7.36
	0811	1.67	4,237	28.5	7.36
	0821	2.0	4,551	28.3	7.38
	0834	2.33	4,585	28.3	7.39
	0845	2.67	4,443	28.3	7.39
	0855	3.0	4,514	28.3	7.37
	0915	3.33	4,518	28.3	7.29
	0920	4.0	4,517	28.3	7.30

TABLE 4

GROUNDWATER SAMPLING SUMMARY
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION, ROOSEVELT ROADS, CTO-0277
PUERTO RICO

Sample Location	Media	BTEX[1]	Sample Identification
7MW05	Groundwater	X	7MW05-01
7MW06	Groundwater	X	7MW06-01
7MW07	Groundwater	X	7MW07-01
7MW08	Groundwater	X	7MW08-01[2]
7MW09	Groundwater	X	7MW09-01

Notes:

[1] EPA Method 8240. Benzene, toluene, ethylbenzene, xylene.
[2] Duplicate Sample Collected.

x = Requested Analysis

TABLE 5
QUALITY ASSURANCE/QUALITY CONTROL ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7ER01	7ER02	TB01	TB02	TB03	TB04	TB04-1	TB05
DATE SAMPLED	11/04/97	11/11/97	10/28/97	10/28/97	11/05/97	11/04/97	11/11/97	11/13/97
TPH								
DIESEL RANGE ORGANICS (mg/L)	0.12 U	NA	NA	NA	NA	NA	NA	NA
GASOLINE RANGE ORGANICS (ug/L)	38 J	NA	50 U	50 U	50 U	50 U	NA	NA
BTEX (ug/L)								
BENZENE	NA	5 U	NA	NA	NA	NA	5 U	5 U
ETHYLBENZENE	NA	5 U	NA	NA	NA	NA	5 U	5 U
TOLUENE	NA	5 U	NA	NA	NA	NA	5 U	5 U
XYLENE (TOTAL)	NA	5 U	NA	NA	NA	NA	5 U	5 U

NOTES:
U = not detected at reported quantitation limit.
J = value is estimated.
NA = not analyzed.
mg/L = milligram per liter or parts per million (ppm).
mg/kg = milligrams per kilogram or parts per million (ppm).

TABLE 6
SUBSURFACE SOIL ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7MW05-01	7MW05-02	7MW05-03	7MW05-04	7MW05-06	7MW06-01	7MW06-02	7MW06-03
DATE SAMPLED	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97
TPH								
DIESEL RANGE ORGANICS (mg/kg)	6.5 U	8 U	7 U	6.8 U	7 U	7.3 U	7.3 U	11 U
GASOLINE RANGE ORGANICS (ug/kg)	53 U	64 U	56 U	56 U	29 J	60 U	59 U	94 U

NOTES:
U = not detected at reported quantitation limit.
J = value is estimated.
NJ = estimated/tentative identification.
mg/kg = milligrams per kilogram or part per million (ppm).
ug/kg = microgram per kilogram or part per billion (ppb).

TABLE 6
SUBSURFACE SOIL ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7MW06-04	7MW06-05	7MW06-06	7MW07-02	7MW07-03	7MW07-04	7MW07-05	7MW07-06
DATE SAMPLED	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97	10/30/97
TPH								
DIESEL RANGE ORGANICS (mg/kg)	8.6 U	7.4 U	8.2 U	6.5 U	7 U	7.4 U	7.1 U	7.1 U
GASOLINE RANGE ORGANICS (ug/kg)	70 U	60 U	67 U	54 U	56 U	61 U	59 U	57 U

NOTES:
U = not detected at reported quantitation limit.
J = value is estimated.
NJ = estimated/tentative identification.
mg/kg = milligrams per kilogram or part per million (ppm).
ug/kg = microgram per kilogram or part per billion (ppb).

TABLE 6
SUBSURFACE SOIL ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7MW08-01	7MW08-01D	7MW08-02	7MW08-02D	7MW09-01	7MW09-02	7MW09-03	7MW09-04
DATE SAMPLED	11/02/97	11/02/97	11/02/97	11/03/97	10/30/97	10/30/97	10/30/97	10/30/97
TPH								
DIESEL RANGE ORGANICS (mg/kg)	11 NJ	9.7 NJ	7.9 NJ	12 NJ	7.6 U	7.5 U	6.8 U	8.7 U
GASOLINE RANGE ORGANICS (ug/kg)	550	52 U	55 U	55 U	61 U	60 U	56 U	71 U

NOTES:
U = not detected at reported quantitation limit.
J = value is estimated.
NJ = estimated/tentative identification.
mg/kg = milligrams per kilogram or part per million (ppm).
ug/kg = microgram per kilogram or part per billion (ppb).

TABLE 6
SUBSURFACE SOIL ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7MW09-05	7MW09-06	7MW09-07	7MW09-08	7MW09-09	7MW09-10	7MW09-11	7MW09-11D
DATE SAMPLED	11/02/97	10/31/97	10/31/97	10/31/97	10/31/97	10/31/97	11/02/97	11/02/97
TPH								
DIESEL RANGE ORGANICS (mg/kg)	7.4 U	8.1 U	8 U	7.7 U	7.1 U	7.1 U	8.1 U	7.8 U
GASOLINE RANGE ORGANICS (ug/kg)	620	480	51 J	37 J	32 J	57 U	65 U	91

NOTES:
U = not detected at reported quantitation limit.
J = value is estimated.
NJ = estimated/tentative identification.
mg/kg = milligrams per kilogram or part per million (ppm).
ug/kg = microgram per kilogram or part per billion (ppb).

TABLE 6
SUBSURFACE SOIL ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7MW09-12	7MW09-12D
DATE SAMPLED	11/02/97	11/02/97
TPH		
DIESEL RANGE ORGANICS (mg/kg)	7.7 U	7.7 U
GASOLINE RANGE ORGANICS (ug/kg)	62 U	62 U

NOTES:
U = not detected at reported quantitation limit.
J = value is estimated.
NJ = estimated/tentative identification.
mg/kg = milligrams per kilogram or part per million (ppm).
ug/kg = microgram per kilogram or part per billion (ppb).

TABLE 7
GROUNDWATER ANALYTICAL RESULTS
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION ROOSEVELT ROADS, CTO-0277
PUERTO RICO

SAMPLE ID	7MW05-01	7MW06-01	7MW07-01	7MW08-01	7MW08-01D	7MW09-01
DATE SAMPLED	11/13/97	11/13/97	11/13/97	11/13/97	11/13/97	11/13/97
BTEX (ug/L)						
BENZENE	5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5 U	5 U	5 U	5 U	5 U	5 U
XYLENE (TOTAL)	5 U	5 U	5 U	5 U	5 U	5 U

NOTES:
U = not detected at reported quantitation limit.
ug/L = micrograms per liter or parts per billion (ppb).

TABLE 8

SUMMARY OF HYDRAULIC CONDUCTIVITY ESTIMATES
TOW WAY FUEL FARM (SWMU 7/8)
NAVAL STATION, ROOSEVELT ROADS, CTO-0277
PUERTO RICO

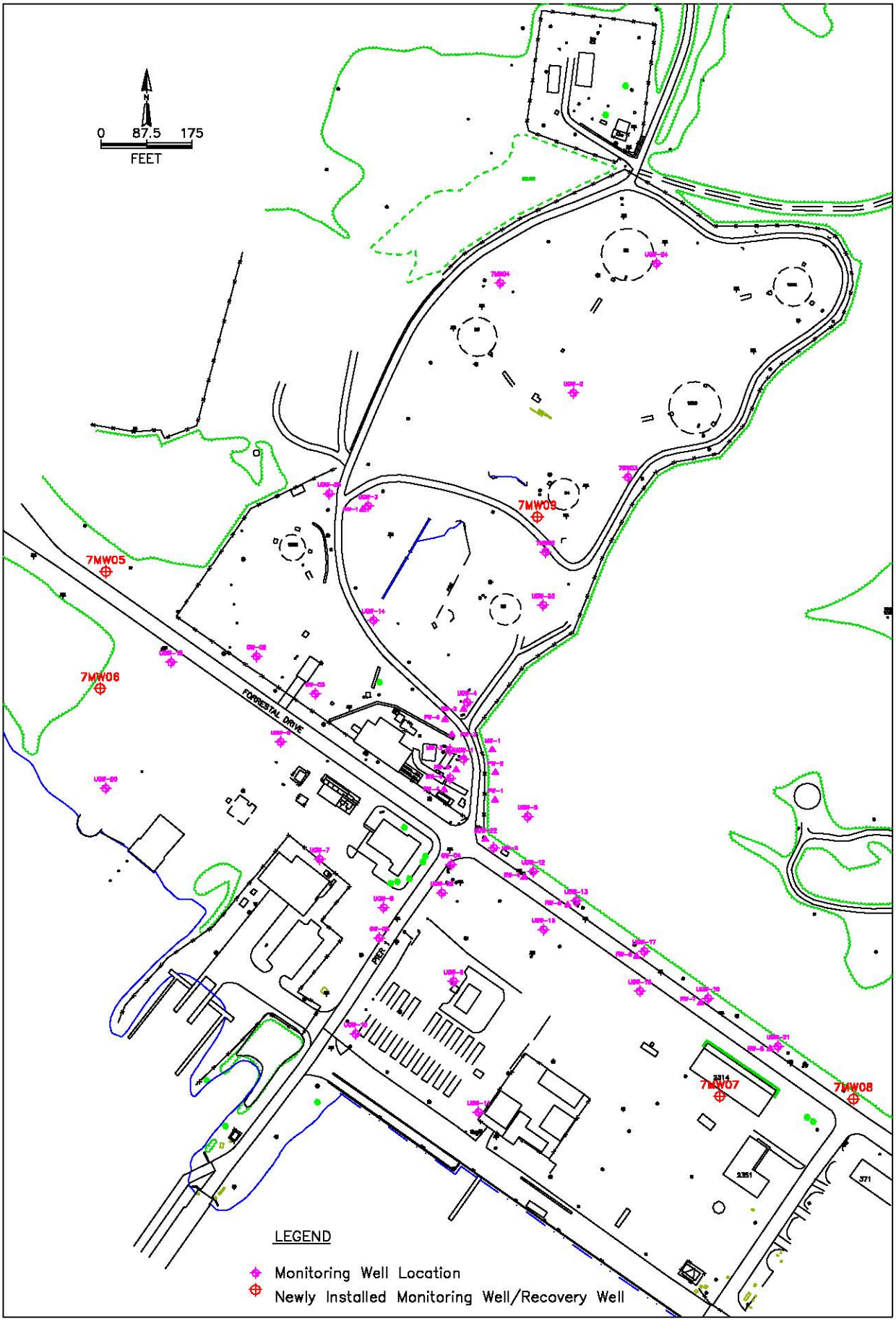
Well Identification	Hydraulic Conductivity (ft/day)		Average	Hydraulic Conductivity (cm/sec)		Average
	Falling Head	Rising Head		Falling Head	Rising Head	
7MW05[(1)]	--	1.227	--	--	4.33×10^{-4}	--
7MW06[(1)]	--	86.6	--	--	3.06×10^{-2}	--
UGW16[(1)]	--	0.2493	--	--	8.80×10^{-5}	--
7MW02A	0.08094	0.2631	0.17202	2.85×10^{-5}	9.28×10^{-5}	6.07×10^{-5}

Notes:

[(1)] Shallow monitoring well

ft/day - Feet per Day
-- - Test Not Used for Groundwater Assessment

FIGURES



DWG. NO. 277500LR

Baker	TITLE: Additional Monitoring Well/Recovery Well Locations – Tow Way Fuel Farm Naval Station Roosevelt Roads, Puerto Rico	DWN: WJH	DES.: JPT	PROJECT NO.: CTO–0277
		CHKD:	APPD:	FIGURE NO.: 1
		DATE: 1/5/97	REV.:	

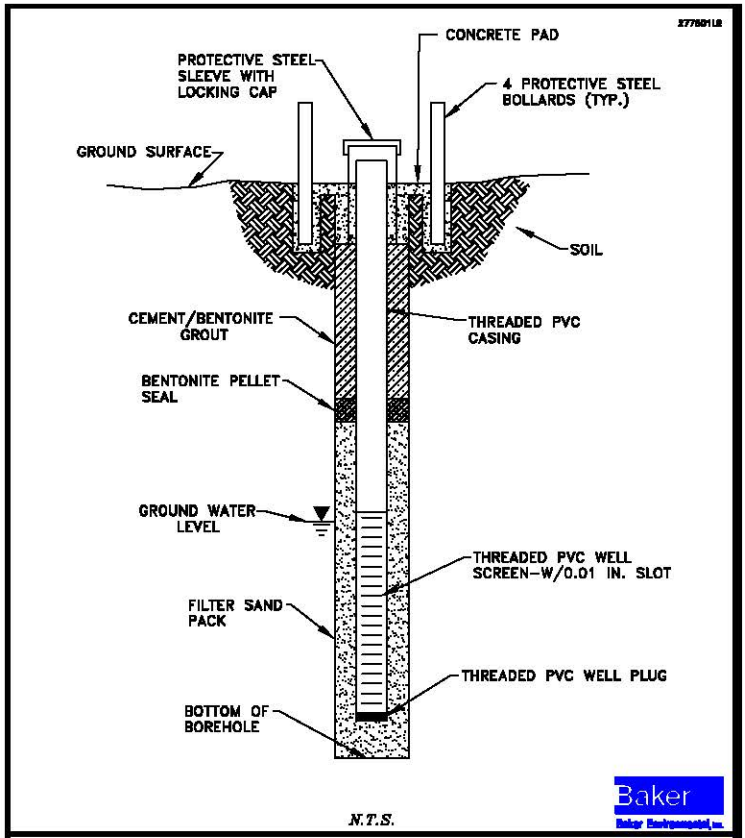


FIGURE 2
TYPICAL SHALLOW ABOVE GRADE TYPE II GROUNDWATER MONITORING WELL CONSTRUCTION DIAGRAM
CTO – 0277

NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

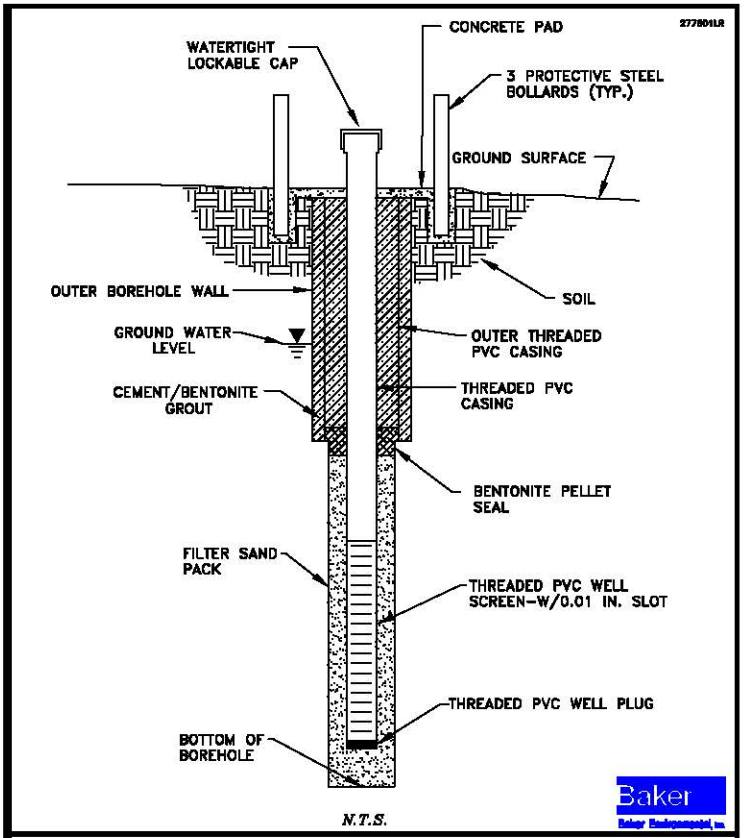


FIGURE 2
TYPICAL DEEP ABOVE GRADE TYPE III GROUNDWATER MONITORING WELL CONSTRUCTION DIAGRAM
CTO – 0277

NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

ATTACHMENT A
TEST BORING AND WELL CONSTRUCTION RECORDS

Baker
Baker Environmental, Inc

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU7
CTO NO.: 0277 BORING NO.: 7MW05
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		8 1/4"		10/22/97	30	clear 70°	20'	0 hr
LENGTH	2'		5						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Located west of Tow Way Fuel Farm North Side of Foresstal Dr.

SAMPLE TYPE
S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	2"	PVC	-2.5 stick up	5
Screen 0.020 slot	2"	PVC	5	25

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1, 2	AN					Auger to 3' bgs No Sample	Bentonite @ 1' bgs	
3							Sand @ 3' bgs	
4, 5	S-1 1540	1.08/2.0 38%	22 50/5"		0.5/0.5	Lt. Brn. Silt, Some gravel. Dry Appears to be fill material. At tip of sample (i.e., last 2") is natural material. Rx Fragments angular/subangular 7MW05-01 TPH DRO/GRO Grain Size	Top of Screen @ 5' bgs	
6, 7	AN							
8								
9, 10	S-2 1550	1.58/2.0 79%	42 46 50/5.5"		0.5/0.5	Tan Silt and Rock Frag. (angular) Little Clay Dry. Blk. Staining (Fe/Mg) along Joints/Planes 7MW05-02 TPH DRO/GRO Grain Size		

Match to Sheet 2

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW05

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TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm
CTO NO.: 0277 BORING NO.: 7MW05

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
11								
12	AN							
13								
14	S-3 1600	1.25/2.0 63%	17 39 50/5"		0.5/0.5	Tan Silt and Rx. Fragments little to trace clay (same as above) Dry to moist Lab Sample 7MW05-03 TPH DRO/GRO		
15								
16								
17	AN							
18								
19	S-4 1620	0.5/2.0 25%	50/6"		0.5/0.5	Rx. Fragments. Trace to little Silt, moist. wet in Rx. surfaces/Joints. water @ 20' bgs 7MW05-04 TPH DRO/GRO		
20							▼	
21								
22	AN							
23								
24	S-5 1640	0.17/2.0 8%	4 50/3"		0.5/0.5	Rx. Fragments. Gray. Fractured Fragmented. Trace Silt & Clay. No Sample collected		
25							Bottom of screen @ 25' bgs	
26								
27	AN							
28								
29	S-6 1700	.33/2.0 17%	50/6"		0.5/0.5	Same as above, little more Silt & Smaller Rx. Fragments 7MW05-06 TPH DRO/GRO		
30								

END OF BORING 30'

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW05 SHEET 2 OF

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TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU7
CTO NO.: 0277 BORING NO.: 7MW06
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		4 1/4"		10/23/97	30	Clear Hi 90°	10'	0 hr
LENGTH	2'		5'						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Located SW of UGW15 South of Forrestal Dr.

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	2"	PVC	-2.5 stick-up	5
Screen 0.020 slot	2"	PVC	5	25

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1, 2, 3	AN					Auger to 3' bgs No Sample	Bentonite @ 1' bgs; Sand @ 3' bgs	
4, 5	S-1 1006	1.5/2.0 75%	15 10 8 8		0.5/0.5	Lt. Brn/orange Silt w/ Some clay. Trace Rx. Fill material Damp. 7MW06-01 TPH DRO/GRO Grain Size	Top of screen @ 5' bgs	
6, 7, 8	AN							
9, 10	S-2 1016	0.92/2.0 46%	9 6 9 10		0.5/0.5	Lt. Brn Silt/clay/gravel/Rxs. Fill material water @ 10' bgs 7MW06-02 TPH DRO/GRO Match to Sheet 2	▼	

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge Diaz BORING NO.: 7MW06 SHEET 1 OF 2

Baker
Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farms SWMU 7
CTO NO.: 0277 BORING NO.: 7MW06

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
11								
12								
13								
14	S-3	1.92/2.0	3 3		0.5/0.5	Lt. Gray F.G. Sand, Some Silt w/ T. clay and T. shells. Damp to moist. 7MW06-03 TPH DRO/GRO Grain Size		
15	1037	96%	3 3					
16						Same to 19.5' bgs then chgs. to ↓		
17								
18								
19	S-4	1.92/2.0	1 1		0.5/0.5	Lt. Gray F.G. Sand and Shells w/ T. Silt. wet. 7MW06-04 TPH DRO/GRO Grain Size		
20	1050	96%	3 4					
21								
22								
23								
24	S-5	2.0/2.0	22 29 39		0.5/0.5	Lt Gray/Brn Clay, little Sand (F.G.) little silt @ 24' chgs to weathered RX		
25	1110	100%	27			Lt. Brn RX. Fragments w/ little to Some clay. (Blk. Fe & Mg Staining) Dry to Damp 7MW06-05 TPH DRO/GRO Grain Size		Bottom of Screen @ 25' bgs
26								
27								
28								
29	S-6	1.0/2.0	34 50/5.5"		0.5/0.5	Lt. Gray weathered RX. Some med. Grain Sand & Silt. wet. 7MW06-06 TPH DRO/GRO Grain Size		
30	1130	50%						

END OF BORING 30'

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW06

Baker
Baker Environmental, Inc

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU 7
CTO NO.: 0277 BORING NO.: 7MW07
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		8 1/4"		10/21/97	20' 10/21 10' 10/22	mostly sunny 85-90°	10.3'	10/22 24hr.
LENGTH	2'		5'						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Located South of Bldg. # 2314

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	6"	PVC	-2.5 Stick-up	5
Screen 0.020 sbt	6"	PVC	5	25

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1	AN					Auger to 3' bgs No Sample	Bentonite @ 1' bgs	
2								
3							Sand @ 3' bgs	
4	S-1 1621	0.5/2.0 25%	9 8 4 4		0.5/0.5	Lt. Brn/Gray Rock, angular to sltly. Rounded. Some silt. Dry to wet @ tip of sample, water @ 5.0' bgs *		
5							Top of screen @ 5' bgs	
6	AN							
7								
8								
9	S-2 1645	0.83/2.0 42%	3 1 5 5"		0.5/0.5	Lt. Brn. Rock and Silt. moist to wet. Sample 7MW07-02 TPH DRO/GRO Grain size		
10						Match to Sheet 2		

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge Diaz BORING NO.: 7MW07 SHEET 1 OF 2

* Alot of rain @ NSRR last week, Possibly Perched Zone, Probably Not True Watertable

Baker
Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU 7
CTO NO.: 0277 BORING NO.: 7MW07

SAMPLE TYPE

S = Split Spoon **A** = Auger
T = Shelby Tube **W** = Wash
R = Air Rotary **C** = Core
D = Denison **P** = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BG/PS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
11								
12	AN							
13								
14	S-3 1710	1.25/2.0 63%	12 37 50/5"		0.5/0.5	Lt. Brn Rock w/ some silt and Trace clay and Trace Sand. wet. 7MW07-03 TPH DRO/GRO Grain Size		
15								
16								
17								
18								
19	S-4 1755	1.67/2.0 83%	20 21 50/6"			Lt. Brn. Rock, angular to Subangular w/ Some silt Trace clay. wet. 7MW07-04 TPH DRO/GRO		
20								
21								
22								
23								
24	S-5 10/22 0800	0.83/2.0 42%	28 40 50/3"		0.5/2.0	Lt. Brn/Gray Rock, angular to Subangular, Fragmented w/ Some Clay wet. 7MW07-05 TPH DRO/GRO		
25							Bottom of Screen @ 25' bgs	
26								
27								
28								
29	S-6 10/22 0905	0.83/2.0 42%	26 25 16 7		0.5/0.5	Lt. Brn. Rock w/ Trace to Little Clay & Trace Sand, wet. RX. is angular to subangular. 7MW07-06 TPH DRO/GRO		
30						END OF BORING 30'		

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW07 SHEET 2 OF

Baker
Baker Environmental, Inc

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm
CTO NO.: 0277 BORING NO.: 7MW08
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		8 1/4"		10/27/97 10/28/97	10 20	clear 90°	11'	
LENGTH	2'		5						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Auger Refusal @ 8.0' Finish boring by Air Hammer Located on Forrestal Dr.

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
N = No Sample
A = Auger
W = Wash
C = Core
P = Piston

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	6"	PVC	0.5	8
Screen 0.020 Slot	6"	PVC	8	28

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1						Attempted 2 holes. Cant Advance augers b/c of RX. V. hard. Chg. to new cutter head, attempt 3rd hole.		
2	AN							
3								
4	S-1	0.83 / 2.0	28 18 13 15		0.5/0.5	Lt. Grn Fragmented RX. w/ Some Silt. Dry. Lab Sample 7MW08-01 TPH Pro/GRO Grain Size 7MW08-01D Dup Collected		
5	1110	42%						
6								
7	AN							
8							Top of Screen @ 8' bgs	
9	S-2	0.83 / 2.0	13 5 8		0.5/0.5	Same Material as above, Dry to Sltly. moist 7MW08-02 TPH DRO/GRO 7MW08-02D Dup collected MS/MSD. Cannot advance augers any further, Switch to Air Hammer		
10	1133	42%	50/5"			Match to Sheet 2		

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW08 SHEET 1 OF 2

Baker

Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm

CTO NO.: 0277 BORING NO.: 7MW08

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
11						Begin Air Hammer @ 8' bgs @ 0800 10/28/97		
12	Downhole Air Hammer							
13								
14								
15								
16						Water encountered @ 16' bgs Nearby existing MW has water @ 11' bgs		
17								
18								
19								
20						20' V. Hard Rx. Advance Air Hammer 1' for 5 min.		
21								
22								
23								
24								
25								
26								
27								
28						28' Alot of Water! Produced From MW V. "clean" ie. sediment free.	Bottom of Screen @ 28' bgs	
29								
30						END of Boring 30'		

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic

DRILLER: Jorge' Diaz BORING NO.: 7MW08 SHEET 2 (

Baker
Baker Environmental, Inc

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU 7
CTO NO.: 0277 BORING NO.: 7MW09
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: Mobil B-90	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT.)	WEATHER	WATER DEPTH (FT.)	TIME
SIZE (DIAM.)	3"		8 1/4"		10/23 10/24	15 46			
LENGTH	2'		5'						
TYPE	STD		HSA						
HAMMER WT.	140 lbs								
FALL	30"								
STICK UP									

REMARKS: Located inside SWMU 7

SAMPLE TYPE
S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

Well Information	Diam.	Type	Top Depth (ft.)	Bottom Depth (ft.)
Riser	6"	PVC	-2.5 stick-up	38.7
Screen 0.020 slot	6"	PVC	38.7	58.7

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm) BGIPS	Visual Description	Well Installation Detail	Elevation (ft. MSL)
1						Auger To 3' bgs		
2	AN					No Sample		
3								
4	S-1	1.17/2.0	12 16		0.5/0.5	Lt. Brn Silt Trace to little clay and Rocks. Moist Fill material. Sample		
5	1625	58%	10 10			7MW09-01 TPH DRO/GRO Grain size		
6								
7	AN							
8								
9	S-2	0.92/2.0	44 20		0.5/0.5	Same as above, a little more Rock Sample 7MW09-02 TPH DRO/GRO		
10	1640	46%	11 7			Match to Sheet 2		

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge Diaz BORING NO.: 7MW09 SHEET 1 OF 2

Baker
Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU 7
CTO NO.: 0277 BORING NO.: 7MW09

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevation (ft. MSL)
11						Continued from Sheet 1		
12	AN							
13								
14	S-3 1715	0.83/2.0 42%	23 13 7 9		0.5/0.5	Same as above, Fill Material 7MW09-03 TPH DRO/GRO		
15								
16								
17	AN							
18								
19	S-4 0800	0.75/2.0 38%	5 5 5 30	Begin 10/24		Lt. Brn Clay, little Silt. Damp to moist. Sample 7MW09-04 TPH DRO/GRO		
20								
21								
22	AN							
23								
24	S-5 0825	1.17/2.0 58%	28 46 10 15		0.5/0.5	Lt. Brn./Greenish Gray Silt. Damp. Trace RX. Fragments. Sample 7MW09-05 TPH DRO/GRO Grain Size		
25								
26								
27	AN							
28								
29	S-6 0900	0.58/2.0 29%	11 22 50/6"		–	Lt. Brn./Greenish Gray Silt. T. Clay. Damp. Sample 7MW09-06 TPH DRO/GRO		
30								

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW09 SHEET 2 OF

Baker
Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm SWMU7
CTO NO.: 0277 BORING NO.: 7MW09

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
31								
32	AN							
33								
34	S-7	1.92 / 2.0	5 6		0.5/0.5	Lt. Brn. Mottled white Silt w/ Relict Feat. of Parent material visible. Moist. Saprolite (weathered Rx.) Sample 7MW09-07 TPH DRO/GRO		
35	1020	96%	14 28				Bentonite @35' bgs	
36								
37	AN						Top of Sand @ 35' bgs	
38								
39	S-8	1.75 / 2.0	21 29		0.5/0.5	Lt. Brn. Mottled white Silt Saprolite. Moist. (weathered Rx) Sample 7MW09-08 TPH DRO/GRO	Top of Screen @38.7' bgs	
40	1100	88%	50/6"					
41								
42	AN							
43								
44	S-9	0.75 / 2.0	12 40		0.5/0.5	Lt. Brn. Silt, Saprolite, T. Rx Fragments. weathered material. Sample 7MW09-09 TPH DRO/GRO		
45	1155		50/4"					
46								
47	AN							
48								
49	S-10	1.08 / 2.0	7 6		0.5/0.5	Lt. Brn. Saprolite w/ little Silt, Rx. Fragments, T. clay. Moist Sample 7MW09-10 TPH DRO/GRO Grain size.		
50	1405	54%	37 50/6"					

DRILLING CO.: Soil Tech BAKER REP.: J. Tepsic
DRILLER: Jorge' Diaz BORING NO.: 7MW09 SHEET 3 OF 7

Baker
Baker Environmental, Inc.

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Tow Way Fuel Farm
CTO NO.: 0277 BORING NO.: 7MW09

SAMPLE TYPE

S = Split Spoon
T = Shelby Tube
R = Air Rotary
D = Denison
A = Auger
W = Wash
C = Core
P = Piston
N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D-1586)(Blows/0.5')
RQD = Rock Quality Designation (%)
Lab. Class. = USCS (ASTM D-2487) or AASHTO (ASTM D-3282)
Lab. Moist. = Moisture Content (ASTM D-2216) Dry Weight Basis

Depth (ft.)	Samp. Type and No.	Samp. Rec. (ft. & %)	SPT or RQD	Lab Class. or Pen. Rate	PID (ppm)	Visual Description	Well Installation Detail	Elevation (ft. MSL)
						Continued from Sheet 1		
51								
52	AN							
53								
54	S-11 1530	1.17 / 2.0 58%	9 50/5"		0.5/0.5	Lt. Brn. Saprolite and Clay. moist. Sample 7MW09-11 TPH DRO/GRO 7MW09-11D Dup collected for TPH		
55								
56								
57	AN							
58								
59	S-12 1645	1.92 / 2.0 96%	14 19 39 50/3.5"		0.5/0.5	Lt. Brn. mottled Drk Brn. Saprolite, little to some silt. moist to wet Along Planar Surfaces Soil/RX is Friable w/ med. Pressure at Thumb Sample 7MW09-12 TPH DRO/GRO Grain Size 7MW09-12D Duplicate		
60							Bottom of Screen @ 58.7' bgs	
						END OF Boring 60'		
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								

DRILLING CO.: Soil BAKER REP.: J. Tepsic
DRILLER: Tech BORING NO.: 7MW09 SHEET 4 OF

ATTACHMENT B
WELL DEVELOPMENT RECORDS

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW05

DATE: 10/26/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START	1330
TIME FINISH	1430
WATER LEVEL (FT)	10.90
TOTAL WELL DEPTH (TD)	24.30
WELL DIAMETER (INCHES)	2 inches
CALCULATED WELL VOLUME	2.2 Gallons
BOREHOLE DIAMETER (INCHES)	8 inches
BOREHOLE VOLUME	35 Gallons
AMOUNT OF WATER ADDED DURING DRILLING	0
DEVELOPMENT METHOD	Manual
PUMP TYPE	B-K Hand Pump
TOTAL TIME (A)	50 min
AVERAGE FLOW (GPM)(B)	2.2 GPM
TOTAL ESTIMATED WITHDRAWAL AxB =	110 Gallons
HNU/OVA READING	0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
1335	5	7.28	–	4013	31.1	V. Thick, V. muddy. Brown
1342	10	7.34	–	4374	31.1	
1344	15	7.32	–	4159	31.1	
1345	20	7.31	–	4.65	30.1	
1347	25	7.33	–	4.75	30.2	
1348	30	7.28	–	4.98	29.8	
1350	35	7.28	–	5.12	30.8	
1351	40	7.25	–	5.56	29.9	Clearing
1353	45	7.26	–	5.47	30.0	
1356	50	7.26	–	5.90	29.9	clearer
1357	55	7.35	–	5.03	29.9	
1402	60	7.27	–	5.49	29.9	
1404	65	7.32	–	5.06	29.4	
1406	70	7.21	–	6.22	29.9	
1407	75	7.36	–	5.25	30.5	
1411	80	7.23	–	5.71	30.1	

OBSERVATIONS/NOTES

Alot of mud in well at beginning of development operations. Satisfied criteria for pH, specific Conductance and Temperature. No elevated HNu Readings observed during development.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW05

DATE: 10/26/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START	
TIME FINISH	
WATER LEVEL (FT)	
TOTAL WELL DEPTH (TD)	
WELL DIAMETER (INCHES)	
CALCULATED WELL VOLUME	
BOREHOLE DIAMETER (INCHES)	
BOREHOLE VOLUME	
AMOUNT OF WATER ADDED DURING DRILLING	
DEVELOPMENT METHOD	
PUMP TYPE	
TOTAL TIME (A)	
AVERAGE FLOW (GPM)(B)	
TOTAL ESTIMATED WITHDRAWAL AxB =	
HNU/OVA READING	

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
1412	85	7.26	—	5.42	31.2	
1414	90	7.30	—	5.19	30.0	
1416	95	7.23	—	5.85	30.1	
1418	100	7.28	—	5.41	30.0	
1421	105	7.27		5.55	30.1	
1422	110	7.29	—	5.47	30.1	Relatively clear, Lt. Gray/Brown

OBSERVATIONS/NOTES

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW06

DATE: 10/26/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START	1115
TIME FINISH	1200
WATER LEVEL (FT)	9.90
TOTAL WELL DEPTH (TD)	25.0
WELL DIAMETER (INCHES)	2 inches
CALCULATED WELL VOLUME	2.5 Gallons
BOREHOLE DIAMETER (INCHES)	8 inches
BOREHOLE VOLUME	39 Gallons
AMOUNT OF WATER ADDED DURING DRILLING	0
DEVELOPMENT METHOD	Manual
PUMP TYPE	B-K Hand Pump
TOTAL TIME (A)	41 min
AVERAGE FLOW (GPM)(B)	2.8 GPM
TOTAL ESTIMATED WITHDRAWAL AxB =	115 Gallons
HNU/OVA READING	0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
1120	2.5	6.85	—	17.60	30.5	
1121	5.0	6.75	—	16.68	30.1	
1123	7.5	6.84	—	17.08	30.1	
1123	10	6.82	—	17.10	30.1	
1125	12.5	6.82	—	17.05	30.1	
1127	15.0	6.80	—	17.61	30.2	
1129	20	6.83		17.75	30.2	
—	25	—	—	—	—	
1130	30	6.86	—	17.45	30.4	
1131	35	6.81	—	17.68	30.3	
1135	40	6.87	—	18.23	30.3	
1136	45	6.86	—	18.11	30.4	Turbid. Lt. Brown
1137	50	6.84	—	18.15	30.2	Turbid. Lt. Brown
1138	55	6.83	—	18.30	30.1	
1145	60	6.94	—	18.70	30.5	Turbid Lt. Brown
1146	65	6.94	—	18.31	30.4	

OBSERVATIONS/NOTES

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW06

DATE: 10/26/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START	
TIME FINISH	
WATER LEVEL (FT)	
TOTAL WELL DEPTH (TD)	
WELL DIAMETER (INCHES)	
CALCULATED WELL VOLUME	
BOREHOLE DIAMETER (INCHES)	
BOREHOLE VOLUME	
AMOUNT OF WATER ADDED DURING DRILLING	
DEVELOPMENT METHOD	
PUMP TYPE	
TOTAL TIME (A)	
AVERAGE FLOW (GPM)(B)	
TOTAL ESTIMATED WITHDRAWAL AxB =	
HNU/OVA READING	

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
1148	70	6.92	–	18.40	30.5	Turbid. Lt. Brown
1148	75	6.94	–	18.40	30.4	
1150	80	6.88	–	18.44	30.1	Clearing
1151	85	6.89	–	18.59	30.3	
1153	90	6.87	–	18.80	30.2	
1155	95	6.93	–	18.89	30.3	Lt. Brown. Sitly. Turbid
1156	100	6.88	–	19.14	30.3	
1156	105	6.88	–	19.22	30.1	
1200	110	6.89	–	19.04	30.1	
1201	115	6.88	–	19.44	30.1	

OBSERVATIONS/NOTES

Satisfied criteria for pH, specific Conductance, and temperature. No elevated HNu readings observed during development.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW07

DATE: 10/29/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START	0800
TIME FINISH	0930
WATER LEVEL (FT)	13.70 (TOC)
TOTAL WELL DEPTH (TD)	25
WELL DIAMETER (INCHES)	6 inch PVC
CALCULATED WELL VOLUME	17 Gallons
BOREHOLE DIAMETER (INCHES)	12 inches
BOREHOLE VOLUME	66 Gallons
AMOUNT OF WATER ADDED DURING DRILLING	0
DEVELOPMENT METHOD	Manual
PUMP TYPE	B-K Hand Pump
TOTAL TIME (A)	80 min.
AVERAGE FLOW (GPM)(B)	1.5 GPM
TOTAL ESTIMATED WITHDRAWAL AxB =	120 Gallons
HNU/OVA READING	0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
0820	5	7.72	—	978	30.7	First 5 gals. V. Thick Mud Brown.
0823	10	7.79	—	1099	30.5	Less Mud
0826	15	7.77	—	1106	28.1	V. Turbid, Lt. Brown
0828	20	7.73	—	1107	29.6	Lt. Brown Turbid
0842	25	8.05	—	898	30.0	Move Pump to bottom of well more thick mud Removed.
0845	30	7.91	—	1201	29.9	Less Mud
0848	35	7.73	—	1151	30.2	Lt. Brown V. Turbid
0851	40	7.61	—	1124	29.8	Lt. Brown clearing
0853	45	7.67	—	1151	29.9	Clearing up more
0856	50	7.67	—	1148	29.4	Sltly. Turbid, Much better Good yield From well
0858	55	7.67	—	1133	29.6	Relatively clear
0904	60	7.65	—	1251	29.7	Relatively Clear Lt. Brown
0905	65	7.64	—	1231	29.6	
0907	70	7.63	—	1186	29.5	
0909	75	7.64	—	1148	29.6	
0912	80	7.66	—	1221	29.7	Relatively clear

OBSERVATIONS/NOTES

Approximately 3' of mud in well at beginning of development operations. Water Quality Parameters remained stable. No Elevated HNu readings observed during development.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW07

DATE: 10/29/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START

TIME FINISH

WATER LEVEL (FT)

TOTAL WELL DEPTH (TD)

WELL DIAMETER (INCHES)

CALCULATED WELL VOLUME

BOREHOLE DIAMETER (INCHES)

BOREHOLE VOLUME

AMOUNT OF WATER ADDED DURING DRILLING

DEVELOPMENT METHOD

PUMP TYPE

TOTAL TIME (A)

AVERAGE FLOW (GPM)(B)

TOTAL ESTIMATED WITHDRAWAL AxB =

HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
0916	85	7.67	—	1309	30.0	
0919	90	7.62	—	1317	29.7	
0920	95	7.63	—	1240	29.7	Relatively Clear
0923	100	7.64	—	1208	29.7	
0926	105	7.66	—	1277	29.9	
0929	110	7.65	—	1309	29.9	Water Quality Parameters Stable. Relatively Clear,

OBSERVATIONS/NOTES

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW08

DATE: 10/27/97

GEOLOGIST/ENGINEER: J. Tepsic

TIME START	NA
TIME FINISH	NA
WATER LEVEL (FT)	10.8
TOTAL WELL DEPTH (TD)	28
WELL DIAMETER (INCHES)	6 inches
CALCULATED WELL VOLUME	26 Gallons
BOREHOLE DIAMETER (INCHES)	12 inches
BOREHOLE VOLUME	100 gallons
AMOUNT OF WATER ADDED DURING DRILLING	0
DEVELOPMENT METHOD	NONE (See note)
PUMP TYPE	NA
TOTAL TIME (A)	NA
AVERAGE FLOW (GPM)(B)	NA
TOTAL ESTIMATED WITHDRAWAL AxB =	NA
HNU/OVA READING	0 PPM

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY

OBSERVATIONS/NOTES Monitoring Well 7MW08 was not Developed. It was not necessary. The well is set in Fractured Rock which produced alot of water during well installation. Air Rotary was used to install the well thereby removing alot of water from the surrounding formation. The water was very clear and sediment free. It is estimated that at least 300 gallons of water was removed during drilling Procedures

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Tow Way Fuel Farm SWMU 7

CTO NO.: 0277 WELL NO.: 7MW09

DATE: 10/28/97

GEOLOGIST/ENGINEER: J. Tefsic

TIME START	1525
TIME FINISH	1630
WATER LEVEL (FT)	52.04 (Toc)
TOTAL WELL DEPTH (TD)	61.30
WELL DIAMETER (INCHES)	6 inch PVC
CALCULATED WELL VOLUME	14 Gallons
BOREHOLE DIAMETER (INCHES)	12 inches
BOREHOLE VOLUME	54 Gallons
AMOUNT OF WATER ADDED DURING DRILLING	0
DEVELOPMENT METHOD	Manual
PUMP TYPE	B-K Hand Pump
TOTAL TIME (A)	60 min.
AVERAGE FLOW (GPM)(B)	0.33 GPM
TOTAL ESTIMATED WITHDRAWAL AxB =	20 Gallons
HNU/OVA READING	0 Ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (uohms)	TEMP (°C)	COLOR AND TURBIDITY
1530	5	7.29	—	4451	30.3	A lot of mud, V. Thick Brown
1532	10	7.25	—	4383	30.1	Well Purged Dry after 10 Gals.
						Added 10 Gals. of H_2O then surged & pumped
						H_2O out in attempt to clean out screen & Formation
						Well Pumped Dry again Repeat Procedure
1625	15	6.55	—	458	30.0	Lt. Brown/clearing
	25	—	—	—	—	Pumped Dry

OBSERVATIONS/NOTES

Very slow recharge. Added Potable water & Surged several times in attempt to Clean out screen & Surrounding formation. Well cleared up a little. Approximately 20 gallons removed.

ATTACHMENT C
CHAIN-OF-CUSTODY FORMS

2 / / - 001

RECRA LabNet Use Only

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client Baker Environmental, Inc.
Est. Final Proj. Sampling Date 11-3-97
Project # 62470-277-06003 412-264-6005
Project Contact/Phone # Mark Kimes/Susan Johnston
RECRA Project Manager ~~T. Fotter~~ B. Ramirez
QC BoA Del _____ TAT BoA
Date Rec'd _____ Date Due _____
Account # _____

Refrigerator #
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives

ANALYSES REQUESTED →

ORGANIC							INORG	
VOA	BNA	Pest/PCB	Herb	TPH MOD 8015 GRO/DRO		GRAIN SIZE	Metal	CN

RECRA LabNet Use Only

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected	TPH MOD 8015 GRO/DRO	GRAIN SIZE
	7MW07-02			S	10/21	1645	X	X
	7MW07-03			S	10/21	1710	X	X
	7MW07-04			S	10/21	1755	X	
	7MW07-05			S	10/22	0800	X	
	7MW07-06			S	10/22	0905	X	
	7MW05-01			S	10/22	1540	X	X
	7MW05-02			S	10/22	1550	X	X
	7MW05-03			S	10/22	1600	X	
	7MW05-04			S	10/22	1620	X	
	7MW05-06			S	10/22	1700	X	

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

Relinquished by	Received by	Date	Time
4PT	FED-EX	10/23/97	1500

Relinquished by	Received by	Date	Time

277-001

RECRA LabNet Use Only

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client: Baker Environmental Inc.
Est. Final Proj. Sampling Date: 11-3-97
Project #: 62470-277-06003
Project Contact/Phone #: M. Kimes / Susan Johnston
RECRA Project Manager: B. Ramirez
QC: B.A. Del: ____ TAT: B.A.
Date Rec'd: ____ Date Due: ____
Account #: ____

Refrigerator #
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives

ANALYSES REQUESTED →

ORGANIC							INORG	
VOA	BNA	Pest/PCB	Herb	TPH Hydrocarbons DRO/GRO		GRAIN SIZE	Metal	CN

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected	VOA	BNA	Pest/PCB	Herb	TPH Hydrocarbons DRO/GRO		GRAIN SIZE	Metal	CN
	7MW06-01			S	10/23	1006					X		X		
	7MW06-02			S	10/23	1016					X				
	7MW06-03			S	10/23	1037					X		X		
	7MW06-04			S	10/23	1050					X		X		
	7MW06-05			S	10/23	1110					X		X		
	7MW06-06			S	10/23	1130					X		X		
	TB			W	9/11	1500	X								

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1. ____
2. ____
3. ____
4. ____
5. ____
6. ____

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # ____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

Relinquished by	Received by	Date	Time
JPT	FED EX	10/23/97	1500

Relinquished by	Received by	Date	Time

277-002

RECRA LabNet Use Only

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client: Baker Environmental, Inc
Est. Final Proj. Sampling Date: 11-3-97
Project #: 62470-277-06003
Project Contact/Phone #: M. Kimes/Susan Johnston 412 269-6000
RECRA Project Manager: Bosco Ramirez
QC: BOA Del: BOA TAT: BOA
Date Rec'd: Date Due:
Account #:

Refrigerator #																	
#/Type Container	Liquid																
	Solid																
Volume	Liquid																
	Solid																
Preservatives																	
ANALYSES REQUESTED →		ORGANIC									INORG						
		VOA	BNA	Pest/PCB	Herb	TPH mod 8015 DRO/GRO		GRAIN SIZE			Metal	CN					
		RECRA LabNet Use Only															

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected													
	7MW09-01			S	10/23	1625					X		X						
	7MW09-02			S	10/23	1640					X								
	7MW09-03			S	10/23	1715					X								
	7MW09-04			S	10/24	0800					X								
	7MW09-05			S	10/24	0825					X		X						
	7MW09-06			S	10/24	0900					X								
	7MW09-08			S	10/24	1100					X								
	7MW09-09			S	10/24	1155					X								
	7MW09-07			S	10/24	1020					X								
	7MW09-10			S	10/24	1405					X		X						

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1.
2.
3.
4.
5.
6.

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # ___
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

Relinquished by	Received by	Date	Time
4PT	FED-EX	10/24/97	1500

Relinquished by	Received by	Date	Time

RECRA LabNet Use Only

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client: Baker Environmental, Inc.
Est. Final Proj. Sampling Date: 11-3-97
Project #: 62470-277-06003
Project Contact/Phone #: M. Kimes/S. Johnston 412 269-6000
RECRA Project Manager: B. Ramirez
QC: BOA Del: BOA TAT: BOA
Date Rec'd: _____ Date Due: _____
Account #: _____

Refrigerator #																			
#/Type Container	Liquid																		
	Solid																		
Volume	Liquid																		
	Solid																		
Preservatives																			
ANALYSES REQUESTED →		ORGANIC								INORG									
		VOA	BNA	Pest/PCB	Herb	TPH Mod 8015				Metal	CN								
		↓ RECRA LabNet Use Only ↓																	

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected															
	TB02			W	9/11	1500					X										

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

Relinquished by	Received by	Date	Time
JB	FED EX	10/24/97	1500

Relinquished by	Received by	Date	Time

RECRA LabNet Use Only

277-003

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client Baker Environmental Inc
Est. Final Proj. Sampling Date 11-3-97
Project # 62470-277-06003
Project Contact/Phone # M. Kimies/Susan Johnston
RECRA Project Manager B. Ramirez
QC BoA Del BoA TAT BoA
Date Rec'd _____ Date Due _____
Account # _____

Refrigerator #																	
#/Type Container	Liquid																
	Solid																
Volume	Liquid																
	Solid																
Preservatives																	
ANALYSES REQUESTED →		ORGANIC								INORG							
		VOA	BNA	Pest/PCB	Herb	TPH Mod 8015 GRO/DRO		GRAIN SIZE		Metal	CN						

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected	VOA	BNA	Pest/PCB	Herb	TPH Mod 8015 GRO/DRO		GRAIN SIZE	Metal	CN					
	7MW09-11			S	10/24	1530					X									
	7MW09-11D			S	10/24	1530					X									
	7MW09-12			S	10/24	1645					X		X							
	7MW09-12D			S	10/24	1645					X									
	7MW08-01			S	10/27	1110					X		X							
	7MW08-01D			S	10/27	1110					X									
	7MW08-02	X	X	S	10/27	1133					X									
	7MW08-02D			S	10/27	1133					X									
	TB03			W	9/11	1500					X									

RECRA LabNet Use Only

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Relinquished by	Received by	Date	Time
JPT	FED-EX	10/27/97	1500

Relinquished by	Received by	Date	Time

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

RECRA LabNet Use Only

Custody Transfer Record/Lab Work Request

277-004

RECRA LabNet

Client: Baker Environmental, Inc.
Est. Final Proj. Sampling Date: 11-3-97
Project #: 62170-277-06003
Project Contact/Phone #: Kimes/S Johnston 412-264-6000
RECRA Project Manager: B. Ramirez
QC: B of A Del: B of A TAT: B of A
Date Rec'd: _____ Date Due: _____
Account #: _____

Refrigerator #
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives
ANALYSES REQUESTED →

MATRIX CODES:	
S -	Soil
SE -	Sediment
SO -	Solid
SL -	Sludge
W -	Water
O -	Oil
A -	Air
DS -	Drum Solids
DL -	Drum Liquids
L -	EP/TCLP Leachate
WI -	Wipe
X -	Other
F -	Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected	ORGANIC VOA	BNA	Pest/PCB	Herb	TPH Mod 8015 GRO	TPH Mod 8015 DRO	INORG Metal	CN
	TER01			W	10/28	1300					X	X		
	* TER02			W	10/28	1400	X							
	TB04			W	10/28	1430	X				X			

RECRA LabNet Use Only

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

TER01 split spoon

TER02 Disposable Bailer

* Report BTEX only

DATE/REVISIONS:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

Relinquished by	Received by	Date	Time
APT	FED-EX	10/28/97	1500

Relinquished by	Received by	Date	Time

RECRA LabNet Use Only

277-005

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client Baker Environmental, Inc.
Est. Final Proj. Sampling Date 10-30-97
Project # 62470-277-06003
Project Contact/Phone # M Kimes/S Johnston 412-269-6000
RECRA Project Manager Bosco Ramirez
QC BGA Del BGA TAT BGA
Date Rec'd _____ Date Due _____
Account # _____

Refrigerator #
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives

ANALYSES REQUESTED →

	ORGANIC							INORG							
	VOA	BNA	Pest/PCB	Herb	BTEX 8020			Metal	CN						
Liquid	EPA 8240														
Solid	BTEX														

RECRA LabNet Use Only

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected	VOA	BNA	Pest/PCB	Herb	BTEX 8020			Metal	CN						
	7MW05-01			W	10/30	1745	X														
	7MW06-01			W	10/30	1355	X														
	7MW07-01			W	10/30	1200	X														
	7MW08-01	X	X	W	10/30	1640	X														
	7MW08-01D			W	10/30	1640	X														
	7MW09-01			W	10/30	1920	X														
	TB05			W	4/14	1550	X														
	7IDW			S	10/31	1030					X										

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

RECRA LabNet Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Lables and COC Record? Y or N
NOTES:

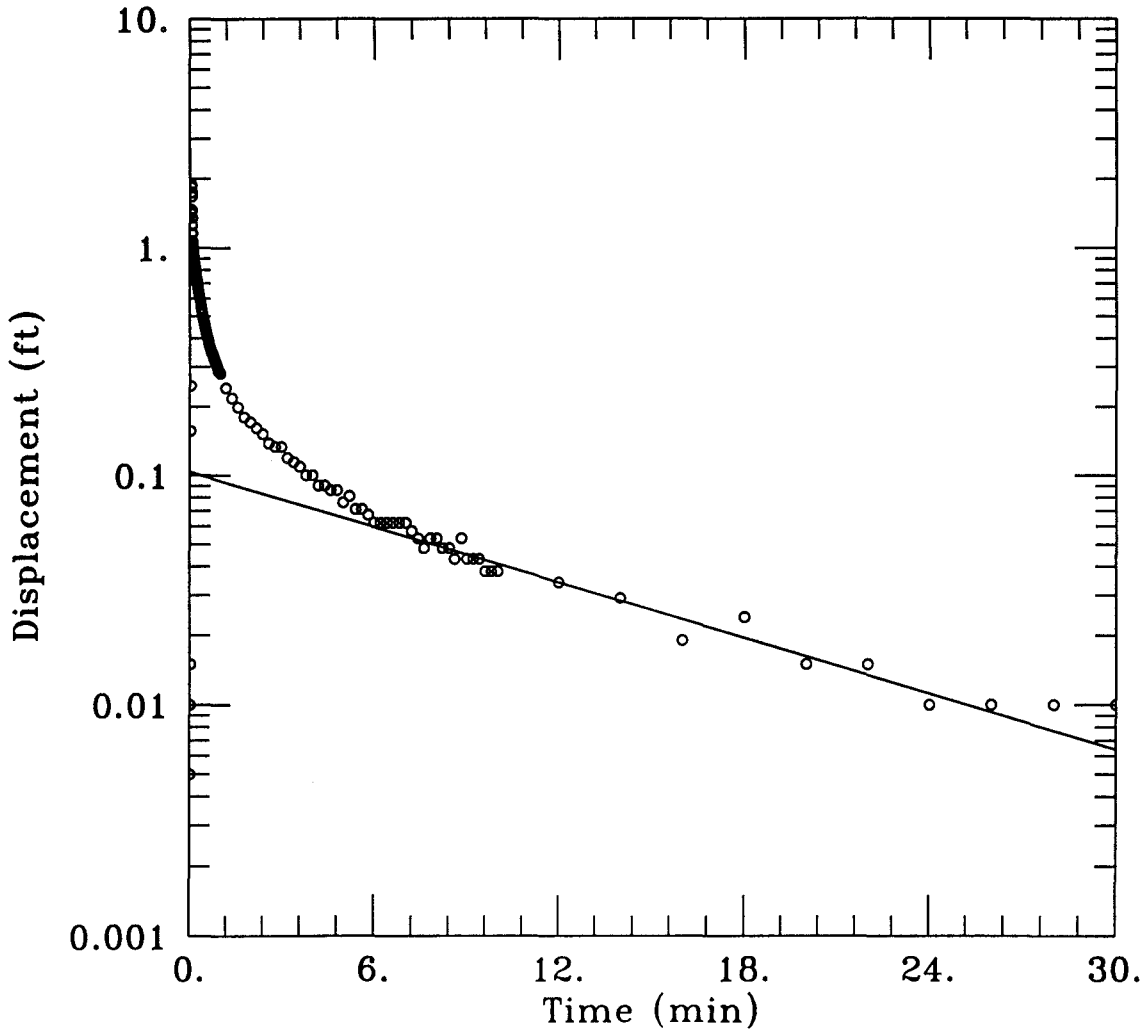
Relinquished by	Received by	Date	Time
JPT	FED-EX	10/31/97	1500

Relinquished by	Received by	Date	Time

ATTACHMENT D
INSITU HYDRAULIC CONDUCTIVITY (SLUG TEST) DATA

Client: **NAVFACENGCOM LANTDIV**	Company: **Baker Environmental, Inc.**
Location: **Roosevelt Roads Naval Station**	Project: **62470-277-0000-09020**

Tow Way Fuel Farm - 7MW02A Falling Head



DATA SET:
7MW02AF.DAT
03/02/98

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/31 - 11/1 1997
test well: 7MW02A
obs. well: 7MW02A

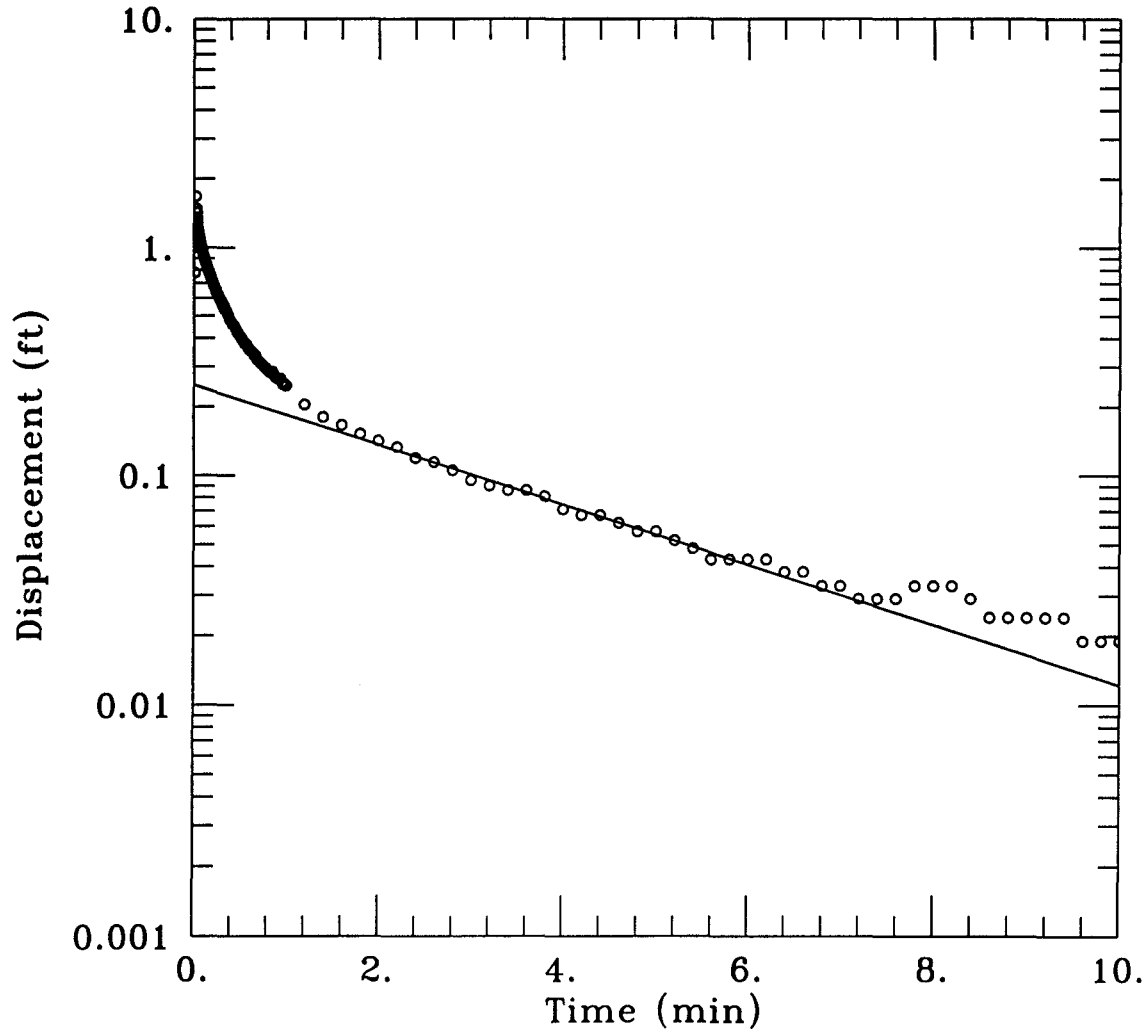
TEST DATA:
H0 = 1. ft
rc = 0.08333 ft
rw = 0.25 ft
L = 20. ft
b = 24.2 ft
H = 24.2 ft

PARAMETER ESTIMATES:
K = 0.08094 ft/day
y0 = 0.1035 ft

AQTESOLV

Client: **NAVFACENGCOM LANTDIV**	Company: **Baker Environmental, Inc.**
Location: **Roosevelt Roads Naval Station**	Project: **62470-277-0000-09020**

Tow Way Fuel Farm - 7MW02A Rising Head



DATA SET:
7MW02AR.DAT
03/02/98

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/31 - 11/1 1997
test well: 7MW02A
obs. well: 7MW02A

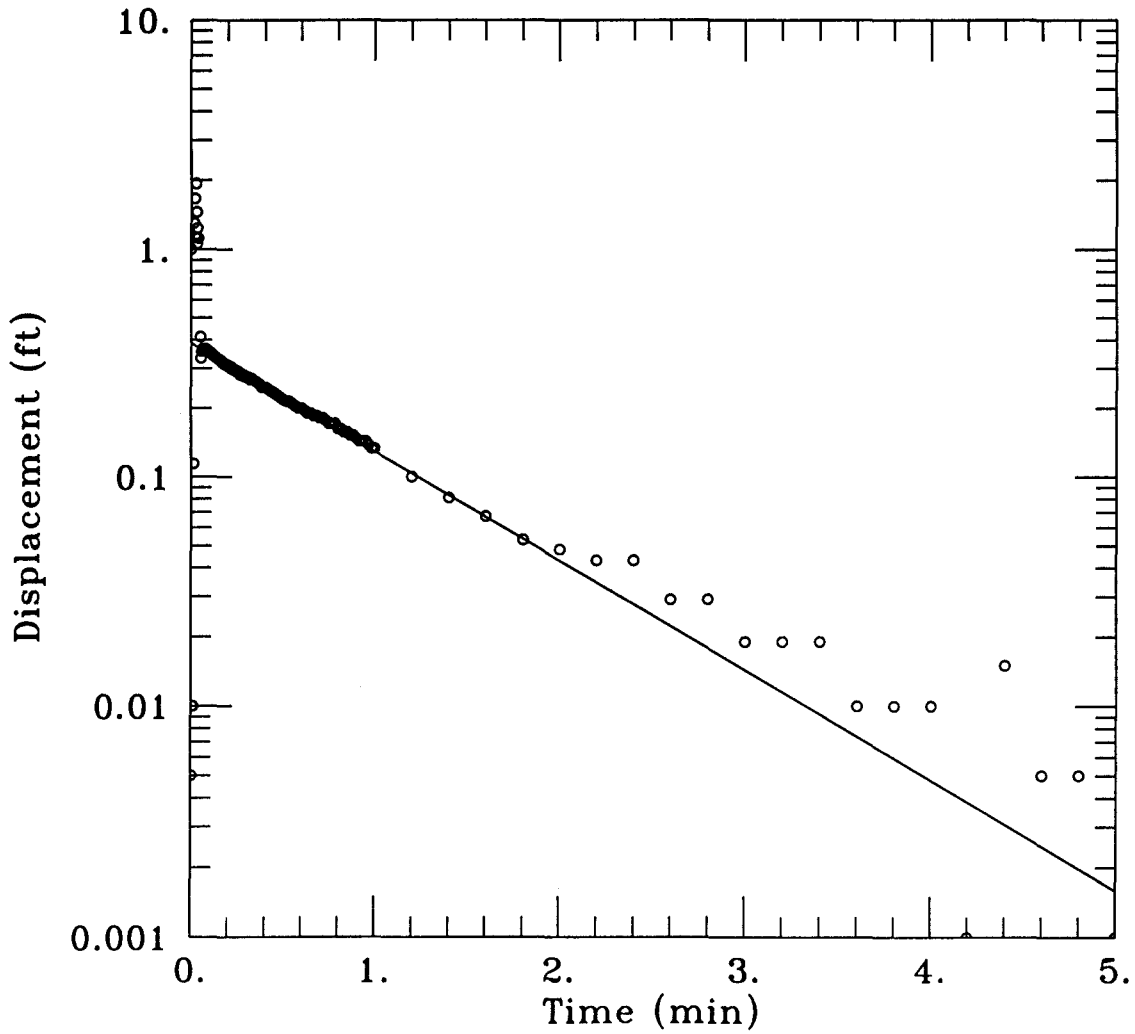
TEST DATA:
H0 = 1. ft
rc = 0.08333 ft
rw = 0.25 ft
L = 20. ft
b = 24.2 ft
H = 24.2 ft

PARAMETER ESTIMATES:
K = 0.2631 ft/day
y0 = 0.2489 ft

AQTESOLV

Client: **NAVFACENGCOM - LANTDIV**	Company: **Baker Environmental, Inc.**
Location: **Roosevelt Roads Naval Station**	Project: **62470-277-0000-09020**

Tow Way Fuel Farm - 7MW05 Rising Head



DATA SET:
7MW05R.DAT
03/02/98

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/31 - 11/1 1997
test well: 7MW05
obs. well: 7MW05

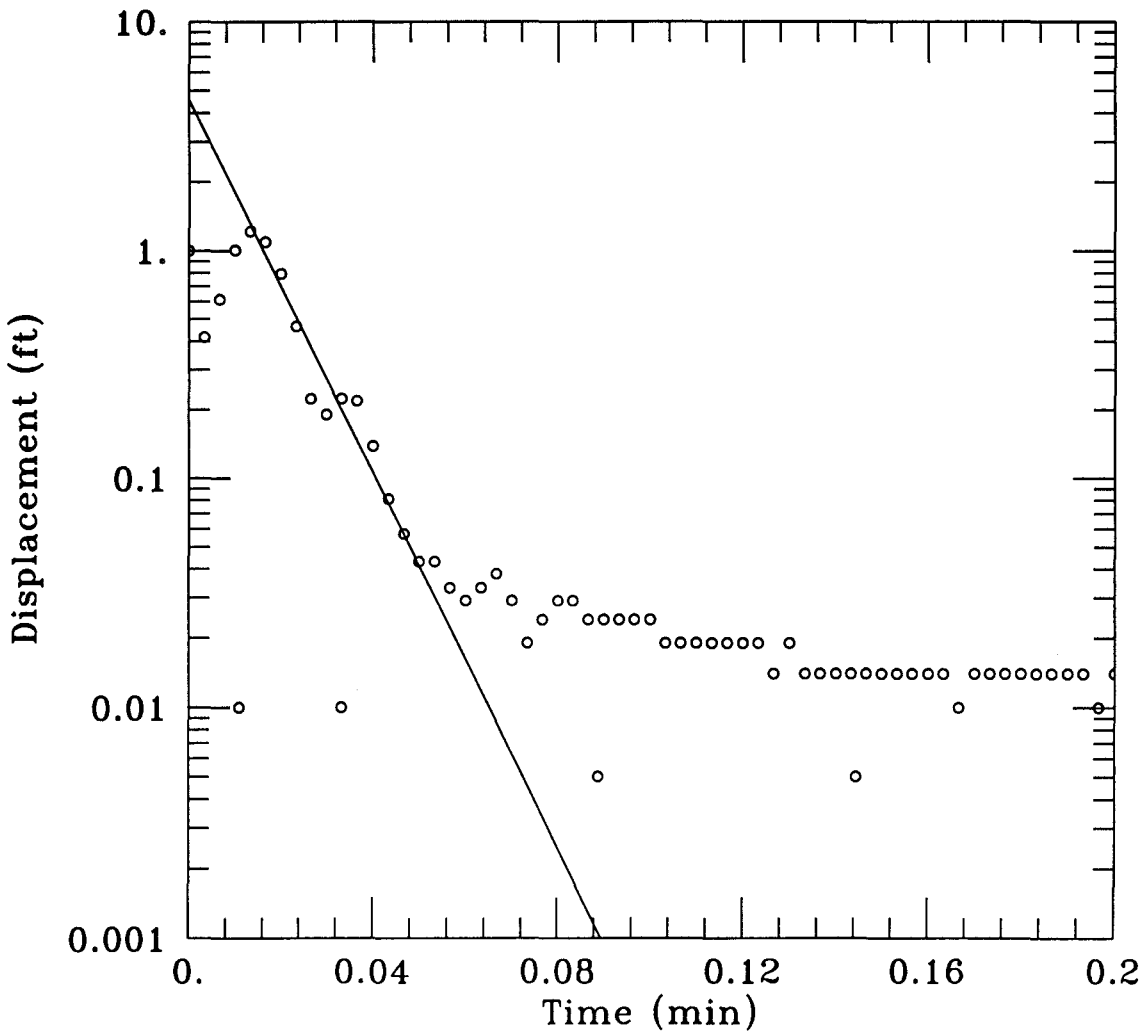
TEST DATA:
H0 = 1. ft
rc = 0.08333 ft
rw = 0.25 ft
L = 13.75 ft
b = 13.75 ft
H = 13.75 ft

PARAMETER ESTIMATES:
K = 1.227 ft/day
y0 = 0.3859 ft

AQTESOLV

Client: **NAVFACENGCOM LANTDIV**	Company: **Baker Environmental, Inc.**
Location: **Roosevelt Roads Naval Station**	Project: **62470-277-0000-09020**

Tow Way Fuel Farm - 7MW06 Rising Head



DATA SET:
7MW06R.DAT
03/02/98

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/31 - 11/1 1997
test well: 7MW06
obs. well: 7MW06

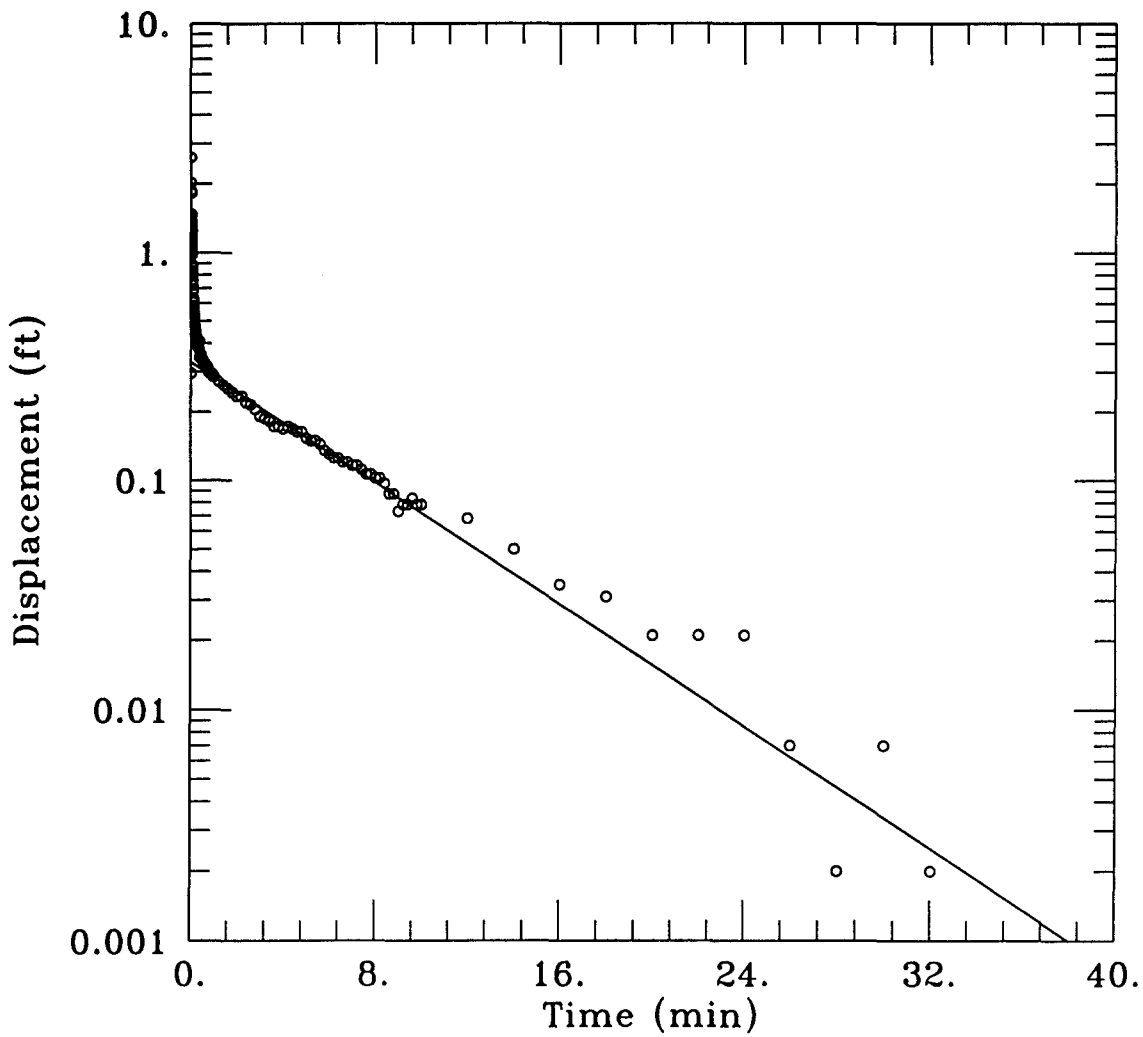
TEST DATA:
H0 = 1. ft
rc = 0.08333 ft
rw = 0.25 ft
L = 17.8 ft
b = 17.8 ft
H = 17.8 ft

PARAMETER ESTIMATES:
K = 86.6 ft/day
y0 = 4.559 ft

AQTESOLV

Client: **NAVFACENGCOM LANTDIV**	Company: **Baker Environmental, Inc.**
Location: **Roosevelt Roads Naval Station**	Project: **62470-277-0000-09020**

Tow Way Fuel Farm – UGW-16 Rising Head



DATA SET:
UGW-16R.DAT
03/02/98

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/31 - 11/1 1997
test well: UGW-16
obs. well: UGW-16

TEST DATA:
H0 = 1. ft
rc = 0.08333 ft
rw = 0.25 ft
L = 8.05 ft
b = 8.05 ft
H = 8.05 ft

PARAMETER ESTIMATES:
K = 0.2493 ft/day
y0 = 0.3295 ft

AQTESOLV

ATTACHMENT E
ENVIRONMENTAL AND GEOTECHNICAL ANALYTICAL RESULTS

ENVIRONMENTAL ANALYTICAL RESULTS

Original Analytical Results - RECRA LabNet

	7MW07-02	7MW07-03	7MW07-04	7MW07-05	7MW07-06	7MW05-01	7MW05-02	7MW05-03	7MW05-04	7MW05-06
tal Petroleum Hydrocarbons										
:sel Range Organics (mg/kg)	6.5 U	7 U	7.4 U	7.1 U	7.1 U	6.5 U	8 U	7 U	6.8 U	7 U
soline Range Organics (ug/kg)	54 U	56 U	61 U	59 U	57 U	53 U	64 U	56 U	56 U	29 J
soline Range Organics (ug/L)										

Original Analytical Results - RECRA LabNet

	7MW06-01	7MW06-02	7MW06-03	7MW06-04	7MW06-05	7MW06-06	TB01
Total Petroleum Hydrocarbons							
Diesel Range Organics (mg/kg)	7.3 U	7.3 U	11 U	8.6 U	7.4 U	8.2 U	
Gasoline Range Organics (ug/kg)	60 U	59 U	94 U	70 U	60 U	67 U	
Gasoline Range Organics (ug/L)							50 U

GEOTECHNICAL TESTING DATA AND RESULTS

Table 1 Geotechnical Tests Performed, Reference Methods and Test Numbers		
Test Parameter	**Method[1]**	**Test Numbers**
Grain Size by Sieve and Hydrometer	D 421/422	9

[1] All analytical methods derived from the Annual Book of ASTM Standards, Section 4. Volume 4.08, Soil and Rock; building Stones; Geotextiles. American Society of Testing Materials, Philadelphia, PA, 1993 unless noted otherwise.

RECRA LabNet Use Only

9710G709

Custody Transfer Record/Lab Work Request

RECRA LabNet

Client: Recra LabNet Chicago

Project #:

Date Rec'd. 10/24/97 Date Due 11/11/97

RECRA PM: Bosco Ramirez

Client Contact/Phone:

Refrigerator#	S/O									
#/Type Container	Y/G									
Volume	16oz									
Preservative										
ANALYSIS REQUESTED	Grain Size									

RECRA Use Only Lab ID	Client ID/Description	Matrix	Date Collected	Grain Size							
001	7MW07-02	S	10/21/97	Xc							
002	1 03		1								
006	7MW05-01		10/22/97								
007	1 02		1								
011	7MW016-01		10/23/97								
013	7MW016-03										
014	04										
015	05										
016	1 06	1	1	1							

Matrix:
S - Soil
SE - Sediment
SO - Solid
W - Water
O - Oil
A - Air
Wi - Wipe
DS - Drum Solids
DL - Drum Liquids
F - Fish
L - EP/TCLP Leachate
X- Other

Special Instructions:

Item/Reason	Relinquished by	Received by	Date	Time	Item/Reason	Relinquished by	Received by	Date	Time
all	P. Bulus	FX → ETL	10/28/97	1505					
all		[illegible] ETL	10/29/97	1130					

RECRA LabNet Use Only

Samples Were:
1 Shipped or Hand-Delivered
NOTES: FX

2 Ambient or chilled
NOTES:

3 Received Broken/Leaking (Improperly Sealed) Y N
NOTES:

4 Properly Preserved Y N
NOTES:

5 Received Within Holding Times Y N
NOTES:

COC Tape Was:
1 Present on Outer Package Y N
2 Unbroken on Outer Package Y N
3 Present on Sample Y N
4 Unbroken on Sample Y N
NOTES:

COC Record Was:
1 Present Upon Receipt of Samples Y N

Discrepancies Between Sample Labels and COC Record? Y N
NOTES:

ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW07-02	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	001	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	74.0
3/8"	9.500	62.7
#4	4.750	52.1
#10	2.000	40.7
#20	0.850	29.1
#50	0.300	20.7
#100	0.150	17.2
#200	0.075	14.7
HYDROMETER	0.0430	13.7
	0.0309	12.9
	0.0223	11.6
	0.0159	11.2
	0.0118	10.4
	0.0085	9.5
	0.0061	8.7
	0.0044	7.4
	0.0031	6.1
	0.0022	5.7
	0.0013	4.8
	0.0009	4.4

EFFECTIVE SIZES

% Finer	Diameter mm
60	8.290
30	0.939
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

brown silty or clayey GRAVEL
with 37% sand and 15% silt or clay

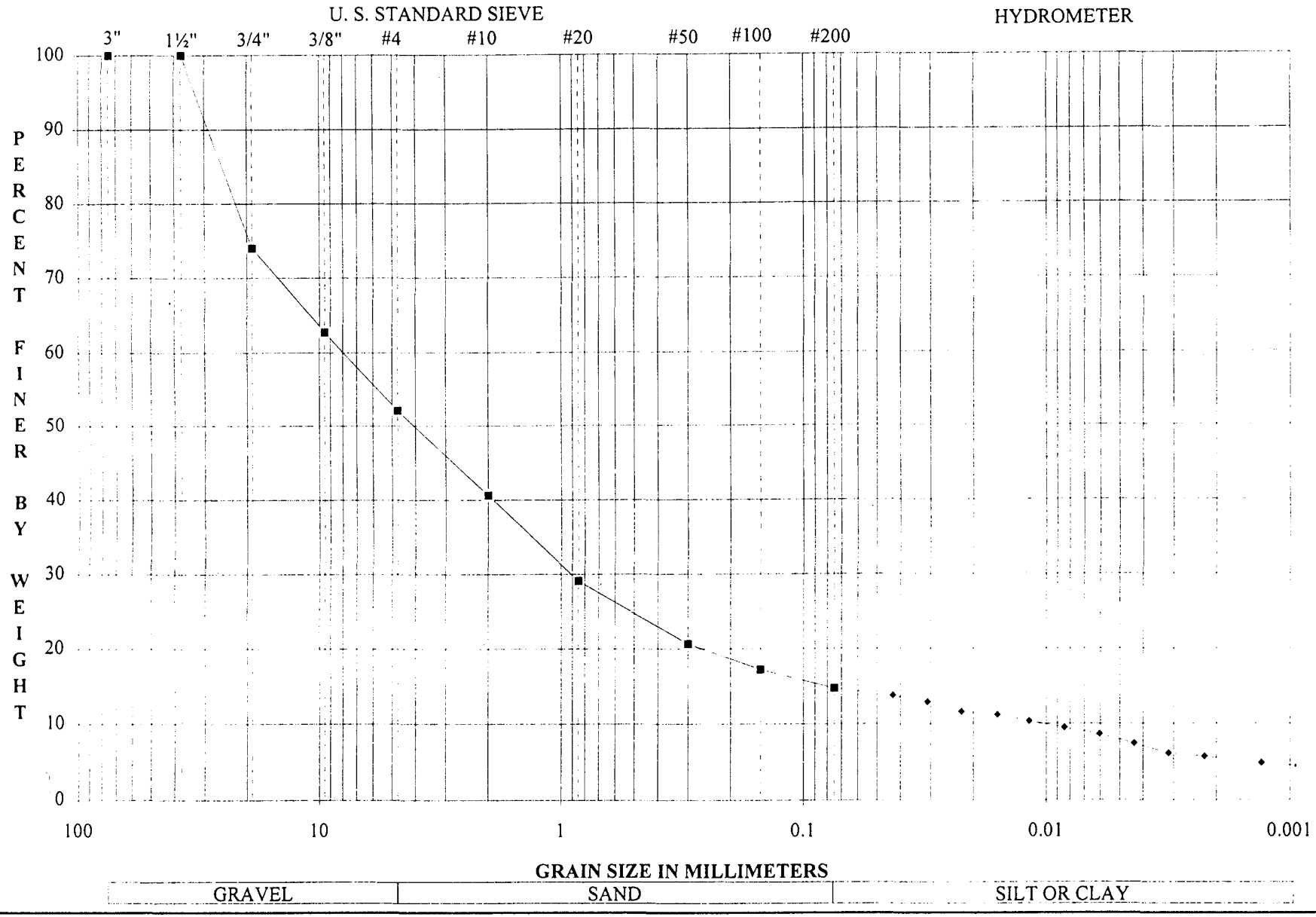
Unified Soil Classification System (USCS) Group Symbol

GM or GC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW07-02, ETL SAMPLE 9710G709-001



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW07-03	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	002	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	91.3
3/8"	9.500	74.7
#4	4.750	55.0
#10	2.000	40.2
#20	0.850	29.1
#50	0.300	21.3
#100	0.150	17.8
#200	0.075	14.9
HYDROMETER	0.0427	15.2
	0.0309	13.8
	0.0222	12.9
	0.0159	12.0
	0.0118	11.1
	0.0085	10.2
	0.0061	9.3
	0.0044	7.9
	0.0031	7.0
	0.0022	6.5
	0.0013	5.2
	0.0009	4.7

EFFECTIVE SIZES

% Finer	Diameter mm
60	5.963
30	0.944
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

brown silty or clayey GRAVEL
with 40% sand and 15% silt or clay

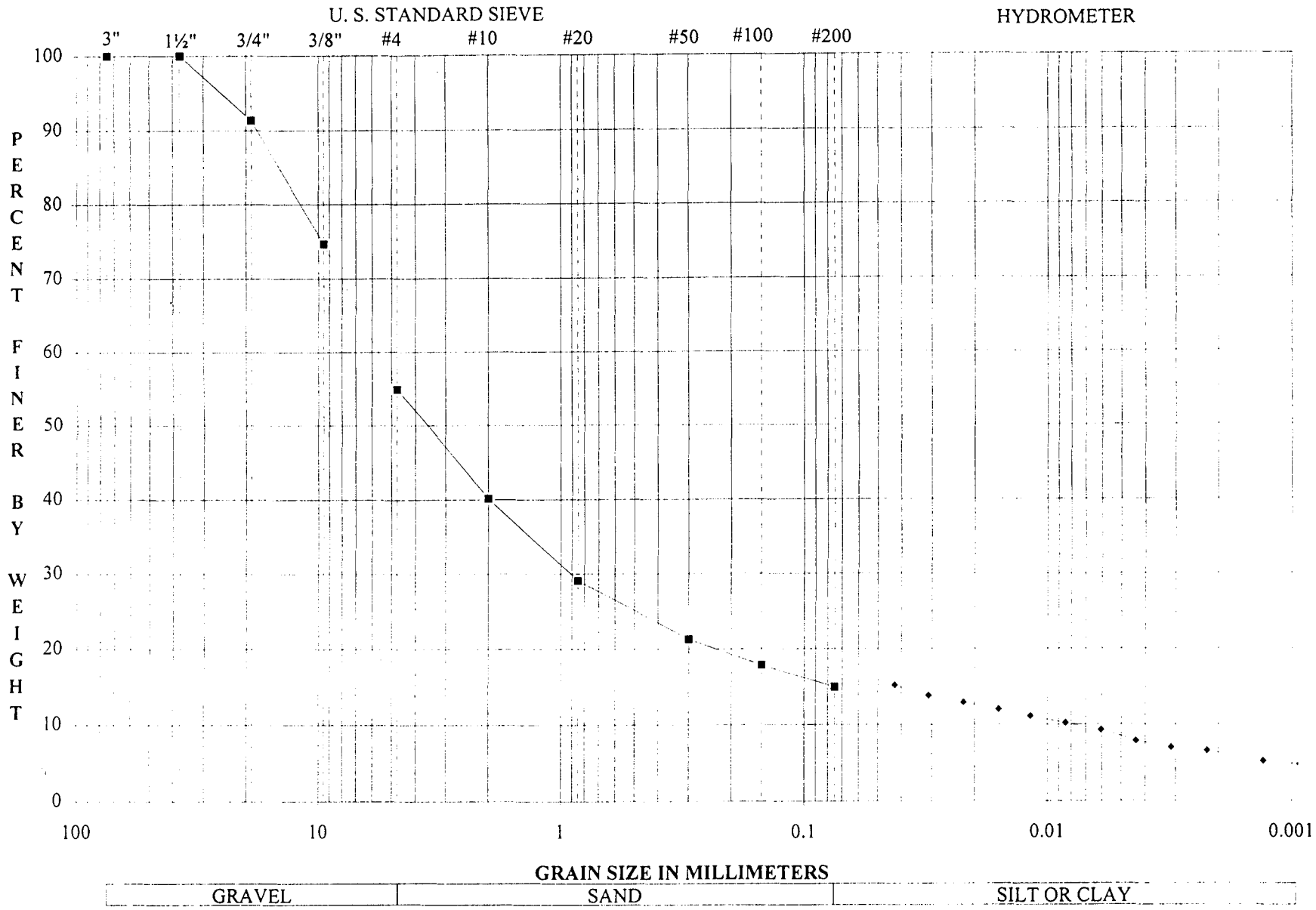
Unified Soil Classification System (USCS) Group Symbol

GM or GC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW07-03, ETL SAMPLE 9710G709-002



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW05-01	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	006	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	95.1
3/8"	9.500	80.6
#4	4.750	69.9
#10	2.000	60.1
#20	0.850	49.5
#50	0.300	38.7
#100	0.150	32.8
#200	0.075	28.4
HYDROMETER	0.0372	25.8
	0.0269	24.8
	0.0194	23.7
	0.0142	21.6
	0.0106	20.5
	0.0077	18.9
	0.0056	16.8
	0.0041	14.6
	0.0030	12.5
	0.0021	11.4
	0.0013	9.8
	0.0009	8.7

EFFECTIVE SIZES

% Finer	Diameter mm
60	1.992
30	0.103
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

brown silty or clayey SAND
with 30% gravel and 28% silt or clay

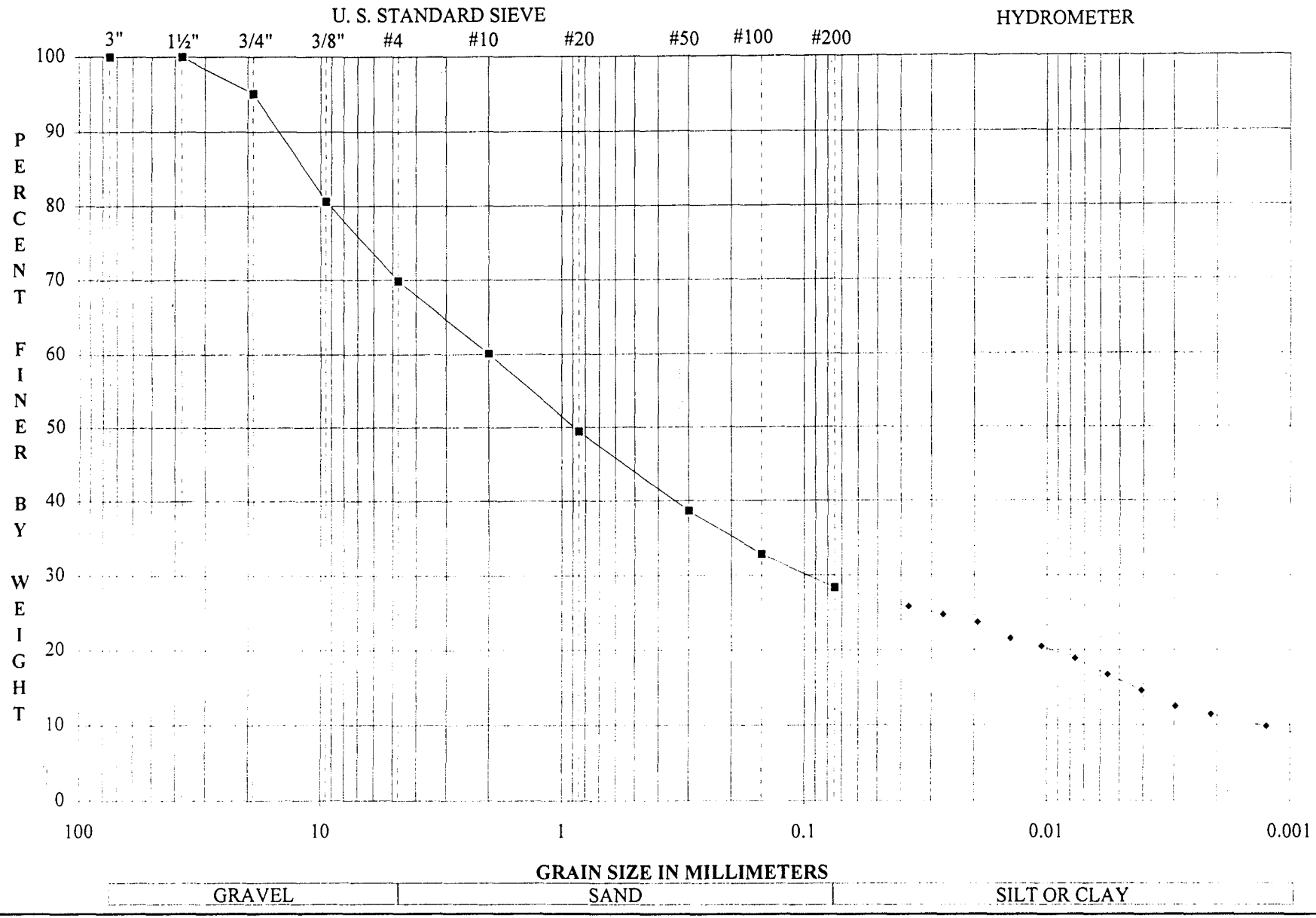
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW05-01, ETL SAMPLE 9710G709-006



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW05-02	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	007	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	100.0
3/8"	9.500	99.4
#4	4.750	79.2
#10	2.000	61.6
#20	0.850	46.1
#50	0.300	32.9
#100	0.150	26.9
#200	0.075	23.1
HYDROMETER	0.0444	19.5
	0.0318	18.2
	0.0227	17.5
	0.0161	16.8
	0.0120	14.7
	0.0086	14.0
	0.0061	12.7
	0.0044	11.3
	0.0031	9.9
	0.0022	9.2
	0.0013	7.8
	0.0009	6.5

EFFECTIVE SIZES

% Finer	Diameter mm
60	1.884
30	0.227
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

yellow brown silty or clayey SAND
with 21% gravel and 23% silt or clay

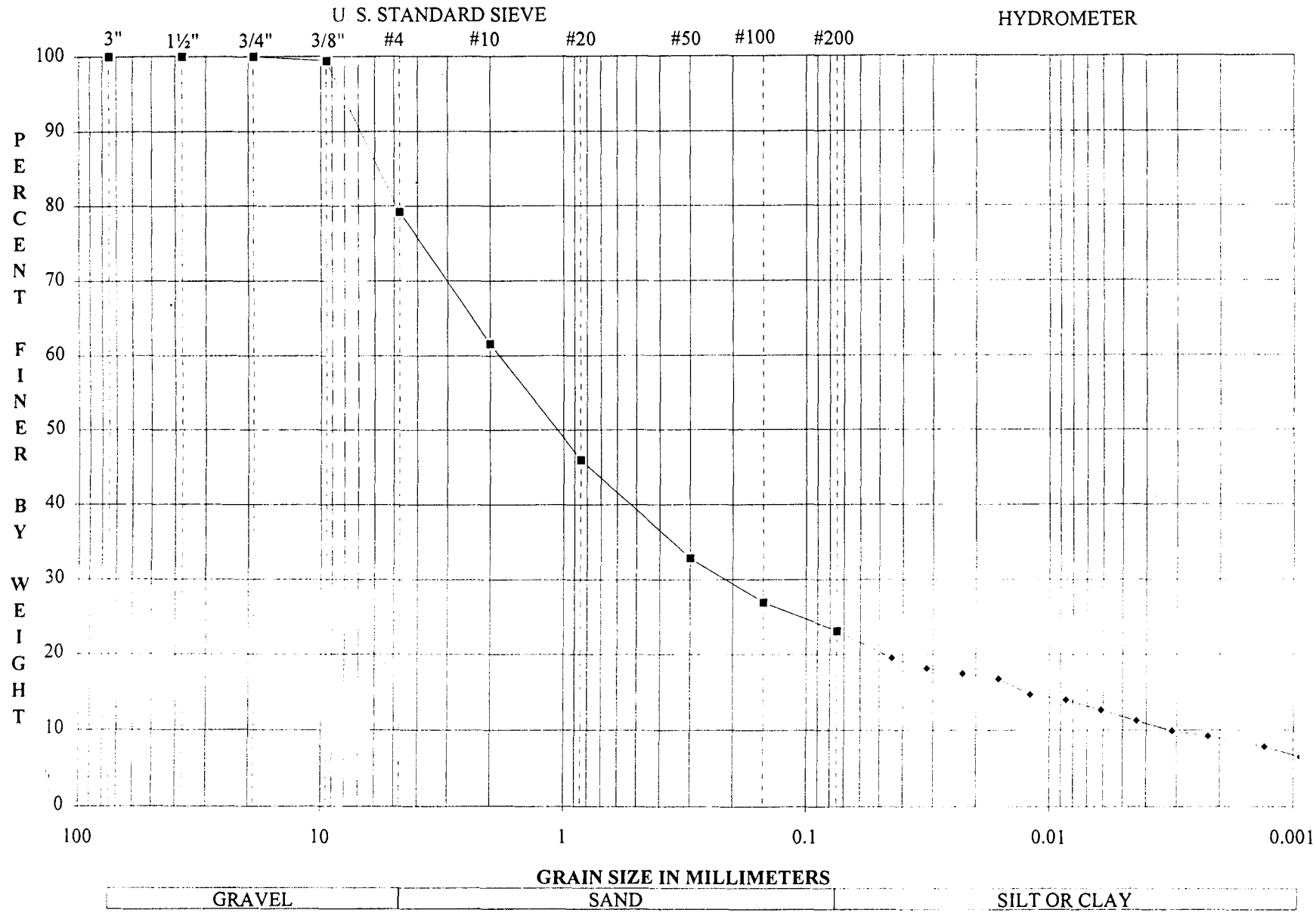
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW05-02, ETL SAMPLE 9710G709-007



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW06-01	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	011	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	93.3
3/8"	9.500	77.2
#4	4.750	65.2
#10	2.000	51.6
#20	0.850	40.2
#50	0.300	32.6
#100	0.150	29.0
#200	0.075	25.6
HYDROMETER	0.0384	24.5
	0.0279	22.8
	0.0205	20.7
	0.0147	19.6
	0.0110	18.0
	0.0079	17.5
	0.0057	15.8
	0.0041	14.2
	0.0029	13.1
	0.0021	12.1
	0.0012	11.0
	0.0009	10.4

EFFECTIVE SIZES

% Finer	Diameter mm
60	3.702
30	0.193
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

red brown silty or clayey SAND
with 35% gravel and 26% silt or clay

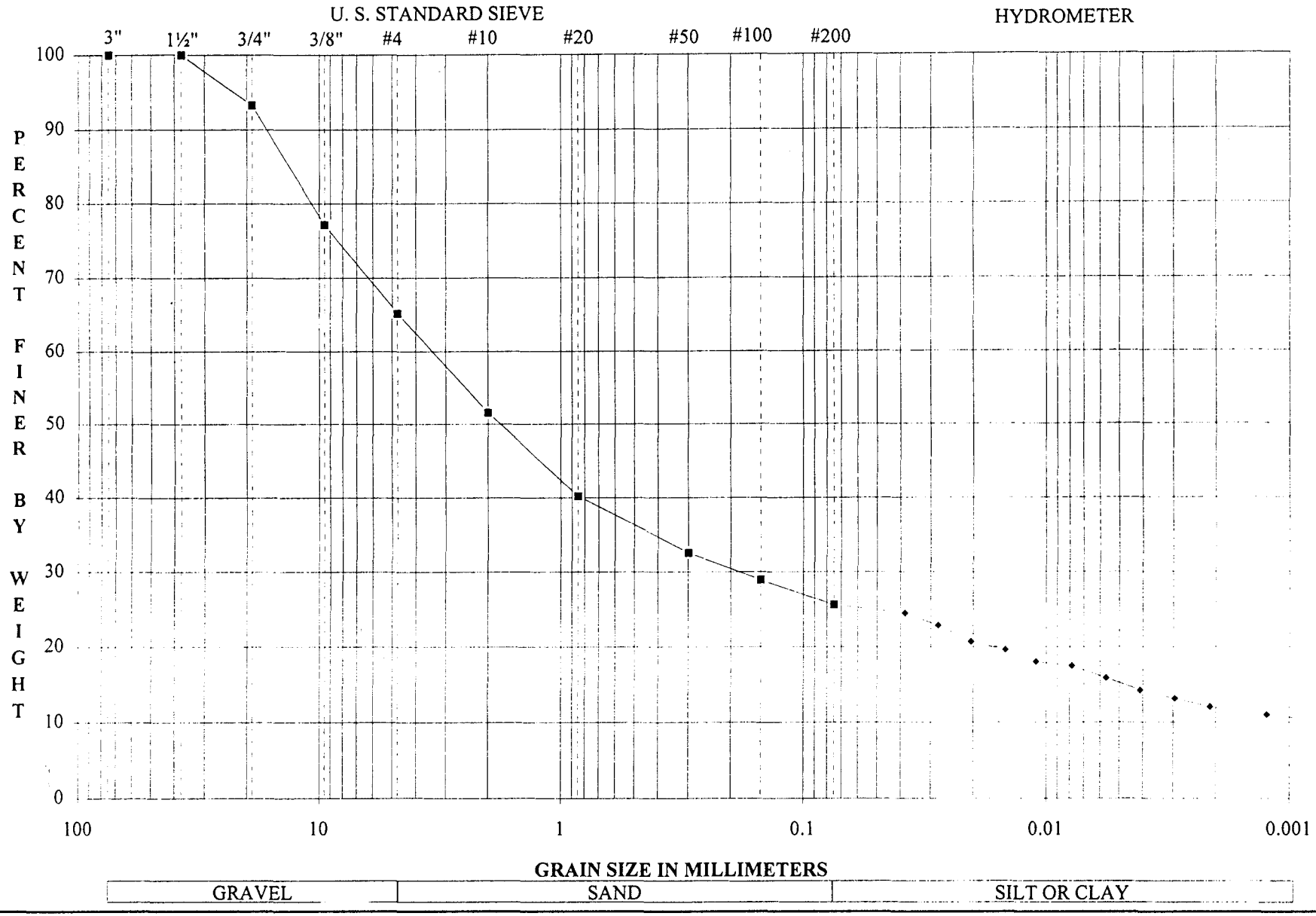
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW06-01, ETL SAMPLE 9710G709-011



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW06-03	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	013	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	97.9
3/8"	9.500	97.6
#4	4.750	95.6
#10	2.000	90.5
#20	0.850	86.3
#50	0.300	73.6
#100	0.150	58.1
#200	0.075	48.5
HYDROMETER	0.0420	41.4
	0.0299	40.2
	0.0217	36.7
	0.0157	33.2
	0.0115	32.0
	0.0083	28.5
	0.0060	26.2
	0.0043	21.5
	0.0031	19.2
	0.0022	16.8
	0.0013	15.7
	0.0009	13.3

EFFECTIVE SIZES

% Finer	Diameter mm
60	0.168
30	NA
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

gray silty or clayey SAND
with 4% gravel and 49% silt or clay

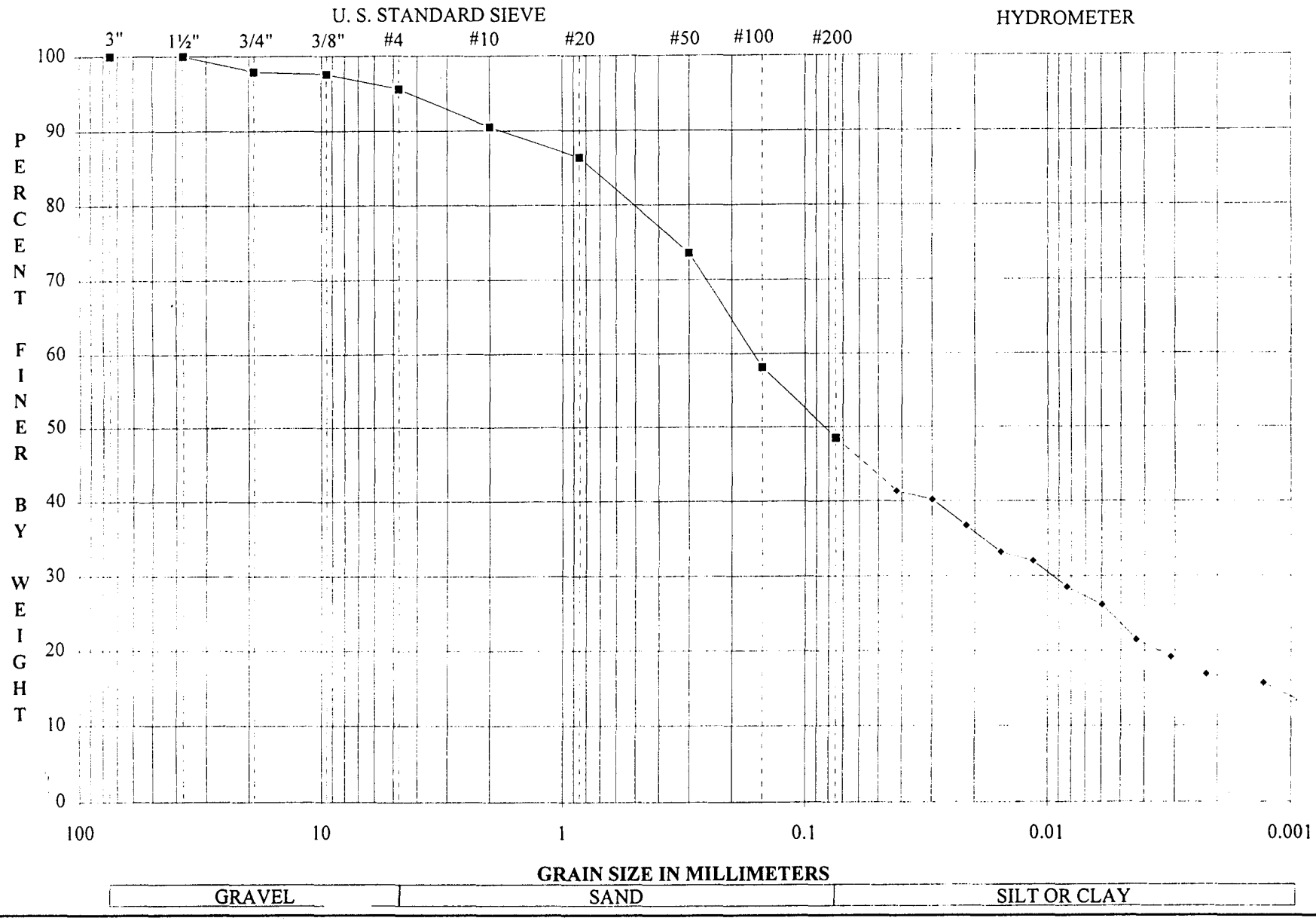
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW06-03, ETL SAMPLE 9710G709-013



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW06-04	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	014	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	100.0
3/8"	9.500	95.8
#4	4.750	79.1
#10	2.000	63.9
#20	0.850	54.8
#50	0.300	41.7
#100	0.150	32.2
#200	0.075	28.3
HYDROMETER	0.0391	28.5
	0.0282	27.2
	0.0208	23.9
	0.0151	21.9
	0.0113	20.0
	0.0081	18.7
	0.0058	17.3
	0.0042	15.4
	0.0030	14.1
	0.0022	12.7
	0.0013	11.4
	0.0009	9.5

EFFECTIVE SIZES

% Finer	Diameter mm
60	1.512
30	0.108
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

Light gray silty or clayey SAND
with 21% gravel and 28% silt or clay
Contains broken sea shells

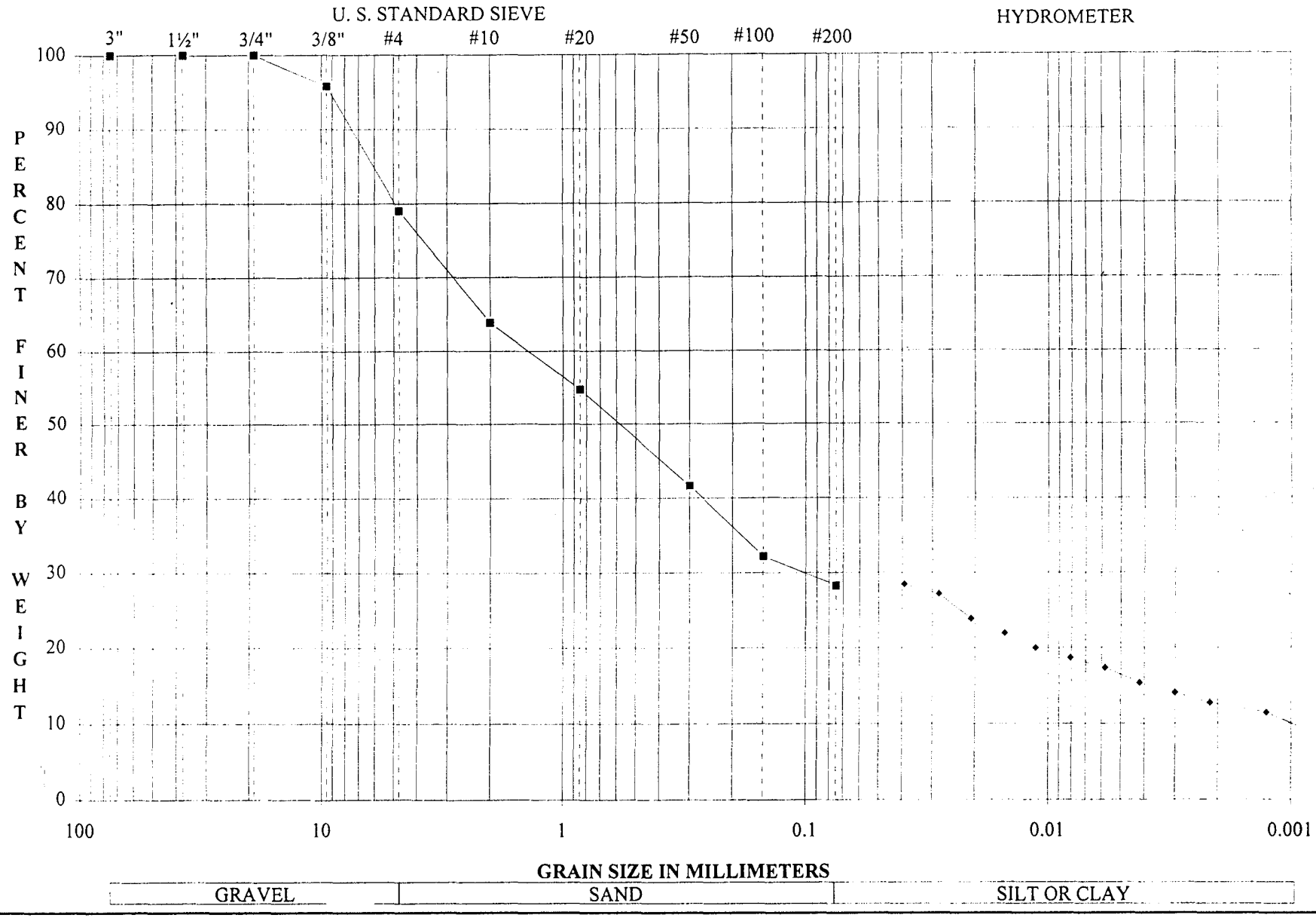
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW06-04, ETL SAMPLE 9710G709-014



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW06-05	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	015	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	87.7
3/8"	9.500	80.7
#4	4.750	63.0
#10	2.000	42.5
#20	0.850	29.4
#50	0.300	21.4
#100	0.150	17.8
#200	0.075	15.0
HYDROMETER	0.0457	11.5
	0.0327	10.6
	0.0235	9.6
	0.0167	9.1
	0.0124	8.2
	0.0088	7.3
	0.0063	6.3
	0.0045	5.4
	0.0032	4.9
	0.0023	4.0
	0.0013	3.5
	0.0010	3.0

EFFECTIVE SIZES

% Finer	Diameter mm
60	4.350
30	0.903
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

yellow brown silty or clayey SAND
with 37% gravel and 15% silt or clay

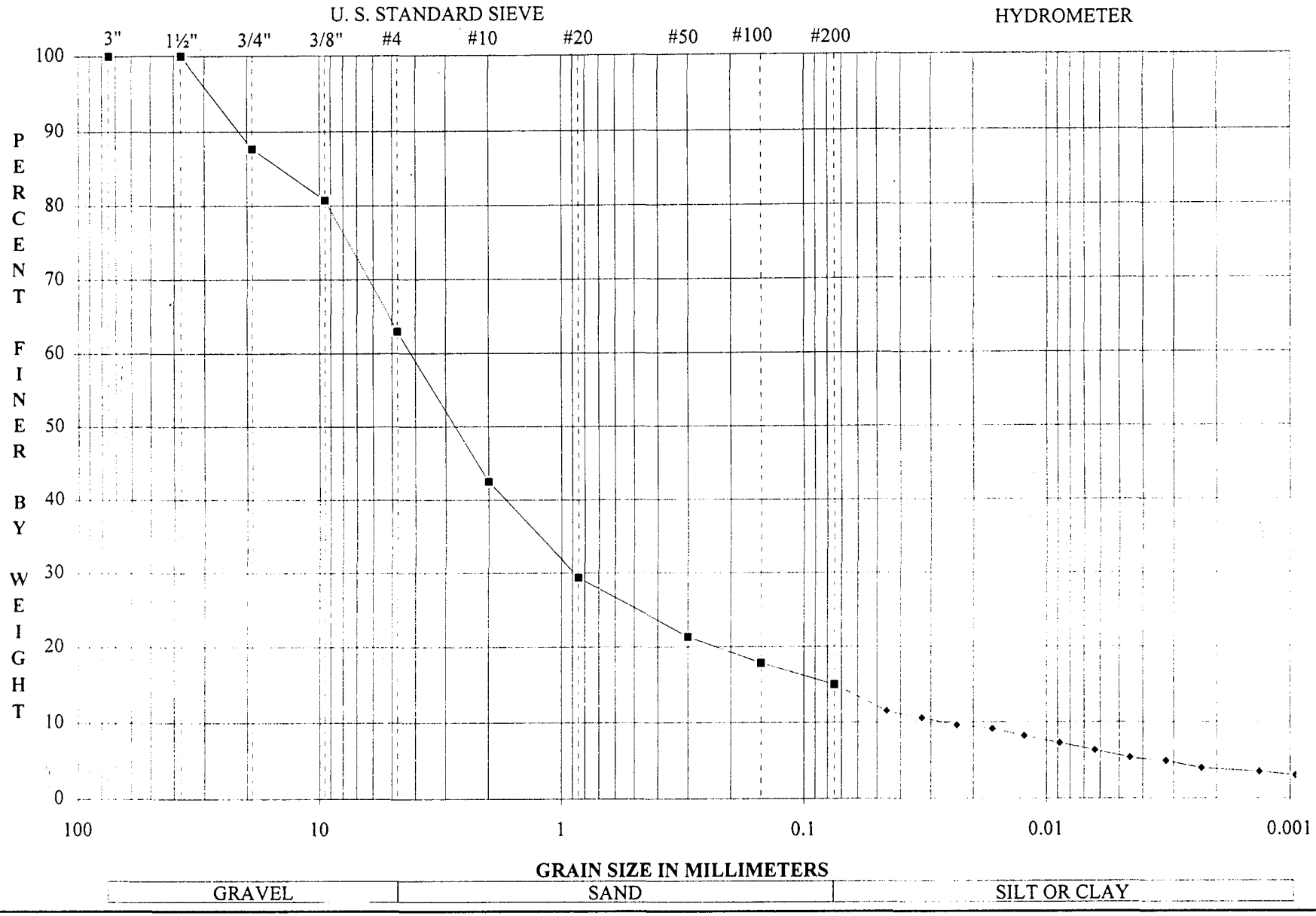
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES:

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW06-05, ETL SAMPLE 9710G709-015



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW06-06	PROJECT ANALYST	WB
JOB NUMBER	9710G709	ETL SAMPLE NUMBER	016	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/06/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	100.0
3/8"	9.500	96.1
#4	4.750	85.7
#10	2.000	64.6
#20	0.850	43.3
#50	0.300	26.1
#100	0.150	20.4
#200	0.075	16.4
HYDROMETER	0.0460	16.1
	0.0327	15.4
	0.0235	14.0
	0.0167	13.3
	0.0124	11.9
	0.0088	11.3
	0.0063	9.9
	0.0045	7.8
	0.0032	6.5
	0.0023	5.1
	0.0013	4.4
	0.0010	3.7

EFFECTIVE SIZES

% Finer	Diameter mm
60	1.752
30	0.423
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

gray silty or clayey SAND
with 14% gravel and 16% silt or clay

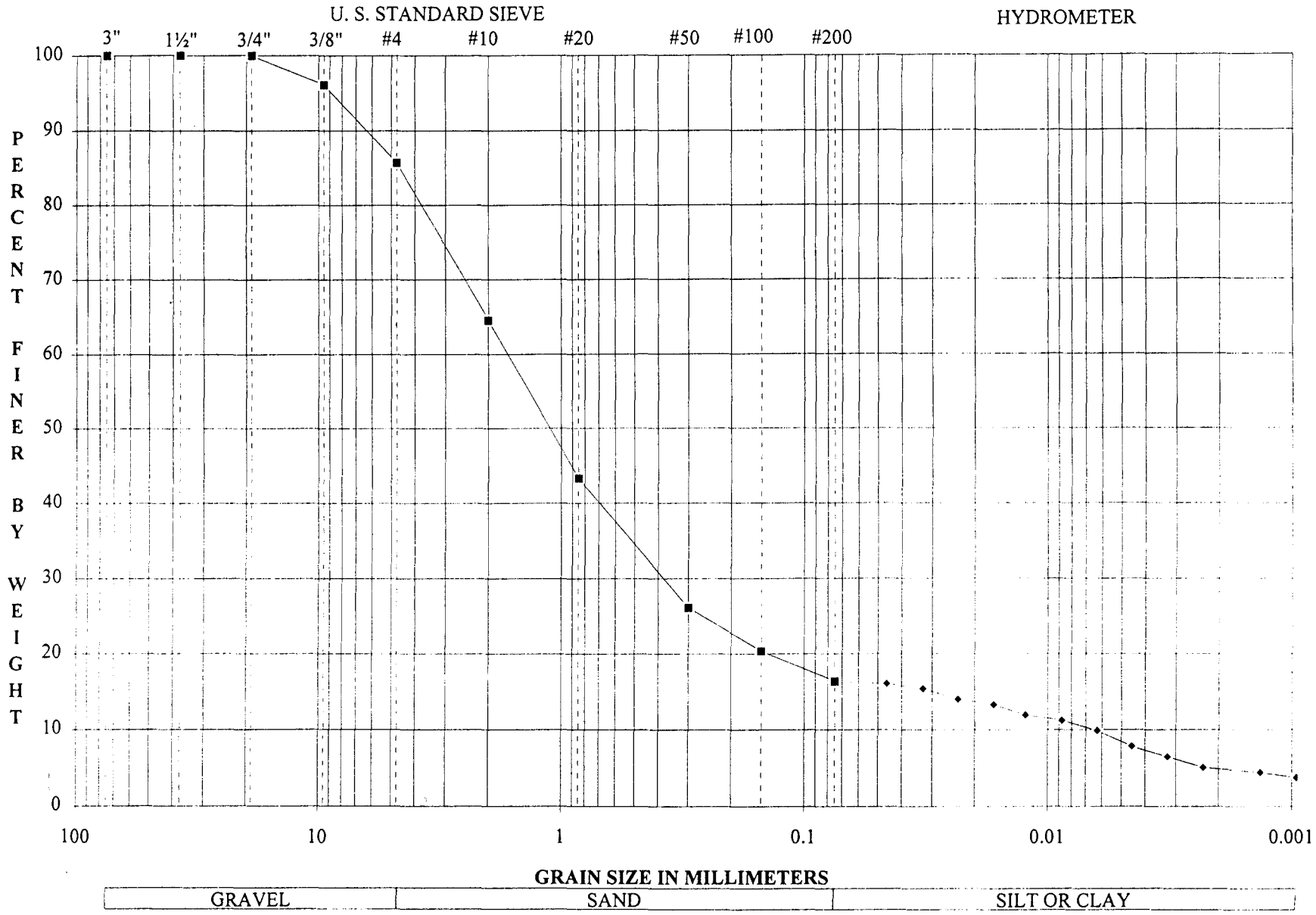
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW06-06, ETL SAMPLE 9710G709-016



ENVIRONMENTAL ANALYTICAL RESULTS

Original Analytical Results - RECRA LabNet

	7MW09-01	7MW09-02	7MW09-03	7MW09-04	7MW09-05	7MW09-06	7MW09-08	7MW09-09	7MW09-07	7MW09-10	TB02
otal Petroleum Hydrocarbons											
esel Range Organics (mg/kg)	7.6 U	7.5 U	6.8 U	8.7 U	7.4 U	8.1 U	7.7 U	7.1 U	8 U	7.1 U	
asoline Range Organics (ug/kg)	61 U	60 U	56 U	71 U	620	480	37 J	32 J	51 J	57 U	
asoline Range Organics (ug/L)											50 U

GEOTECHNICAL TESTING DATA AND RESULTS

Table 1 Geotechnical Tests Performed, Reference Methods and Test Numbers		
Test Parameter	**Method[1]**	**Test Numbers**
Grain Size by Sieve and Hydrometer	D 421/422	3

[1] All analytical methods derived from the Annual Book of ASTM Standards, Section 4. Volume 4.08, Soil and Rock; building Stones; Geotextiles. American Society of Testing Materials, Philadelphia, PA, 1993 unless noted otherwise.

Custody Transfer Record/Lab Work Request

RECRA LabNet

RECRA LabNet Use Only
9710G713

Client: Recra LabNet Chicago
Project #:
Date Rec'd.: 10/25/97 Date Due: 11/11/97
RECRA PM: Bosco Ramirez
Client Contact/Phone:

Refrigerator#			S/O								
#/Type Container			1/G								
Volume			1/6oz								
Preservative											
ANALYSIS REQUESTED			Grain Size								
RECRA Use Only Lab ID	Client ID/Description	Matrix	Date Collected								
001	7MW09-01	S	10/23/97	C							
005	1 05	1	10/24/97	1							
010	1 10	1	1	1							

Matrix:
S - Soil
SE - Sediment
SO - Solid
W - Water
O - Oil
A - Air
WI - Wipe
DS - Drum Solids
DL - Drum Liquids
F - Fish
L - EP/TCLP Leachate
X- Other

Special Instructions:

Item/Reason	Relinquished by	Received by	Date	Time	Item/Reason	Relinquished by	Received by	Date	Time
all	P. Bukot	FX→ETL	10/28/97	1510					
all		[illegible] EIL	10/29/97	1130					

RECRA LabNet Use Only

Samples Were:
1 Shipped or Hand-Delivered
NOTES: FX

2 Ambient or chilled
NOTES:

3 Received Broken/ Leaking (Improperly Sealed) Y N
NOTES:

4 Properly Preserved Y N
NOTES:

5 Received Within Holding Times Y N
NOTES:

COC Tape Was:
1 Present on Outer Package Y N
2 Unbroken on Outer Package Y N
3 Present on Sample Y N
4 Unbroken on Sample Y N
NOTES:

COC Record Was:
1 Present Upon Receipt of Samples Y N

Discrepancies Between Sample Labels and COC Record? Y N
NOTES:

ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW09-01	PROJECT ANALYST	JRA
JOB NUMBER	9710G713	ETL SAMPLE NUMBER	001	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/05/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	91.3
3/8"	9.500	84.9
#4	4.750	75.6
#10	2.000	63.4
#20	0.850	53.5
#50	0.300	44.2
#100	0.150	39.0
#200	0.075	34.4
HYDROMETER	0.0427	32.9
	0.0307	30.9
	0.0219	29.9
	0.0158	27.0
	0.0116	26.0
	0.0083	24.0
	0.0060	21.1
	0.0043	19.1
	0.0031	18.1
	0.0022	16.2
	0.0013	15.2
	0.0009	13.2

EFFECTIVE SIZES

% Finer	Diameter mm
60	1.602
30	NA
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

light yellowish brown silty or clayey SAND with 24% gravel and 34% silt or clay

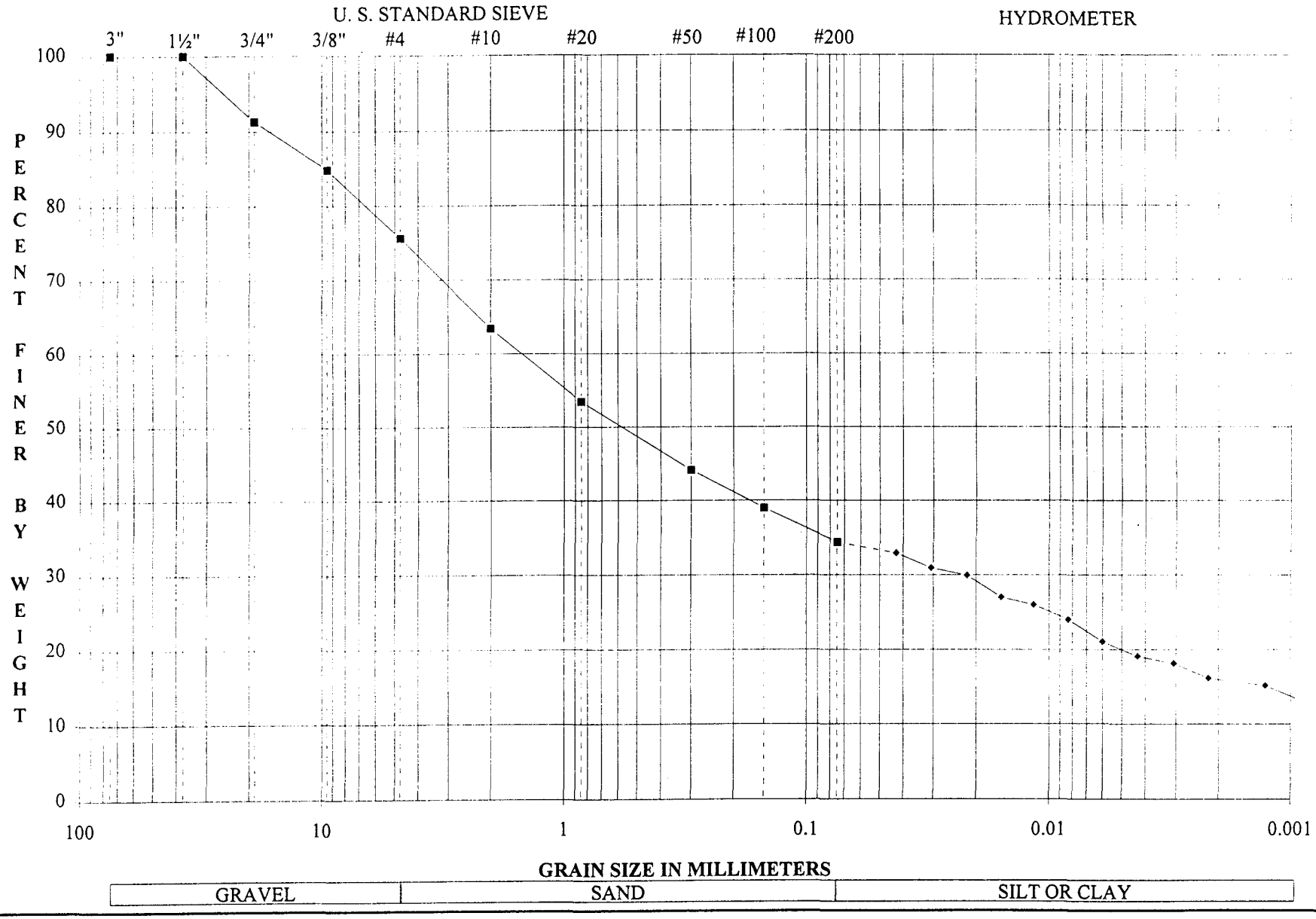
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW09-01, ETL SAMPLE 9710G713-001



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW09-05	PROJECT ANALYST	JRA
JOB NUMBER	9710G713	ETL SAMPLE NUMBER	005	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/05/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	100.0
3/8"	9.500	98.8
#4	4.750	95.2
#10	2.000	84.0
#20	0.850	74.0
#50	0.300	63.4
#100	0.150	56.6
#200	0.075	50.5
HYDROMETER	0.0380	47.6
	0.0277	44.5
	0.0201	41.4
	0.0146	38.4
	0.0108	36.3
	0.0078	34.3
	0.0057	30.2
	0.0041	27.1
	0.0029	25.0
	0.0021	23.0
	0.0012	22.0
	0.0009	18.9

EFFECTIVE SIZES

% Finer	Diameter mm
60	0.224
30	NA
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

light yellowish brown SILT or CLAY with 5% gravel and 45% sand

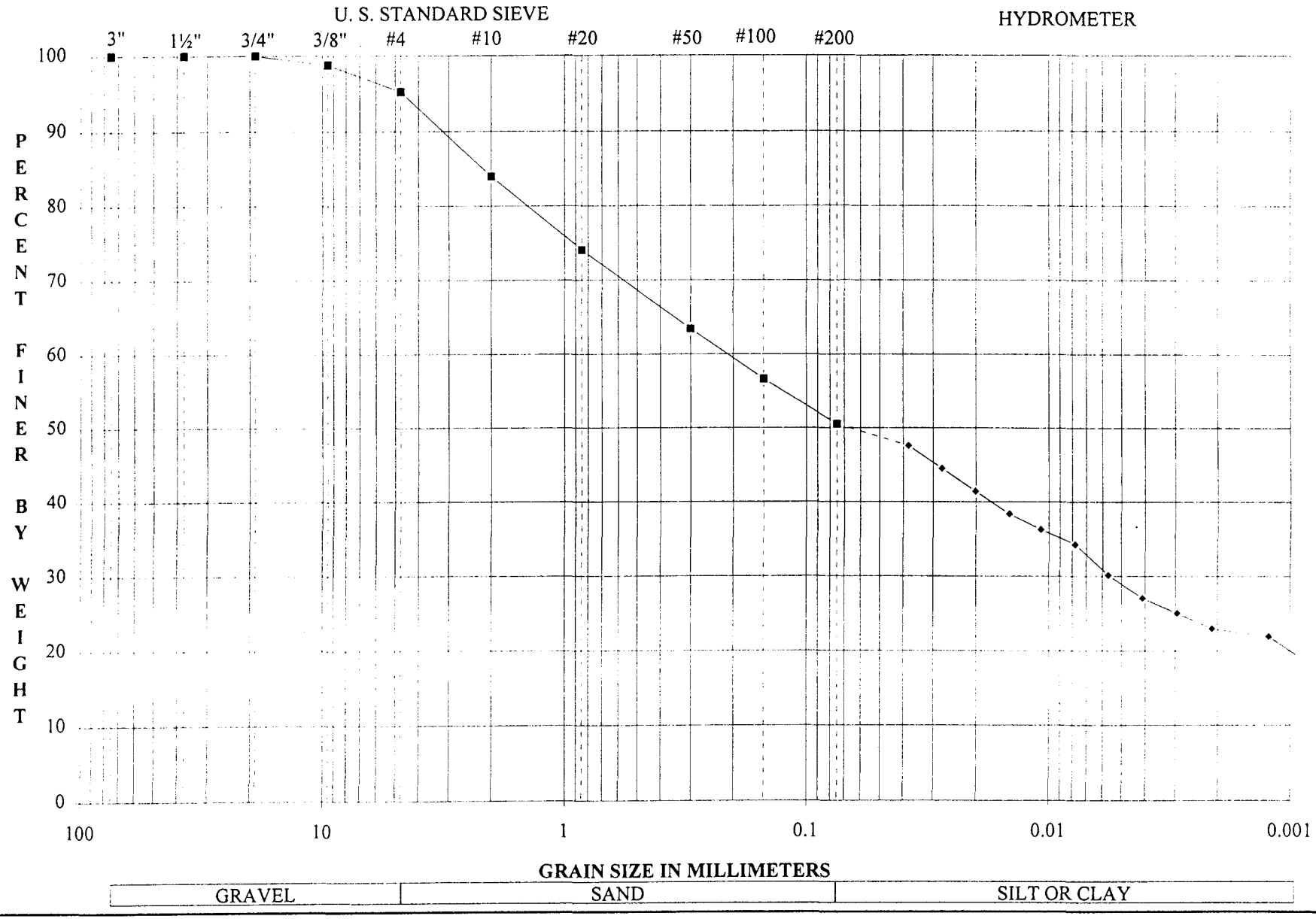
Unified Soil Classification System (USCS) Group Symbol

ML, CL, MH, or CH

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW09-05, ETL SAMPLE 9710G713-005



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW09-10	PROJECT ANALYST	JRA
JOB NUMBER	9710G713	ETL SAMPLE NUMBER	010	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/05/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	100.0
3/8"	9.500	90.9
#4	4.750	73.8
#10	2.000	50.2
#20	0.850	34.9
#50	0.300	24.6
#100	0.150	20.2
#200	0.075	16.6
HYDROMETER	0.0460	17.1
	0.0330	15.7
	0.0236	14.2
	0.0169	12.7
	0.0124	12.0
	0.0088	11.3
	0.0063	10.5
	0.0045	9.1
	0.0032	9.1
	0.0023	7.6
	0.0013	6.9
	0.0009	6.1

EFFECTIVE SIZES

% Finer	Diameter mm
60	3.144
30	0.587
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

brownish yellow silty or clayey SAND with 26% gravel and 17% silt or clay

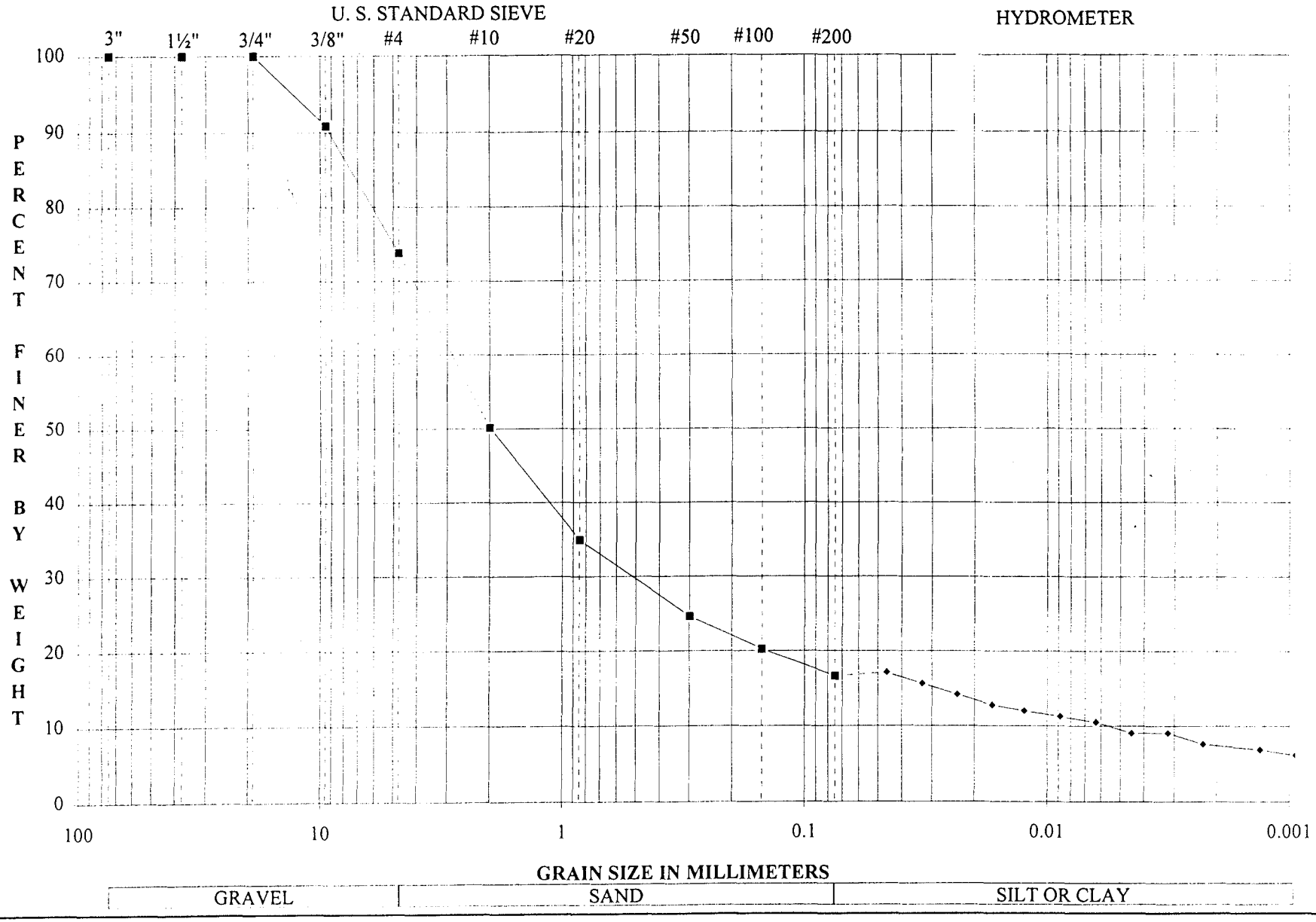
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW09-10, ETL SAMPLE 9710G713-010



ENVIRONMENTAL ANALYTICAL RESULTS

Original Analytical Results - RECRA LabNet

	7MW09-11	7MW09-11D	7MW09-12	7MW09-12D	7MW08-01	7MW08-01D	7MW08-02	7MW08-02D	TB03
Total Petroleum Hydrocarbons									
Diesel Range Organics (mg/kg)	8.1 U	7.8 U	7.7 U	7.7 U	11	9.7	7.9	12	
Gasoline Range Organics (ug/kg)	65 U	91	62 U	62 U	550	52 U	55 U	55 U	
Gasoline Range Organics (ug/L)									50 U

GEOTECHNICAL TESTING DATA AND RESULTS

Table 1 Geotechnical Tests Performed, Reference Methods and Test Numbers		
Test Parameter	**Method[1]**	**Test Numbers**
Grain Size by Sieve and Hydrometer	D 421/422	2

[1] All analytical methods derived from the Annual Book of ASTM Standards, Section 4. Volume 4.08, Soil and Rock; building Stones; Geotextiles. American Society of Testing Materials, Philadelphia, PA, 1993 unless noted otherwise.

Custody Transfer Record/Lab Work Request

RECRA LabNet

RECRA LabNet Use Only: 9710G734

Client: Recra LabNet Chicago
Project #:
Date Rec'd.: 10/28/97 Date Due: 11/13/97
RECRA PM: Bosco Ramirez
Client Contact/Phone:

RECRA Use Only Lab ID	Client ID/Description #6 10/28/97	Matrix	Date Collected	Refrigerator# 8/6	#/Type Container 1/6	Volume 16oz	Preservative	ANALYSIS REQUESTED Grain Size
003	7MW09-~~11~~ 12	S	10/24/97	C				
005	7MW08-01	L	10/27/97	C				

Matrix:
S - Soil, SE - Sediment, SO - Solid
W - Water, O - Oil, A - Air, WI - Wipe
DS - Drum Solids, DL - Drum Liquids, F - Fish, L - EP/TCLP Leachate
X- Other

Special Instructions:

Item/Reason	Relinquished by	Received by	Date	Time	Item/Reason	Relinquished by	Received by	Date	Time
all	P. Bulu	FX → ETL	10/28/97	1515					
all		C. Shah ETL	10/29/97	1130					

RECRA LabNet Use Only

Samples Were:
1 Shipped or Hand-Delivered FX
NOTES:

2 Ambient or chilled
NOTES:

3 Received Broken/Leaking (Improperly Sealed) Y N
NOTES:

4 Properly Preserved Y N
NOTES:

5 Received Within Holding Times Y N
NOTES:

COC Tape Was:
1 Present on Outer Package Y N
2 Unbroken on Outer Package Y N
3 Present on Sample Y N
4 Unbroken on Sample Y N
NOTES:

COC Record Was:
1 Present Upon Receipt of Samples Y N

Discrepancies Between Sample Labels and COC Record? Y N
NOTES:

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GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW09-12	PROJECT ANALYST	JRA
JOB NUMBER	9710G734	ETL SAMPLE NUMBER	003	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/05/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	100.0
3/8"	9.500	100.0
#4	4.750	99.5
#10	2.000	78.3
#20	0.850	55.8
#50	0.300	39.5
#100	0.150	31.4
#200	0.075	24.9
HYDROMETER	0.0453	27.3
	0.0325	25.1
	0.0233	23.0
	0.0167	20.8
	0.0124	18.7
	0.0088	16.5
	0.0063	14.4
	0.0045	12.2
	0.0032	11.2
	0.0023	9.0
	0.0013	8.0
	0.0010	6.9

EFFECTIVE SIZES

% Finer	Diameter mm
60	1.064
30	0.134
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

light yellowish brown silty or clayey SAND with 25% silt or clay

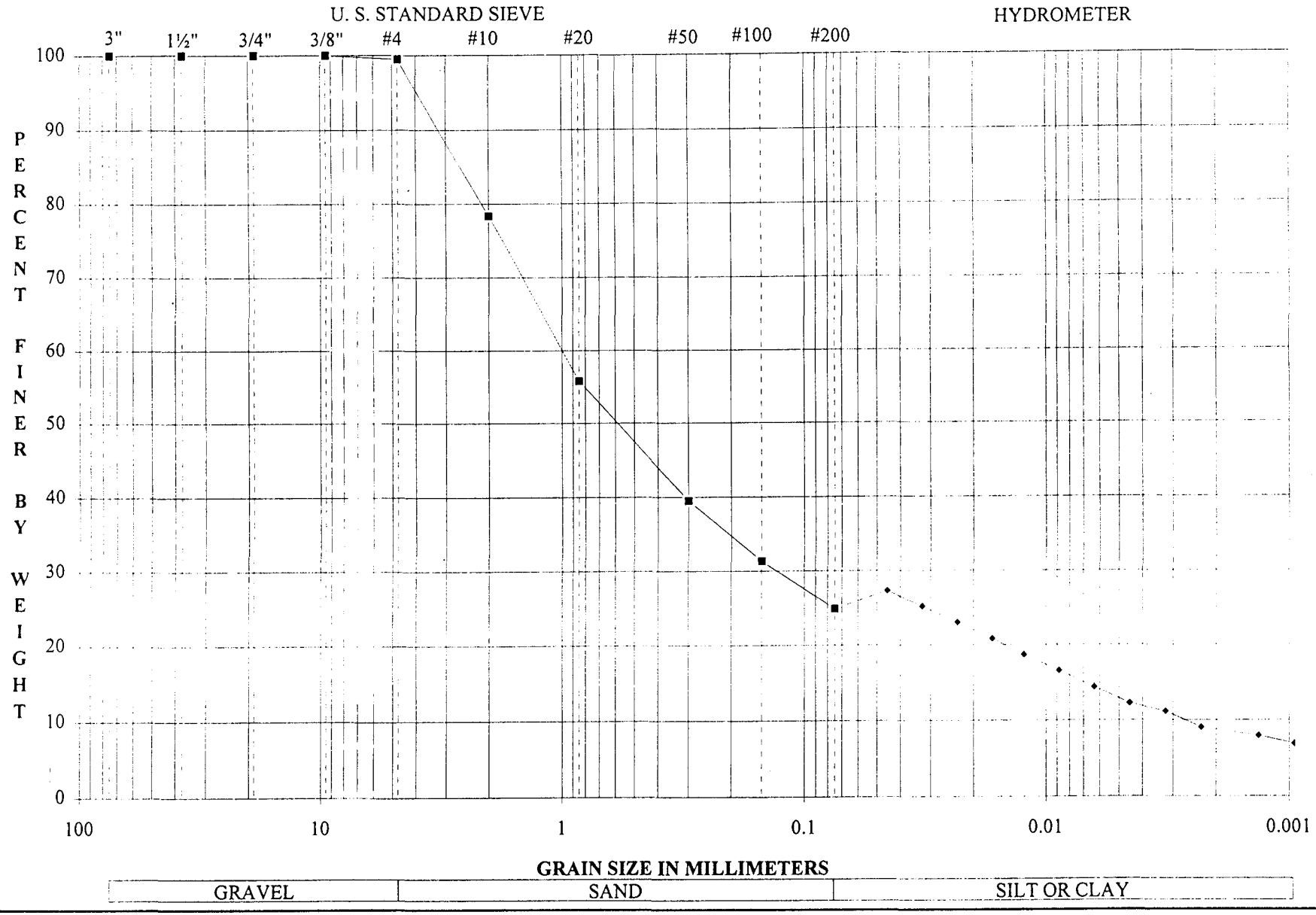
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW09-12, ETL SAMPLE 9710G734-003



ROY F. WESTON, INC. ENVIRONMENTAL TECHNOLOGY LABORATORY

GEOTECHNICAL TESTING DATA AND RESULTS

PROJECT	Recra LabNet/Chicago/Baker	PROJECT SAMPLE I.D.	7MW08-01	PROJECT ANALYST	JRA
JOB NUMBER	9710G734	ETL SAMPLE NUMBER	005	QA/QC ANALYST	RWF
P. O. NUMBER	UP01172	DATE RECEIVED	10/29/97	DATE COMPLETED	11/05/97

PARTICLE SIZE DISTRIBUTION

U. S. Standard Sieve Size	Diameter mm	% Finer
3"	75.00	100.0
1½"	37.50	100.0
3/4"	19.00	96.8
3/8"	9.500	78.5
#4	4.750	66.6
#10	2.000	51.5
#20	0.850	39.2
#50	0.300	27.3
#100	0.150	22.2
#200	0.075	18.4
HYDROMETER	0.0427	18.4
	0.0307	17.3
	0.0220	16.2
	0.0159	14.5
	0.0118	13.4
	0.0085	12.3
	0.0061	10.7
	0.0044	9.0
	0.0031	8.5
	0.0022	7.9
	0.0013	6.8
	0.0009	5.7

EFFECTIVE SIZES

% Finer	Diameter mm
60	3.549
30	0.426
10	NA
Uniformity Coefficient	Gradation Coefficient
NA	NA

SAMPLE DESCRIPTION

light grayish brown silty or clayey SAND with 33% gravel and 18% silt or clay

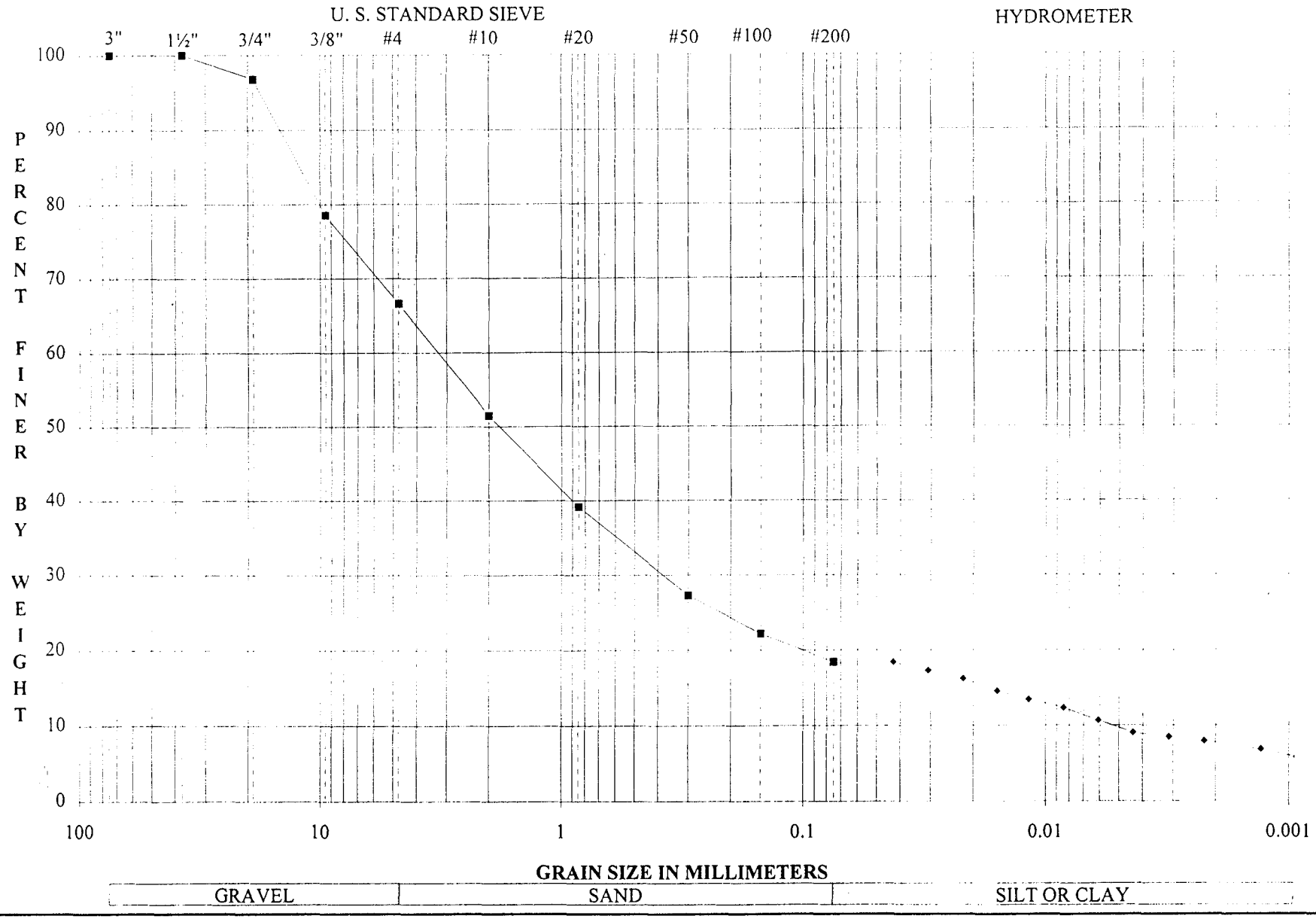
Unified Soil Classification System (USCS) Group Symbol

SM or SC

NOTES

NA=NOT APPLICABLE

PARTICLE-SIZE DISTRIBUTION CURVE
PROJECT SAMPLE 7MW08-01, ETL SAMPLE 9710G734-005



ENVIRONMENTAL ANALYTICAL RESULTS

Original Analytical Results - RECRA LabNet

	7ER01 10/28/97	7ER02 10/28/97	TB04 10/28/97
Total Petroleum Hydrocarbons			
Diesel Range Organics (mg/L)	0.12 U	NA	NA
Gasoline Range Organics (ug/L)	38 J	NA	50 U
BTEX (ug/L)			
Benzene	NA	5 U	5 U
Toluene	NA	5 U	5 U
Ethylbenzene	NA	5 U	5 U
Xylene (total)	NA	5 U	5 U

Original Analytical Results - RECRA LabNet

	7MW05-01 10/30/97	7MW06-01 10/30/97	7MW07-01 10/30/97	7MW08-01 10/30/97	7MW08-01 10/30/97	7MW09-01 10/30/97	TB05 10/30/97
BTEX (ug/L)							
Benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylene (total)	5 U	5 U	5 U	5 U	5 U	5 U	5 U

Original Analytical Results - RECRA LabNet

7IDW
10/31/97

BTEX (ug/kg)	
Benzene	1.2 U
Toluene	1.2 U
Ethylbenzene	1.2 U
Xylene (total)	1.2 U