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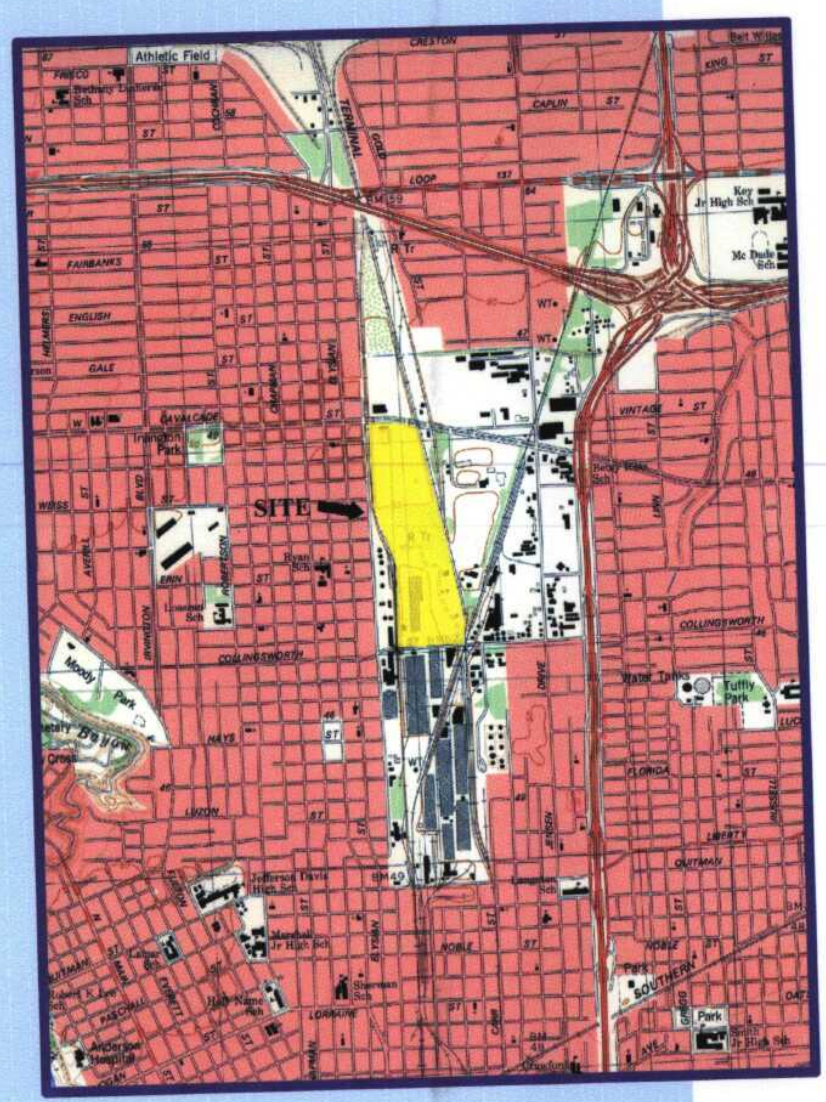

Verification of Groundwater Fate and Transport Evaluation

South Cavalcade Superfund Site Houston, Texas

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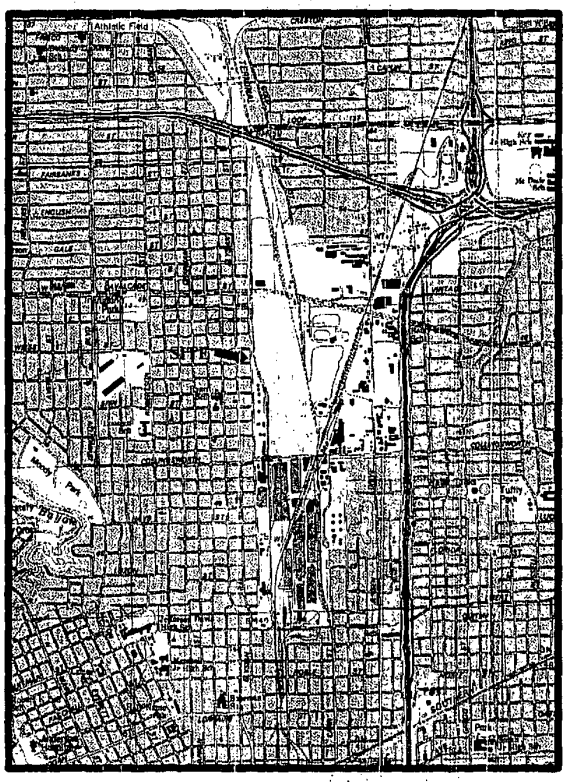

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VERIFICATION OF GROUNDWATER FATE AND TRANSPORT EVALUATION

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ABBREVIATIONS AND ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable and Relevant
Beazer	Beazer East, Inc.
Betchtel	Bechtel Environmental, Inc.
BOD	Biochemical Organic Demand
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
cm/sec	Centimeters/second
COD	Chemical Organic Demand
COI	Constituents of Interest
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	Environmental Protection Agency
f_{oc}	Fraction of Organic Carbon
ft/ft	Foot/foot
ft/year	Foot/year
g/cc	Grams/cubic centimeter
GC	Gas Chromatograph
GFTER	Groundwater Fate and Transport Evaluation Report
GRAA	Groundwater Remedial Action Area
GESPMP	Groundwater Extraction System Performance Monitoring Plan
HGCSD	Harris-Galveston Coastal Subsidence District
KEY	Key Environmental, Inc.
Koppers	Koppers Company, Inc.
NPL	National Priorities List
ORP	Oxidation/Reduction Potential
PAH	Polynuclear Aromatic Hydrocarbons
PDSA	Potential DNAPL Source Area
RAWP	Remedial Action Work Plan
RD/RP	Remedial Design and Remedial Action
RDWP	Remedial Design Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Site	South Cavalcade Superfund Site
SOPs	Standard Operating Procedures
SOW	Statement of Work

ABBREVIATIONS AND ACRONYMS (cont.)

TOC	Total Organic Carbon
TEG	Transglobal Environmental Geochemistry
TDWR	Texas Department of Water Resources
USGS	United States Geological Survey

1.0 INTRODUCTION

This document presents the results of the Verification of the Groundwater Fate and Transport Evaluation for the South Cavalcade Superfund Site (Site) located in Houston, Texas. The location of the Site is depicted on Figure 1-1. This Report was prepared by Key Environmental, Inc. (KEY), and Groundwater Insight, Inc. on behalf of Beazer East, Inc. (Beazer). The investigation described herein was conducted pursuant to the Work Plan for Verification of the Groundwater Fate and Transport Evaluation (Work Plan) which was reviewed and approved by the U.S. Environmental Protection Agency (EPA)[1]. The current report also describes and incorporates supplemental data collection activities that were conducted in response to the results from implementing the approved Work Plan. The scope of the supplemental activities was communicated to EPA by letter dates March 21, 2000[2].

On August 5, 1997, Beazer submitted a revised Groundwater Fate and Transport Evaluation Report[3] (GFTER) to the U.S. EPA for review and approval. The GFTER presented the results of analytical groundwater fate and transport modeling conducted using existing data, where possible, and information from published technical literature as protective default values where Site-specific data were not available. The fate and transport modeling presented in the GFTER was completed by Beazer as a preliminary evaluation of whether natural attenuation processes are sufficient to meet the remedial objectives for shallow groundwater at the South Cavalcade Site. The results of the GFTER supported a preliminary hypothesis that effective natural attenuation of dissolved organic constituents of interest (COI) may be occurring in the shallow groundwater zone at the Site. The GFTER was approved by the EPA on August 14, 1997[4].

Implementation of the scope of work presented herein represents an intermediate step in the evaluation of natural attenuation in the shallow groundwater zone. The data acquired are used for further evaluation of the hypothesis that natural attenuation processes are sufficient to attenuate migration of dissolved COI in shallow groundwater to the extent necessary to satisfy the remedial objectives for shallow groundwater at the Site. If the hypothesis is supported by the data presented herein, then Beazer will propose a plan for a future groundwater monitoring program. The objective of this plan would be acquisition of additional time-series and spatial groundwater COI concentration data for long term verification of the natural attenuation of COI in shallow groundwater. The development of the monitoring plan will be based on a comprehensive evaluation of all available information.

The natural attenuation assessment activities described herein focus only on the dissolved COIs in the shallow groundwater zone. The COIs have been detected in groundwater in the underlying discontinuous sand unit (referred to as the "intermediate zone") during previous investigations.

However, as described in the EPA-approved *100% Remedial Design for the Groundwater Collection and Reinjection System and DNAPL Recovery System* (100% Remedial Design), it is possible, based on existing information, that these detections are the result of improperly drilled and constructed monitoring wells. An investigation to further evaluate the possible presence of COIs in groundwater in the intermediate zone was proposed by Beazer in the EPA-approved 100% Remedial Design. Beazer completed the abandonment of existing wells and installation and sampling of the replacement wells in April 2000. The results of the intermediate zone groundwater sampling and analysis will be provided to EPA and TNRCC in a separate report.

1.1 SITE BACKGROUND

Site background information is presented in this subsection. The majority of the following text was taken from previously submitted reports.

1.1.1 Site Description

The South Cavalcade Site occupies approximately 66 acres of urban land approximately three miles north of downtown Houston, Texas. The Site is rectangular in shape with a length of approximately 3,400 feet (in the north-south direction) and a width of approximately 900 feet (in the east-west direction). A Site base map is provided as Figure 1-2.

The Site was operated as a wood treating plant from 1910 until 1962, with utilization of creosote and various metal salts in the wood treating processes. The wood treating process area was located in the southern portion of the Site along Collingsworth Street. Koppers Company, Inc. (Koppers), now known as Beazer, operated the wood treating facility from 1940 until closure in 1962. A coal tar distillation plant was operated by Koppers on the southeastern portion of the Site from about 1944 until 1962. Since the discontinuation of these operations, several trucking firms have occupied the property.

The Site is currently occupied by three trucking firms; thus, much of the ground surface, especially in the southern and northern portions of the Site, is covered by concrete or asphalt pavement, or buildings, as shown on Figure 1-2. Additionally, Beazer recently completed the construction of a concrete cap in areas where soil concentrations exceed the remedial goal specified in the EPA Record of Decision (ROD)[5] for the Site. The central portion of the Site is currently undeveloped. A groundwater treatment facility is located along the eastern Site boundary in the central portion of the Site. Continued future use of the Site properties for non-residential purposes is to be expected, because deed restrictions for on-Site properties are in place and the consent agreements between

EPA and the respective property owners prohibit property use for residential purposes. The consent agreements between EPA and the respective property owners also prohibit on-Site groundwater use.

Land use in the vicinity of the Site is a mixture of commercial, industrial and residential. Industrial and commercial properties are located to the east and across Collingsworth Street to the south of the Site. The North Cavalcade Superfund Site, which is also the location of a former wood treating facility, is located directly across Cavalcade Street to the north of the Site. Active rail lines immediately border the Site boundaries to the east and the west. The nearest residences are located several hundred feet to the west of the Site.

1.1.2 Site Groundwater Remedial History

In 1983, the Houston Metropolitan Transit Authority investigated the Site for potential use in the municipal mass transit system. Results of this investigation indicated localized areas of potential impact and the Site was subsequently referred to the Texas Department of Water Resources (TDWR). In April 1984, TDWR recommended to EPA that the Site be placed on the National Priorities List (NPL). In October 1984, EPA proposed that the Site be added to the NPL. The Site was formally included on the NPL in June 1986.

In March 1985, Koppers entered into an Administrative Order on Consent (AOC) to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Site. The RI/FS was completed by Koppers in August 1988 with submittal of the *Remedial Investigation Report*[6] and the *Feasibility Study Report*[7] to EPA.

The ROD was subsequently issued by EPA in September 1988 which presented the selected remedial alternatives for Site soil and groundwater. The selected remedial alternative for groundwater included extraction and treatment of groundwater containing constituent concentrations greater than the remedial goals specified in the ROD. The ROD stipulated that "groundwater collection will continue until constituents have been recovered to the maximum extent possible", as "determined during the Remedial Action, based upon experience in operating the groundwater collection and treatment system." The ROD specified that once EPA had determined that groundwater constituents have been recovered to the maximum extent possible, groundwater collection would cease and any remaining constituents would be allowed to naturally attenuate to background levels. The ROD also indicated that the groundwater could be remediated via in situ biological treatment if equal performance was demonstrated.

The Detailed Statement of Work for South Cavalcade Site (SOW)[8] was completed by Bechtel Environmental, Inc. (Bechtel) on behalf of Beazer in May 1990. The SOW described the remedial

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design and remedial action (RD/RA) activities to be performed by Beazer including pilot study tasks to support the design of the selected remedies. In March 1991, Beazer entered into a Consent Decree[9] with EPA for implementation of the RD/RA activities specified in the SOW. The SOW was subsequently incorporated into the EPA-approved *Remedial Design Work Plan* (RDWP)[10] prepared by Bechtel on behalf of Beazer, dated March 1992.

Pilot study tasks conducted to support the groundwater remedial design included a groundwater collection well pilot study, groundwater recovery trench pilot study and groundwater treatment system pilot study. Pilot study tasks were completed in October 1993. The *100% Design Groundwater Collection and Reinjection System and Dense Non-Aqueous Phase Liquid Recovery System*[11] was submitted to EPA in December 1994 and was subsequently approved.

Implementation of the groundwater remedial action was initiated in June 1995 in accordance with the EPA-approved *Remedial Action Work Plan* (RAWP)[12] dated May 1995 and associated support documents. One DNAPL recovery well (RWN-4) and four groundwater collection wells (RWN-1, RWN-2, RWN-3 and RWN-5) were installed within Groundwater Remedial Action Area (GRAA) 1 located in the north section of the Site. One DNAPL recovery well (RWS-5) and three groundwater collection wells (RWS-3, RWS-4, and RWS-6) were installed within GRAA 2, which includes the area formerly occupied by the coal tar distillation plant. Two combined groundwater collection/DNAPL recovery wells (RWS-1 and RWS-2) were installed within GRAA 3, which includes the area formerly occupied by the wood treating process area.

Start-up of the groundwater collection and DNAPL recovery components of the groundwater remedy was conducted in September 1995, following completion of the groundwater treatment plant modifications. In an EPA letter dated October 6, 1995[13], EPA indicated that "there is some question as to whether EPA will continue to apply the current remedial action goals [i.e., the remedial goals specified in the ROD issued in 1988] to groundwater cleanup." This direction was taken in response to a July 31, 1995 EPA memorandum[14] directing a policy favoring applicable and relevant and appropriate requirement (ARAR) waivers at sites where it is technically impracticable to remediate groundwater to Federal or State standards. As provided by the October 6, 1995 EPA letter and in accordance with an agreement between EPA and Beazer, groundwater collection and treatment has been delayed pending determination of the potential inapplicability of the groundwater remedial goals specified in the ROD. Operation of the DNAPL recovery component of the groundwater remedy is currently ongoing.

DNAPL recovery operations were conducted in conjunction with groundwater pumping during November and December 1995 as start-up/shakedown of the groundwater treatment system was completed. In January 1996, operation of the DNAPL recovery system in the passive mode of

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operation (i.e. collection of DNAPL without groundwater pumping to increase hydraulic gradients) was initiated in accordance with the EPA-approved 100% Remedial Design. Evaluation of the DNAPL recovery data collected through June 1996 in accordance with the statistical protocol (i.e., zero-slope analysis) specified in the *Groundwater Extraction System Performance Monitoring Plan* (GESPMP)[15] indicated that DNAPL had been recovered to the "maximum extent possible" under the passive mode of operation.

As a result and in accordance with the EPA-approved 100% Remedial Design, DNAPL recovery, with groundwater extraction to enhance hydraulic gradients, was initiated in one GRAA (GRAA 3) to evaluate the effectiveness and practicability of this enhancement prior to its use in the other GRAAs. Evaluation of the DNAPL recovery data collected in GRAA 3 from July through September 1996 indicated that groundwater extraction (at a pumping rate of 0.3 gpm from individual recovery wells) appeared to enhance DNAPL recovery in Wells RWS-1 and RWS-2. Based on this observation, DNAPL recovery with groundwater extraction to enhance hydraulic gradients was initiated in GRAAs 1 and 2 in October 1996. Currently, DNAPL recovery with groundwater extraction is being conducted in all three GRAAs. As of this time, approximately 2,000 gallons of DNAPL have been removed from the shallow water-bearing zone. Beazer will continue operation of the DNAPL Recovery System in the gradient enhanced mode, in accordance with the EPA-approved RAWP and applicable EPA Guidance, such as the *Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration*[16].

In addition to the ongoing DNAPL recovery operation, Beazer has been conducting annual groundwater monitoring since March 1993 in two deeper monitoring wells located in the vicinity of the Site, as stipulated in the ROD. This activity is independent of the natural attenuation assessment for shallow groundwater and is subject only to the applicable provisions of the ROD and EPA approved RDWP. The results of this monitoring show that the deeper groundwater beneath the Site has not been impaced.

1.1.3 Site Conceptual Model Overview

A detailed Site conceptual model was developed and presented in Section 2.0 of the GFTER. An overview of the Site conceptual model presented in the GFTER is presented in the following paragraphs, to facilitate an understanding of existing Site conditions pertinent to the subject groundwater fate and transport evaluation.

The COIs have been detected in groundwater within the shallow fluvial-deltaic deposits, comprising intermittent, interbedded fine sand, silt, and clay that extend from the ground surface to a maximum depth of approximately 22 ft-bgs. The water table typically occurs within this unit at a few feet

below the ground surface. Groundwater flow within the aquifer is generally in a westerly direction. Aquifer testing results indicate average horizontal hydraulic conductivities for the northern and southern sections of the Site are 7.8 x 10^{-3} cm/sec (8,070 ft/year) and 1.6 x 10^{-3} cm/sec (1,655 ft/year), respectively. Horizontal hydraulic gradients in the shallow zone are relatively flat ranging from1.76 x 10^{-3} to 5.88 x 10^{-3} ft/ft. A downward vertical hydraulic gradient has been measured between the shallow aquifer and the underlying discontinuous sand unit (referred to as the intermediate zone in the 100% Remedial Design), which lies at a depth of 40 to 50 feet below ground surface. COIs have been detected in groundwater in some instances in this discontinuous sand unit.

The COIs have been identified to be Polynuclear Aromatic Hydrocarbon (PAH) compounds and benzene, toluene, ethylbenzene and xylene (BTEX) based on the analytical results of groundwater samples collected from within the shallow zone. These constituents are typical COIs for sites where wood treating operations have been conducted using creosote as a preservative.

The source areas for these COIs are the locations at the Site where DNAPL has been observed as a separate phase in monitoring wells or visually observed during completion of soil borings. As a supplement to the Work Plan, Beazer conducted a complete evaluation of the RI boring logs, Site soil data and DNAPL thickness measurements to refine the delineation of the potential DNAPL source areas (PDSAs), which had been previously defined in the GFTER and the Work Plan as the former plant process areas. The results of this evaluation were provided to EPA in December 1998, and are further refined herein based on observations made and data acquired during the recent field work. Figure 1-3 shows the inferred extent of DNAPL based on the 1998 data evaluation. The inferred extents of DNAPL as shown on Figure 1-3 therefore represent the refined limits of the various PDSAs.

No addition to, or movement of, DNAPL is anticipated over time, due to the strong indications that the DNAPL has achieved a static distribution within the shallow aquifer and the fact that 38 years have elapsed since wood treating was conducted at this Site. However, the areas containing immobile free-phase or residual DNAPL are anticipated to be a long term source for dissolved phase COIs within shallow groundwater.

COIs dissolve from the DNAPL into the groundwater as a function of the effective solubilities. Migration of COIs occurs in the general groundwater flow direction due to dispersion and advection. Attenuation mechanisms such as dispersion, adsorption and biodegradation cause COI concentrations to decrease with migration away from the source. The PAH compounds have low aqueous solubilities and are readily attenuated by sorption to naturally occurring organic carbon in the aquifer matrix. BTEX constituents have moderate solubilities, however, they are more readily

attenuated by biodegradation. Additionally, because BTEX compounds comprise only a very small fraction of creosote, effective solubility concentrations for these compounds are relatively low.

In the GFTER, the downgradient extent of COIs in the south area was estimated using the data from monitoring well MW-08, which is located approximately 320 feet downgradient of the southwestern Site boundary. COI concentrations measured in groundwater samples collected from this well were less than applicable standards. Monitoring well MW-01, located approximately 250 feet downgradient of the northern PDSA, was used in the GFTER to evaluate the potential downgradient extent of COIs in the north area. Previous analytical data for samples collected from this well indicated that benzene concentrations in this well slightly exceeded the remedial goal specified in the ROD.

In the GFTER, the nearest potential future off-Site groundwater exposure points were protectively assumed to be approximately 400 feet downgradient from the potential constituent source areas. Consequently, these hypothetical exposure points were used in the fate and transport model to evaluate the effectiveness of natural attenuation for preventing potential future exposure to constituents in groundwater. The protective nature of the assumed 400-foot distance to the nearest possible future receptor is indicated by the following observations:

- water in the local area is supplied by the municipal system;
- the quality of shallow groundwater is poor due to naturally occurring conditions;
- groundwater yield from the shallow aquifer is expected to be low; and,
- no groundwater withdrawal wells within the shallow aquifer are known to exist within one mile of the Site.

1.1.4 Groundwater Fate and Transport Evaluation Results

The fate and transport evaluations were conducted using protective assumptions regarding constituent transport, natural attenuation processes, and potential future use of shallow groundwater. These assumptions were intended to ensure that the potential for future exposure to COIs in groundwater is not underestimated. The significant results of the GFTER are summarized below:

- A review of background literature for similar compounds and similar sites indicates it is reasonable to expect that the creosote constituents in shallow groundwater at the South Cavalcade Site undergo some degree of biodegradation.

- The behavior of sulfate in groundwater was consistent with the utilization of this compound as an electron acceptor in the biodegradation of creosote constituents.

- The observation of relatively stable constituent concentrations over time was consistent with biodegradation, and supported the incorporation of biodegradation into the fate and transport evaluation.

- The results of the BIOSCREEN simulations support the hypothesis that effective natural attenuation of COIs occurs within a short distance of potential constituent source areas, before groundwater concentrations greater than the ROD remedial goals or TNRCC MSCs are realized at the nearest hypothetical future groundwater withdrawal well.

- The results of the BIOSCREEN simulations indicate that the COIs in the shallow groundwater have already achieved a steady state or equilibrium distribution, and that future migration or increasing concentrations of COI will not occur.

- A comparison of the 1986-87 groundwater concentration data with data obtained from the supplemental groundwater sampling completed in November 1993 indicates stable or decreasing constituent concentrations between 1986-87 and 1993.

In general, the results of the fate and transport evaluations were supportive of the hypothesis that a monitored natural attenuation remedy is feasible for shallow groundwater at the South Cavalcade Site. The data collection and information gathering activities described in this report are intended to further evaluate the hypothesis presented in the GFTER.

1.2 PURPOSE OF INVESTIGATION / PROJECT OBJECTIVES

This report presents the results of investigative activities that were implemented to provide additional field data and Site-related information necessary to verify the conclusions of the GFTER and to determine the overall feasibility of a monitored natural attenuation remedy for shallow groundwater at the South Cavalcade Site. This investigation was implemented to evaluate monitored natural attenuation in a manner consistent with the following definition developed by the EPA Office of Research and Development and Office of Solid Waste and Emergency Response[17]:

> "The term "monitored natural attenuation", as used in this Directive, refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remedial objectives within a time frame that is reasonable compared to that offered by other more active methods. The "natural attenuation processes" that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without

human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation; dispersion; dilution; sorption; volatilization; and chemical or biological stabilization, transformation, or destruction of contaminants."

The specific objective for monitored natural attenuation at the South Cavalcade Site is based on potential risk to human health and the environment due to COIs dissolved in groundwater. Specifically, the monitored natural attenuation objective states that this approach will be deemed to provide acceptable mitigation of risk if current or future dissolved COI concentrations do not exceed the ROD remedial goals for groundwater at hypothetical future downgradient exposure points. Further, the hypothetical groundwater exposure point is to be considered the hypothetical location of a future groundwater extraction well, and the increase in the rate of downgradient groundwater movement in the vicinity of the well due to pumping is to be considered in the analysis. In order to meet the objective, monitored natural attenuation must eventually cause dissolved COI distributions to stabilize or recede before the hypothetical downgradient exposure point is reached.

As described in the EPA-approved GFTER, the hypothetical exposure points were selected as the nearest non-industrial property downgradient of the Site. In the north area, the area between the Site boundary and the hypothetical location of future groundwater use is occupied by a right-of-way for an active rail line and a public roadway. In the south area, the area between the Site boundary and the hypothetical location of future groundwater use is occupied by an active petroleum storage facility, a right-of-way for an active rail line and a public roadway.

The data collection and interpretation activities described herein are sufficiently supportive of the hypothesis presented in the GFTER: that a monitored natural attenuation remedy is feasible for shallow groundwater at the Site. Consequently, this report also proposes the general criteria of an appropriate natural attenuation groundwater monitoring program. The objective of the groundwater monitoring program is to acquire the time-series and spatial groundwater concentration data necessary for ongoing confirmation of effective natural attenuation of dissolved COIs in shallow zone groundwater.

1.3 TECHNICAL APPROACH

The data collection and evaluation approaches used herein are guided by EPA Data Quality Objectives Guidance[18] which advocates a step-wise process to the development of sampling programs to ensure that the data collected are appropriate to meet the project objectives. This approach involves a decision rule process which establishes pre-determined evaluation criteria to which collected information are compared. Upon comparison and evaluation of the data, the

decision rule process is followed, by which a resulting action/decision is methodically determined. In conjunction with the comparison of data to pre-determined criteria, technical and practical judgement are utilized to ensure that the project objectives are attained and that appropriate decisions are made consistent with project-specific requirements.

The implementation of the field activities was dependent upon the real-time interpretation of field data (e.g., gas chromatograph [GC] groundwater field screening results and potentiometric data). These interpretations guided sampling activities to ensure that a sufficient quantity of data was collected at appropriate locations to satisfy project objectives.

In addition to the evaluation of the real-time field data, Beazer completed a review of available historic information to refine the current understanding of the limits of potential on-Site constituent sources, as agreed at the July 2, 1998 meeting with EPA. Findings of this task served as the basis for development of supplemental characterization activities that were completed in conjunction with the investigation proposed in the Work Plan. The purpose of the supplemental characterization was to evaluate whether any other constituent source areas may exist which have associated dissolved phase plumes that are more extensive than the two plumes to be addressed under the Work Plan.

The conclusions presented in the GFTER are based on: 1) Site conditions as described by the Site conceptual model and, 2) representative and protective literature values used as input for the analytical groundwater fate and transport modeling. Results of the data collection and information gathering efforts are used to evaluate the GFTER conclusions by collecting Site-specific information relative to these conditions and values. Therefore, this scope of work focuses mainly on three primary lines of natural attenuation evidence:

- Direct observation or interpretation of plume status (i.e., advancing, stable, or receding);
- Evidence of intrinsic biodegradation; and,
- Sorption to aquifer solids.

For the analysis conducted in the GFTER, it has been assumed that input concentrations from the source to the plume are constant, which further assumes that the source does not become depleted over time. This assumption generally imparts a higher degree of protectiveness to the analysis than the assumption of source depletion, since it provides the greatest potential for plume migration. The constant source assumption is reasonable with respect to creosote DNAPL sources, such as those at South Cavalcade because the relatively low solubilities of most of the constituent compounds will provide a slow rate of mass transfer from the source to groundwater, and a correspondingly slow rate of source depletion. Consequently, the emphasis of the current investigation is on dissolved phase natural attenuation processes, rather than depletion of the DNAPL sources.

1.4 ORGANIZATION OF REPORT

The following section provides a brief general review of the technical basis for the natural attenuation of the COIs present in groundwater at the South Cavalcade Site. The results of the investigation are generally divided into two categories: those conducted to evaluate modeling boundary conditions and input parameters (Section 3.0), and those intended to evaluate plume migration (Section 4.0). These sections are organized in a manner that is generally consistent with EPA Data Quality Objectives Guidance, and include the following subsections: Objectives, Input Data, Sampling Locations and Frequencies, Decision Rules, and Results. Section 4.0 describes the implications of supplemental investigative results on the GFTER conclusions. Section 5.0 presents the conclusions regarding the feasibility and applicability of monitored natural attenuation as the remedy for shallow groundwater at the Site. Section 6.0 presents general recommendations regarding the components of a future groundwater monitoring program.

The Report is also supported by several appendices as follows:

- Appendix A – Description of Field Implementation
- Appendix B – Soil Boring / Monitoring Well Logs
- Appendix C – Analytical Laboratory Reports
- Appendix D – Geotechnical Testing Report
- Appendix E – Microbial Testing Report
- Appendix F - DNAPL Testing Results
- Appendix G – Water Use and Water Well Database
- Appendix H – Statistical Calculations
- Appendix I – Applicable Output from GFTER

2.0 TECHNICAL BASIS FOR NATURAL ATTENUATION

2.1 GENERAL

As stated by the EPA (1999), the use of natural attenuation as a remedial approach depends on "a variety of physical, chemical or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These *in situ* processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation or destruction of contaminants." The Directive goes on to state that when relying on natural attenuation process for site remediation, "EPA prefers those processes that degrade or destroy contaminants".

2.2 LABORATORY EVIDENCE FOR BIODEGRADATION OF COMPOUNDS SIMILAR TO THE SOUTH CAVALCADE COIs

Evidence of indigenous microbial presence in the subsurface environment is now well documented (e.g., Barbaro et al., 1994; Wilson et al., 1983; Ghiorse and Balkwill, 1983) and widely accepted. The ability of indigenous microbes, especially bacteria, to degrade a wide range of organic substances has also been conclusively demonstrated. Mueller et al. (1989) provided an overview of biodegradation for a wide range of creosote compounds, with reference to environmental releases of this liquid. They cited a wide range of laboratory studies where biodegradation of PAHs, heteroaromatics and phenolic compounds has been demonstrated and where specific strains of microbes able to utilize these compounds have been isolated from environmental samples.

Biodegradation of compounds typical of the COIs at the South Cavalcade Site (i.e., monoaromatics and PAHs) has been demonstrated in a host of laboratory studies, and under a range of environmental conditions. For example, Major et al.(1988), Kuhn et al.(1988) and Hutchins et al. (1991) demonstrated the biodegradation of various aromatic compounds, linked with dissolved oxygen utilization and nitrate-reduction. Flyvberg et al. (1993) demonstrated biodegradation of dissolved creosote compounds under nitrate-reducing conditions. Similarly, biodegradation has been demonstrated in association with iron reduction (e.g., Lovley et al., 1989), sulfate reduction (e.g., Haag et al., 1991; Edwards, et al., 1992) and methanogenesis (e.g., Godsy et al., 1992; Edwards and Grbic-Galic, 1994; Adrian and Suflita, 1994).

Numerous other laboratory studies documenting biodegradation of compounds representative of the South Cavalcade COIs have been summarized in some excellent review articles (e.g., Grbic-Galic, 1989; Grbic-Galic, 1990; Bollag and Kaiser, 1991; Muelller et al., 1989). These articles provide

conclusive laboratory evidence that the types of COIs present at the South Cavalcade Site are biodegradable under a range of environmental conditions (aerobic, denitrifying, sulfate-reducing, methanogenic and fermentative).

2.3 FIELD EVIDENCE FOR BIODEGRADATION OF COMPOUNDS SIMILAR TO THE SOUTH CAVALCADE COIs

Numerous field studies support the conclusions from laboratory studies: that biodegradation can play a substantial role in natural attenuation of compounds originating from creosote and similar mixtures. Two of the most intensive field investigations of natural attenuation processes for creosote and similar mixtures have been conducted by the United States Geological Survey (USGS). The first study was based on a wood-preserving site in Pensacola, Florida (Mattraw and Franks, 1986) where the investigators concluded that biodegradation was limiting the distance to which dissolved phase compounds (primarily phenols and PAHs) were migrating away from the source area. Biodegradation was indicated by changes in plume inorganic geochemistry indicative of redox reactions, and by the limited extent of dissolved organic compounds in the groundwater.

In the second USGS study, groundwater affected by a large spill of crude oil in Bemidji, Minnesota, was intensively characterized (Bennet et al., 1993). It was determined that a range of hydrocarbons, including BTEX and PAHs, were naturally attenuating through biodegradation along the groundwater flowpath and that characteristic redox zones indicative of biodegradation had developed in the affected groundwater zone.

Klecka et al. (1990) demonstrated natural bioremediation of PAHs and phenolic compounds at a previous charcoal manufacturing plant in Michigan; Madsen et al. (1991) showed that biodegradation was imposing substantial limits on the extent of dissolved phase PAHs in groundwater downgradient of a coal tar disposal site in a shallow aquifer in New York state. Stroo et al. (1997) present case studies of natural attenuation evaluations for PAHs and other organics at three industrial sites: two wood treating facilities and a railyard. The authors conclude that natural biodegradation has limited the extent of dissolved phase distributions at all three sites.

A few field studies have been conducted, where compounds similar to those in creosote have been introduced to groundwater, under controlled experimental conditions. Since these studies are conducted with experimental controls, but under natural environmental conditions, they provide a useful link between laboratory studies and work conducted on industrial sites. King and Barker (1999) emplaced an experimental source of 160 pounds of creosote below the water table and conducted intensive monitoring of the dissolved phase plume that resulted. The authors conclusively determined that substantial dissolved phase biodegradation occurred for the eight study compounds.

Over the four year study period, dissolved phase distributions for some compounds approached or achieved steady state; others reached a maximum extent and then began to recede toward the source.

In a study at Columbus Air Force Base in Mississippi, MacIntyre et al. (1993) injected a dissolved phase slug below the water table, containing two monoaromatics, a PAH and a chlorinated compound. Detailed monitoring indicated substantial biodegradation of all compounds, as they migrated with groundwater.

The overall implication from the studies reviewed above is that biodegradation can be an important influence on the dissolved phase behavior of the types of compounds found in creosote. In general, these compounds have been observed to biodegrade at a rate that provides substantial natural attenuation. Consequently, downgradient migration of the compounds is significantly less than would be predicted if only advection, dispersion and sorption are considered.

2.4 GENERAL CONCEPTUAL MODEL FOR MNA

The components of a generalized conceptual model for natural attenuation of non-halogenated organic compounds, such as those that comprise creosote, has gradually developed over the past two decades and is illustrated in Figure 2-1. Figure 2-1 shows the development of an organic plume from a source, such as a deposit of residual creosote below the water table, that dissolves gradually into groundwater. The downgradient and outward spreading of the dissolved phase plume is caused by the processes of advection and dispersion, and is further affected by partitioning of the solute to the geologic medium (sorption). The advective rate of transport for a non-sorbing, non-degrading (i.e., conservative) solute is the same as the rate of groundwater flow, and is given by:

$$v_{sol} = Ki/n$$

where v_{sol} = the average solute velocity (length/time), K = hydraulic conductivity of the porous media (length/time), i = the hydraulic gradient (dimensionless) and n = the effective porosity of the porous media (dimensionless).

Many organic compounds tend to partition (or sorb) from groundwater to the geological medium, as they migrate. One of the effects of sorption is a decrease in the rate of migration of the solute front. For a solute that undergoes sorption, a retardation factor (R) is often used to relate the velocity of the solute to the groundwater velocity (v_{gw}), as follows:

$$v_{sol} = v_{gw} / R.$$

A third influence on solute migration is dispersion, which operates in the direction of the concentration gradient, such that:

$$J_d = -D\ (dC/dx)$$

where J_d = dispersive solute flux (mass/time across a unit cross-sectional area), D = the dispersion coefficient of the porous medium (length^2/time), C = the solute concentration (mass/volume) and dC/dx = the concentration gradient in the x direction. Since dispersion acts according to the concentration gradient, it forces the plume outward, causing concentrations to decrease along the plume center line. The affect of solute sorption on dispersion is similar to its affect on advection, and is typically described by:

$$J_d = (-D/R)(dC/dx)$$

If solute transformation does not occur, then dispersion and sorption are the main processes that decrease solute concentration along the path of groundwater flow. Furthermore, if only dispersion and sorption occur, then the solute may migrate relatively long distances before a substantial decrease in concentration occurs. However, the process of solute transformation has potential to substantially limit the rate and extent of plume growth.

For compounds such as those present in creosote, transformation occurs primarily as a result of biodegradation, where the compounds are transformed through microbial activity. This microbially-mediated process occurs as a coupled redox reaction whereby an electron is transferred from the organic compound (also referred to as the electron donor, or substrate) to an available electron acceptor. The transfer results in the release of energy which is utilized for microbial metabolism, and the release of carbon that may be used for microbial growth. Typical electron acceptors available in groundwater, in the order of those that release the greatest energy to those that release the least energy, are as follows: dissolved oxygen, nitrate, manganese (IV) oxide and iron (III) hydroxide coatings on soil sediments, dissolved sulfate, and carbon dioxide (Baedecker and Back, 1979; Lyngkilde and Christensen, 1992).

Long-term oxidation of the primary substrate depletes the supply of available electron acceptors in a step-wise, or sequential manner. Consequently, the redox potential in groundwater becomes more reducing during the biodegradation process, and then becomes more oxidizing as the concentration of biodegradable compounds (and therefore the tendency for electron acceptor utilization) decreases downgradient of the source. In a dynamic groundwater system containing a biodegradable organic plume, these reactions lead to the zonation of electron acceptor utilization shown in Figure 2-1.

These processes have been discussed in a hydrogeological context by Baedecker and Back (1979b), in conjunction with the development of redox zones downgradient of a landfill. A more recent landfill study (Lyngkilde and Christensen, 1992) provided detailed delineation of these characteristic redox zones. Redox zonation has also been shown to develop in biodegradable plumes from other organic sources, such as creosote (Mattraw and Franks, 1986) and petroleum hydrocarbons (Bennet et al., 1993). It has been recognized that biodegradation of these compounds is favored under more oxidizing conditions (Lee et al., 1988; Grbic Galic, 1990; MacFarland and Sims, 1991). Also contributing to this framework was the development and application of mathematical modeling (Borden and Bedient, 1986; MacQuarrie et al., 1990), which illustrated the important role of dispersion in supplying oxygen as an electron acceptor along the periphery of the plume.

Since the electron acceptors utilized earlier in the redox sequence are generally the most efficient in terms of biodegradation, the development of electron acceptor zonation also causes zonation in biodegradation potential. As shown in Figure 2-1, the rate of biodegradation is expected to be most rapid under aerobic conditions, and slower under anaerobic conditions.

The concept of a "steady state" plume is illustrated in Figure 2-1. This is a situation where the rate of plume biodegradation is equal to the rate at which the compounds (e.g., COIs) are introduced to groundwater from the source zone. At this point, the plume stops increasing in mass and, if the rate of input from the source decreases, then the plume will begin to recede.

2.5 VISUALIZING MNA TRENDS

Radial diagrams provide an effective means of illustrating the general conceptual model for MNA. An example of a radial diagram is shown in Figure 2-2, as generated with a plotting program called SEQUENCE (manual: Carey, 1999; example application: Carey et al., 1999). SEQUENCE-Redox diagrams provide a visual comparison of background electron acceptor concentrations to concentrations at a given sampling location in the plume. The axes of the diagram are arranged such that the electron acceptors and metabolic by-products are presented in the order that they are influenced during biodegradation reactions. For example, the axes in Figure 2-2 are oriented in the sequence of oxygen, nitrate, dissolved manganese and ferrous iron, sulfate and methane.

The direction of increasing concentration for each axis in a SEQUENCE-Redox diagram is specified so that typical background concentrations for the geochemical indicator are plotted towards the outer extent of each axis, and the concentrations representing a zone where biodegradation is occurring are plotted towards the inner extent of each axis (i.e., closer to the origin). For example, electron acceptor concentrations will typically decrease from background levels during the biodegradation process; therefore, the axes representing oxygen, nitrate, and sulfate are oriented such that

concentrations are *decreasing* in a radially inwards direction towards the origin. Metabolic by-product concentrations will typically increase during the biodegradation process; hence the axes representing manganese, iron, and methane are *increasing* towards the origin.

Figure 2-3 provides an illustration of the expected trend in electron acceptors and metabolic by-product concentrations along the center line of a biodegradable plume, illustrated with typical SEQUENCE-Redox diagrams. As shown, electron acceptor and metabolic by-product concentrations upgradient of the COI source are indicative of background (relatively oxidizing) conditions. As groundwater flows through the source and dissolves COIs, the groundwater immediately downgradient of the source becomes highly reducing due to the sequential utilization of electron acceptors during the oxidation of elevated concentrations of dissolved COIs.

3.0 SAMPLING TO VERIFY MODELING ASSUMPTIONS

The overall objective of this component of the investigation is to evaluate whether modeling assumptions (i.e., model input parameter values and boundary conditions) used in the GFTER, and the information used in development of the Site conceptual model are appropriate and representative of Site conditions. Table 3-1 presents a summary of the data acquisition program. Additional Site-specific information pertaining to DNAPL source physical properties and composition, groundwater flow, and COI sorption were collected from locations shown on Figure 3-1. In addition, information regarding off-Site groundwater usage in the vicinity of the Site was updated. Specific aspects of the fate and transport evaluation examined herein include:

- Hydraulic gradients and groundwater flow directions (Section 3.1);
- Aquifer organic carbon content (Section 3.2);
- Physical properties (grain size distribution, porosity, and bulk density) of the aquifer matrix (Section 3.3);
- DNAPL physical properties presented in the Site conceptual model (Section 3.4); and,
- Local groundwater usage information presented in the Site conceptual model (Section 3.5).

Hydraulic gradient and aquifer organic carbon content were chosen for further examination, because the GFTER analysis indicated that the predicted extent of COI migration was relatively sensitive to these parameters, when they were varied over a realistic range.

Certain physical aquifer properties (bulk density and porosity) were not identified as sensitive parameters in the GFTER analysis but were selected for further evaluation in this investigation. This characterization was done in the interest of ensuring that the literature values used for these parameters did not differ significantly from Site-specific values. Similarly, some additional Site-specific characterization of DNAPL properties was conducted.

Hydraulic conductivity was not identified for additional characterization because the values used in the GFTER were determined from Site[19] [20] pumping tests, which are considered as the most appropriate method for determining hydraulic conductivity values to be used in the evaluation of natural attenuation (Wiedemeier et al., 1995[21]). Site-specific, upper-end, hydraulic conductivities were extensively used in the GFTER, to ensure that the model predictions were protective, and additional detail regarding hydraulic conductivity is provided in that report.

Aquifer dispersivity was also not identified for additional evaluation. In the GFTER, it was determined that modeling results were relatively insensitive to longitudinal dispersivity when it was varied over a realistic range. Transverse dispersivities (horizontal and vertical) were assumed to be negligible, because this approach tends to promote downgradient constituent migration, within the BIOSCREEN model.

3.1 HYDRAULIC GRADIENTS AND GROUNDWATER FLOW DIRECTIONS

3.1.1 Objectives

Current potentiometric data were acquired and compared with previous data to evaluate whether the hydraulic gradient data used in the fate and transport model are appropriate and representative of Site conditions.

3.1.2 Evaluation Data

Groundwater potentiometric surface elevation measurements were measured using an electronic water level indicator tape graduated in hundredths of feet. The depth to groundwater was measured from the surveyed point on the top of the well casing. The measuring points on the monitoring wells were re-surveyed for this investigation to ensure consistency in the data. Depth to groundwater at individual monitoring points was converted to geodetic elevations and these data were used to contour the potentiometric surface. The resulting potentiometric surface was used to determine groundwater flow directions and to calculate hydraulic gradients.

3.1.3 Sampling Locations and Frequency

A single round of groundwater potentiometric surface elevation measurements was collected from Site monitoring wells and piezometers screened within the shallow silty sand zone. The locations of these wells and piezometers are shown on Figure 3-2, and generally correspond to those points that were previously monitored, with the addition of piezometers installed as part of the recent groundwater Remedial Action.

This task was conducted one week after the temporary suspension of the DNAPL recovery system operations, to ensure that the data were representative of groundwater flow direction under non-pumping conditions. The period of one week was estimated to be sufficient recovery time, based on aquifer recovery information presented in the Groundwater Collection Trench Pilot Study Report. In addition, the treatment plant operator monitored groundwater levels following the temporary shut down, to determine when the water levels had stabilized.

3.1.4 Decision Rules

A total of 28 rounds of groundwater potentiometric surface elevation data were collected from February 1983 to November 1987 (presented in the Final Report - Remedial Investigation) and were used in the GFTER to determine average and maximum hydraulic gradients, for the north and south areas. The general areas in which these data were collected are shown on Figure 3-2. These data represent a substantial database for evaluating groundwater flow direction trends over time. As stated in the Final Report - Remedial Investigation, the data indicate that gradient direction and magnitude were relatively constant over time.

Shallow groundwater hydraulic gradient values ranging from 1.76×10^{-3} to 5.88×10^{-3} ft/ft were used in the GFTER, to represent non-pumping conditions. This range is based on data presented in the Final Report - Remedial Investigation and serves as the evaluation criterion for comparison with hydraulic gradients calculated as part of this investigation.

If the area-specific hydraulic gradients determined from this investigation are within the range used in the GFTER, then the GFTER values will be considered representative and appropriate. If the estimated hydraulic gradients from the current investigation are less than 1.76×10^{-3} ft/ft, then the model will be considered protective with respect to the hydraulic gradients.. If they are greater than 5.88×10^{-3} ft/ft, then the model will be re-run utilizing the area-specific hydraulic gradient from the current investigation.

The inferred PDSA limits and the range of observed groundwater flow directions in the shallow sandy silt zone were also used to ensure that the proposed groundwater sampling locations were downgradient of the potential DNAPL source area. Evaluation of these data also provided an opportunity to adjust the sampling locations if necessary. An update to the estimated extent of DNAPL is shown in Figure 1-3. The figure also shows the range of groundwater flow directions determined from past Site data, and provides a visual indication of the areas that are hydraulically downgradient of the DNAPL extent.

3.1.5 Results

Table 3-2 presents the groundwater potentiometric surface elevation data collected immediately prior to initiating field activities in November 1999. Figure 3-3 presents the contoured potentiometric surface of these data. The north and south area hydraulic gradients shown on the figure are 1.57×10^{-3} ft/ft and 4.57×10^{-3} ft/ft, respectively. The calculated gradient for the north area is less than the range presented in the GFTER and; therefore, it is concluded that the GFTER results are protective with respect to the north area hydraulic gradient. For the south area, the

gradient is within the range presented in the GFTER. It is therefore concluded that the GFTER is representative and appropriate with respect to the south area hydraulic gradient.

As shown, the flow directions in the north and south areas were within the range of groundwater flow directions defined by the previous groundwater data. Based on these flow directions and the PDSA, shown in Figure 1-3, the groundwater sampling locations proposed in the Work Plan were considered to be appropriately located. Any subsequent changes to these locations were made on the basis of access constraints.

3.2 ORGANIC CARBON CONCENTRATION

In the GFTER fate and transport modeling, COI sorption was incorporated on the basis of the estimated fraction of organic carbon (f_{oc}) in the aquifer matrix. A protective value (i.e., a value intended to simulate the maximum expected degree of COI migration) for f_{oc} was selected based on the range of literature values presented by Karickhoff et al. for similar aquifer materials. The sensitivity analysis presented in the GFTER indicated that the modeling results were relatively sensitive to f_{oc} when it was varied over a realistic range.

3.2.1 Objectives

The objective of this component of the investigation is to evaluate whether the f_{oc} value used in the GFTER was adequately representative of the Site.

3.2.2 Evaluation Data

Soil samples were collected from the Site, and were submitted to the subcontracted analytical laboratory for analysis of Total Organic Carbon (TOC) by EPA Method 9060 modified for soil in accordance with the Work Plan. Initial laboratory results indicated that TOC was not detected in any of the soil samples. However, these data were considered suspect, on the basis of visual inspection, which indicated the presence of natural organic carbon in the soil. When the original samples were subsequently analyzed according to the Walkley-Black method by a different division of the subcontracted analytical laboratory, TOC was detected.

3.2.3 Sampling Locations and Frequency

A total of eight soil samples were collected from the shallow silty sand zone in the vicinity of the dissolved phase plumes, for analysis of TOC. In each of the north and south areas, samples were collected at two direct-push boring locations. These locations were at both ends of the two transects

of direct soil borings oriented transverse to the direction of groundwater flow, as shown in Figure 3-1. At each location, one sample was collected from the upper half of the silty sand unit and one from the lower half, as as indicated by continuous stratigraphic logging starting at a depth of 2 ft-bgs. Sample collection was performed using direct-push techniques using split-spoon samplers with acetate liners.

3.2.4 Decision Rules

In the GFTER fate and transport modeling, COI sorption was incorporated on the basis of the estimated fraction of organic carbon (f_{oc}) in the aquifer matrix. A protective value (i.e., a value intended to simulate the maximum expected degree of COI migration) for f_{oc} was selected based on the range of literature values presented by Karickhoff et al[22]. for similar aquifer materials. The f_{oc} used in the GFTER fate and transport model ranged from 8.6×10^{-4} to 5.7×10^{-3} and this range serves as the evaluation criterion. For comparison with this range, a 95% confidence interval was calculated for data from each Site area (i.e. north and south) using f_{oc} data obtained during this investigation. The Work Plan established the following decision rules:

- Overlap of the GFTER data range with the range defined by the 95% confidence limits for the analytical organic carbon results indicates that the f_{oc} range utilized in the modeling is adequately representative;

- If the lower limit of the 95% confidence interval is greater than 5.7×10^{-3}, then the model is protective with respect to constituent adsorption; and,

- If the upper limit of the 95% confidence interval is less than 8.6×10^{-4}, then the model is to be re-run utilizing the mean organic carbon content determined from the field investigation.

3.2.5 Results

The analytical results for TOC (and calculated f_{oc}) are presented in Table 3-3. The arithmetic mean, standard deviation , skewness, and the 95% confidence limits for population means for f_{oc} are provided in Appendix H. The 95% confidence limits for north and south area f_{oc} results range from 5.52×10^{-4} to 1.74×10^{-3}, and from 5.9×10^{-4} to 1.3×10^{-3}, respectively. Both of these ranges overlap the GFTER f_{oc} range of 8.6×10^{-4} to 5.7×10^{-3}. The f_{oc} range utilized in the GFTER modeling is therefore considered adequately representative of the Site.

3.3 PHYSICAL PROPERTIES OF THE AQUIFER MATRIX

3.3.1 Objectives

The objective of measuring physical properties of the aquifer matrix was to evaluate whether various assumptions and parameter values used in the fate and transport model are adequately representative of the Site. Specifically, grain size distribution data from multiple locations within the aquifer were used to provide an indication of the spatial variability of materials comprising the aquifer matrix. Aquifer porosity and bulk density were also evaluated.

3.3.2 Evaluation Data

Aquifer samples were submitted to a geotechnical laboratory for analysis of grain size (ASTM D422), bulk density (ASTM D2937) and particle specific gravity (ASTM D854). Porosity values were calculated from the bulk density data.

3.3.3 Sample Locations and Frequency

A total of eight soil samples were collected from four direct-push locations within the shallow silty sand unit. These were the same locations where soil samples for TOC were collected, as described in Section 3.2.3, and shown in plan view on Figure 3-1.

3.3.4 Decision Rules

In accordance with the Work Plan, the 95% confidence interval for the porosity and bulk density measurements obtained from the soil samples were compared to the porosity and bulk density values used in the GFTER fate and transport model. If the respective values for porosity and bulk density used in the fate and transport model are within the range of the 95% confidence intervals for each parameter, then the model will be considered representative of the Site conditions with respect to these parameters.

If the porosity value utilized in the fate and transport model is less than the lower limit of the 95% confidence interval, then the model will be declared protective, as lower porosity facilitates constituent transport. If the porosity value entered into the model is significantly greater than the upper limit of the 95% confidence interval, then the Work Plan stated that the model would be re-run using the geometric mean porosity acquired through the field activities.

Increases in bulk density values result in greater retardation factors. Therefore, if the bulk density value used in the fate and transport model is less than the lower limit of the 95% confidence interval, then the model will be considered protective. If the modeled bulk density from the GFTER is greater than the upper limit of the 95% confidence interval then the model will be re-run using the geometric mean bulk density acquired the field activities.

3.3.5 Results

Results for porosity and bulk density are provided in Table 3-4 and the geotechnical laboratory report on soil grain analysis is presented in Appendix D. The arithmetic mean, standard deviation, skewness, and the 95% confidence limits for porosity and bulk density are provided in Appendix H.

The porosity results indicate that the 95% confidence interval ranges from 30% and 34 %. A value of 37.5% was used for the GFTER model, which represented a central value from a porosity range for this soil type, obtained from Freeze and Cherry (1979)[23]. The porosity value used in the model is greater than the upper limit of 95% confidence interval and, according to the porosity Decision Rule, the model should be re-run, using the mean of the Site-specific porosity values (32%). However, an indication of the insensitivity of the model results to porosity is illustrated in the figures in Appendix I, which is excerpted from the GFTER. The figure shows the modeled center line profiles for naphthalene, over a relatively broad range of porosities (from 25% to 50%) and illustrates the similarities between the profiles. Given this relative insensitivity, and the small difference between the porosity value used in the GFTER (37.5%) and the mean value from the Site (32%), the existing GFTER modeling is considered adequately representative of the Site. Consequently, the model was not re-run using the updated porosity value.

The limits of the 95% confidence interval for bulk density are 1.84 to 1.72 grams per cubic centimeter (g/cc). A bulk density value of 1.325 was used for the GFTER model, and was obtained from Freeze and Cherry (1979). Since the bulk density value used in the model was less than the lower limit of the 95% confidence interval, the value used in the model is considered adequately representative of the Site.

Results of soil grain analysis are provided in Table 3-4 and can be used to further characterize the Site conceptual model. The results generally indicate that the material at the bottom of the silty sand unit is coarser than the material closer to the top of the unit. Also, the data are qualitatively supportive of the suggestion in the conceptual model that the shallow unit is more hydraulically conductive in the north area. This is indicated by a higher percentage of coarse particles in the samples from the north area.

3.4 DNAPL PROPERTIES

3.4.1 Objectives

The objective of this component of the investigation was to determine whether properties of the Site DNAPL are consistent with the assumption of negligible DNAPL mobility, as suggested by the Site conceptual model. The Site conceptual model assumes that the density and viscosity of DNAPL at the Site are similar to typical values reported for creosote in the literature. These properties (relatively low density and high viscosity) tend to limit the lateral and vertical migration and mobility of creosote DNAPL in the subsurface relative to more dense, less viscous DNAPLs (e.g., chlorinated solvents). Releases of DNAPL to the subsurface are not believed to have occurred in the time since wood treating operations at the Site were discontinued over 38 years ago. Therefore, the DNAPL is expected to have attained a static distribution in the subsurface.

3.4.2 Evaluation Data

Samples of DNAPL were collected for laboratory determination of density (ASTM D1298), viscosity (ASTM D446) and interfacial tension (du Nouy Ring Method).

3.4.3 Sampling Locations and Frequency

A total of four DNAPL samples were collected to evaluate DNAPL physical properties. One sample was collected from each of the four existing DNAPL recovery wells, at the locations shown on Figure 3-1. Samples were collected from the following wells: RWN-4 (north area), RWS-1 (south area), RWS-2 (south area), and RWS-5 (south area)..

3.4.4 Decision Rules

The evaluation criteria for DNAPL density and viscosity correspond to typical values for creosote DNAPL as presented in the published technical literature, and as referenced in the GFTER.

The typical density range for creosote is 1.01 to 1.05 g/cc though densities as high as 1.14 g/cc have been measured in some blends. Given this near-neutral density, and in consideration of Site stratigraphy and operational history, the GFTER conceptual model suggested that the DNAPL has likely attained a static distribution within the subsurface at the Site. Measured densities within the typical range (1.01 to 1.14 g/cc) will be considered consistent with the GFTER conceptual model with respect to creosote density. Measured density below this range may indicate that this liquid behaves as an LNAPL, and would not be subject to the same stratigraphic controls as a DNAPL.

A density greater than this range would indicate that the liquid may be more mobile than a typical creosote (assuming the same viscosity). If the density values are greater or less than the evaluation criteria range of 1.01 to 1.14 g/cc, then the conceptual model will be revised with respect to DNAPL density.

The GFTER assumes that the viscosity of the DNAPL is similar to typical creosote, which ranges from 10 to 70 centipoise. The GFTER also indicates that viscosities within, or greater than this range tend to limit the potential for migration. Measured viscosity values for DNAPL that exceed 10 centipoise are considered consistent with the GFTER conceptual model with respect to migration potential, as it relates to viscosity. If measured viscosity values are less than the evaluation criteria, the conceptual model will be revised with respect to viscosity.

Interfacial tension was evaluated with respect to Site-specific hydraulic gradient and hydraulic conductivity, using the relationships shown in Figure 3-4. These relationships will be used to evaluate the mobility of DNAPL under Site-specific conditions. If DNAPL mobility is indicated, then the Site conceptual model will be revised with respect to the interfacial tension.

3.4.5 Results

The observed values for DNAPL specific gravity (density compared to a standard), viscosity and interfacial tension are presented in Table 3-5. In addition, DNAPL analytical results are presented in Table 3-6. Figure 3-5 also indicates that the samples collected are representative of typical creosote. The arithmetic mean , standard deviation , skewness, and the 95% confidence limits were calculated for these parameters and are provided in Appendix H. The results indicate that the limits of the 95% confidence interval for DNAPL specific gravity are 1.0578 and 1.0835 g/cc. This 95% confidence interval is within the Decision Rule density criteria range of 1.01 to 1.14 g/cc Consequently, the DNAPL density data are consistent with the GFTER conceptual model.

The limits of the 95% confidence interval for the DNAPL sample viscosities are 13.66 and 20.75 centipoise (Table 3-5), which is within the Decision Rule range of from 10 to 70 centipoise. The viscosity of the Site DNAPL is therefore considered to be consistent with the GFTER conceptual model.

The limits of the 95% confidence interval for interfacial tension is 41.0 to 43.2 dynes per centimeter (dynes/cm). Using an interfacial tension value of 40 dyne/cm, representative Site hydraulic gradients of <0.006 ft/ft and a representative Site hydraulic conductivity of <0.04 cm/sec, the relationships shown in Figure 3-4 predict that the Site DNAPL is immobile. This result is consistent with the GFTER conceptual model.

3.5 POTENTIAL GROUNDWATER USAGE

3.5.1 Objectives

Information considered in the GFTER indicates that shallow groundwater is not used within a 1-mile radius of the Site, and that potential future use of shallow groundwater in the vicinity of the Site is extremely unlikely. The objective of this evaluation is to confirm these hypotheses using current information.

3.5.2 Sources of Information

Evaluation of groundwater usage is based on information acquired using the Harris-Galveston Coastal Subsidence District (HGCSD) water well database, Atlas Environmental Research (Atlas) water well inventory results, and by contacting appropriate personnel from the City of Houston and HGCSD. The HGCSD water well database and Atlas water well inventory have been queried to determine the nearest location of shallow groundwater use in the area downgradient of the Site. This search has served as a check and an update on the previous well inventory presented in the GFTER. A review of local hydrologic conditions was also completed to determine the location of the nearest potential downgradient shallow groundwater discharge point. In addition, Atlas was also asked to provide information on any recent applications for the installation of groundwater extraction wells within the area between the Site and the nearest shallow groundwater user or shallow groundwater discharge area. Also, the HGCSD was asked to provide information regarding any planned future restrictions on groundwater use in the area.

City of Houston personnel were contacted to determine the public water supply source for the area surrounding the Site. Information regarding the current cost and availability of water supplied through the municipal system was also requested. This information has been used to compare the construction and operation costs of using groundwater versus the cost of using water from the local public supply. Also, information regarding long-term water use projections were requested from the local supplier. This information has served to evaluate the potential for future installation of shallow groundwater extraction wells within the vicinity of the Site.

3.5.3 Decision Rules

The current understanding of groundwater usage in the vicinity of the Site serves as the evaluation criterion. Elements of this understanding are as follows:

- The potential for current and future use of shallow groundwater in the vicinity of the Site is unlikely; and,
- The hypothetical future groundwater exposure points assumed in the fate and transport evaluation represent the nearest possible downgradient locations to the PDSA where groundwater extraction could occur in the future.

3.5.4 Results

On-Site property owners are prohibited from installing groundwater production wells on their properties by virtue of their respective Consent Orders with the United States and corresponding settlement/access agreements with Beazer. Active rail lines, public roads and/or active industrial facilities occupy the areas between the PDSAs and the hypothetical future groundwater withdrawal wells. Therefore, modifications to the assumed locations of future groundwater withdrawals is not necessary, even if the groundwater usage information indicates that current or future use of shallow groundwater in the downgradient vicinity of the Site is possible.

Shallow groundwater is not used within a one mile radius of the Site. The following information was reviewed and confirms that the potential for future use of shallow groundwater downgradient of the Site is unlikely.

Water Well Information

Figure 3-6 presents the Water Well Location Map for a one-mile radius around the Site. The updated water well information provided by Atlas and HGCSD, confirms that shallow groundwater is not used within the vicinity of the Site. Review of the Atlas water well inventory indicates that water well number 21 (Figure 3-6) which was shown in the GFTER, was in error. Atlas confirmed through further research that this water well never existed in the area as previously shown. Atlas did not identify any current applications for the installation of groundwater extraction wells within the area investigated.

Hydrologic Conditions

After reviewing the local hydrologic conditions (Figure 3-6), the nearest downgradient discharge points were located. These points correspond to a stream named Little Whiteoak Bayou. In the northern area, the nearest downgradient discharge point is approximately 7,400 feet hydraulically downgradient from the PDSA, and in the south area, the nearest downgradient discharge point is approximately 4,100 feet hydraulically downgradient from the PDSA. This review was conducted using the USGS Settegast Topographic Quadrangle.

Water Supply

Public water is supplied by City of Houston Public Works and Engineering for the area surrounding the Site. There are two sources of water that the City of Houston uses, surface water (70%) and groundwater (30%). Surface water is extracted from three reservoirs surrounding the City of Houston and is estimated to last to circa 2035. Groundwater is extracted from pumping wells that are deeper than 1,000 feet below ground surface. The closest City of Houston supply wells are located hydraulically upgradient from the Site with respect to shallow groundwater flow (Figures 3-3 and 3-6).

Groundwater versus Public Supply

The Extraction Well Pilot Study Report indicates that the shallow aquifer cannot sustain more than 2 gallons per minute. This low yield precludes commercial or industrial shallow groundwater use that would have much greater production demands. The potential for residential groundwater use is discussed in the following paragraphs.

Economic Constraints

A comparison was made using the construction and operation cost of using groundwater versus the cost of using the public water supply. A scenario was developed to compare the cost of installing a shallow groundwater well and extracting groundwater from it to using the public water supply. The scenario is based on the following parameters:

- The maximum sustainable pumping rate is 2 gallons per minute (Keystone, July 1992);
- The depth of the hypothetical shallow production well would be approximately 25 feet below ground surface (based on Site stratigraphy);

- Installation cost of a 25-foot deep water well is approximately $3,735[24];
- Monthly operational cost of a residential water well is approximately $9.00 (Almeda Water Well);
- Residential water wells are typically pumped for 1 hour per day (Almeda Water Well);
- Groundwater pumped at 2 gallons per minute for 1,800 minutes in a billing month (1 hour per day) yields 3,600 gallons per month which corresponds to >3,000 to 4,000 gallons per month on the City of Houston public water supply billing schedule;
- Monthly cost for public water supply usage at 3,600 gallons per month is $24.62 based on the City of Houston public water supply billing schedule (Appendix G); and,
- Time to recover up front capital cost divided by difference in monthly water bill and monthly well operational cost equals **20 years**.

This analysis demonstrates that the duration to recover the upfront capital cost of well installation makes this option not economically viable. As discussed in the GFTER, natural shallow groundwater quality is poor due to naturally occurring inorganic constituents (iron and manganese) that have been measured above their respective Texas Drinking Water Standards. Therefore, additional costs associated with water treatment would likely be incurred.

Regulatory Constraints

Groundwater withdrawal within the vicinity of the Site is regulated by the District Regulatory Plan of the Harris-Galveston Coastal Subsidence District. Specifically, the purpose of the plan states, *"The District's Regulatory Plan has been developed for the period through the year 2030 with an overall goal to reduce groundwater withdraw to no more than 20% of total water demand."*

Specific elements of the plan include:

- Disincentive fees that have been established to discourage and regulate the withdrawal of groundwater;
- Restrictions on the percentage of groundwater that can be used when surface water sources are available; and,

- Policies that encourage alternate water use strategies that serve to reduce permitted groundwater withdrawals.

These elements of the 1999 District Regulatory Plan, which act to restrict the withdrawal of groundwater in the vicinity of the Site, support the discussion of the HGCSD regulatory authority presented in the GFTER.

Considering all of the above, the current review of current and potential future groundwater use supports the GFTER hypotheses that shallow groundwater is not currently used in the vicinity of the Site and that future use is extremely unlikely.

4.0 GROUNDWATER SAMPLING TO EVALUATE NATURAL ATTENUATION OF DISSOLVED-PHASE CONSTITUENTS

Site-specific data pertaining to dissolved COI distribution and indicators of intrinsic biodegradation were collected during the November-December 1999 field investigation and the supplemental activities completed in April and June 2000. Figure 4-1 presents the Site-wide distribution of benzene and naphthalene concentrations determined as a result of these activities. The objective of the analysis included in this section of the report was to determine whether natural attenuation is effectively mitigating constituent migration from the Site. Groundwater and soil samples were collected from strategic locations on- and off-Site and compared with existing data, where appropriate, to address the following specific objectives:

- To acquire data within the "cores" (zones of relatively high concentration) of the dissolved phase plumes, for evaluation with respect to GFTER conclusions (Section 4.1);
- To determine whether intrinsic biodegradation indicators are consistent with natural attenuation (Section 4.2); and,
- To assess the current downgradient extent of COIs and its effect on GFTER conclusions (Section 4.3).

The results from this work support the overall conclusion of the GFTER: that implementation of a Monitored Natural Attenuation remedy is feasible for the South Cavalcade Site.

4.1 PLUME CORE LOCATION (BTEX AND PAH)

4.1.1 Objectives

A comparison of measured COI concentrations to GFTER modeling results requires that groundwater samples collected from monitoring wells located downgradient of the source areas be representative of maximum (i.e. centerline) concentrations. If concentration data collected from the periphery of the plume are utilized for comparison to model results, then there is potential to overestimate the effects of natural attenuation. Consequently, a focus of the sampling activities was to ensure that the downgradient monitoring locations used as the basis for the GFTER work are representative of maximum concentrations at given distances from the source. More specifically, the objective of this sampling was to determine whether MW-01 and MW-08 are within the "core" of the plume. The decision rules used to define the plume core during this field investigation are provided in Section 4.1.4.

4.1.2 Evaluation Data

The assessment of the plume core location is based on the distribution of BTEX and PAHs in groundwater. The groundwater sampling and analysis program for BTEX and PAHs is summarized in Table 3-1. On-Site field-screening analysis of naphthalene and benzene was conducted with a mobile Gas Chromatograph, by Transglobal Environmental Geochemistry (TEG). Fixed-base laboratory analyses for BTEX and PAHs were conducted by STL-Savannah.

4.1.3 Sampling Locations and Frequency

Groundwater samples were collected along transects oriented transverse to the groundwater flow direction and directly downgradient of the northern and southern PDSAs, as indicated in Figure 3-1. Seven transect sampling locations were emplaced in both the North and South areas, to define the plume cores in each of these areas. The sampling points were located as follows:

- Groundwater flow direction was determined by measuring the potentiometric surface elevations in existing monitoring wells prior to the transect boring program (see Section 3.1).
- The location of the plume axes were estimated to be directly downgradient of the center of the PDSA, in the direction of groundwater flow.
- The first sampling point in each transect was located on the assumed axis of each plume, at an accessible location downgradient of each of the PDSAs.
- Three additional sampling points were located on each side of the initial point, in the direction transverse to groundwater flow (total of seven sampling points in each of the two transects).
- The additional sampling points were spaced equidistant from each other, approximately 40 feet apart within the access constraints of the transect area.
- Additional points were to be added to each end of each transect, until the edges of the core of the plume were defined; however, field screening data indicated that the north and south edges of both plume cores were reasonably defined within the initial seven transect points.

Groundwater sampling for field screening purposes was conducted on a one-time basis using direct-push methods. Samples were collected from the shallow, saturated, silty sand unit (i.e., the hydraulic zone of interest) as confirmed by continuous stratigraphic logging starting at a depth of 2 ft-bgs. At

each transect location, groundwater samples were collected at two foot vertical intervals from the water table to the bottom of the silty sand unit. Field screening analysis for benzene and naphthalene was conducted for all groundwater samples, using the mobile GC. The results of the mobile GC analyses were used to determine the vertical interval with the greatest benzene and/or naphthalene concentrations at each location along the transect. On the basis of this field screening determination, a second temporary well screen was installed within a second boring advanced at a location immediately adjacent to the original boring location and to the depth interval where the greatest concentration was detected during the field screening process. A groundwater sample was then collected from this interval and submitted to STL-Savannah for laboratory analysis of BTEX and PAH.

4.1.4 Decision Rules

Mobile GC data from all transect locations were used to evaluate the horizontal and vertical distribution of COIs in the shallow zone groundwater and to determine the vertical location for collection of groundwater samples for laboratory analysis. Laboratory analytical data were used for transverse delineation of plume cores. In accordance with the Work Plan, the plume core within each transect was defined as that zone that contains concentrations greater than 50% of the maximum concentration detected along the transect. The longitudinal delineation of the plume core was defined as that zone extending downgradient from the PDSA, through all transect points that contained "core" concentrations and extending to the monitoring locations used for comparison of GFTER monitoring results.

The monitoring locations used for comparison to the GFTER fate and transport model (i.e., MW-01 and MW-08) were compared to the plume core locations. The Work Plan Decision Rule stated that if the monitoring locations are within the core of the plume, as defined above, then data from these locations will be considered sufficiently representative of maximum plume concentrations, and supportive of the model conclusions.

4.1.5 Results

Benzene and naphthalene results obtained with the mobile GC were used for real-time estimates of the depth at which the maximum dissolved phase COI concentrations occurred. This approach is intended to provide the basis for subsequent collection of samples for laboratory analysis at the maximum concentration depth, to define the plume core. The mobile GC data were also used to determine whether additional delineation points were required on either end of the north and south transects. A summary of mobile GC data for benzene and naphthalene, and fixed-base laboratory data for BTEX and PAHs are provided in Tables 4-1 and 4-2, respectively. Benzene and

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naphthalene concentrations from both types of analyses are shown plotted in cross-section for the North and South Areas on Figures 4-2 and 4-3 respectively.

Evaluation of Plume Core Location - North Area

In the North Area, mobile GC analyses indicated large concentration differences between benzene and naphthalene, with naphthalene often detected at concentrations at least two orders of magnitude greater than benzene concentrations. Due to these large differences, only one of the parameters could be analyzed within the calibration range of the instrument, in a given sample run. Undiluted samples were typically appropriate for benzene analysis and provided naphthalene results that were "semi-quantitative", in that they could be ranked relative to each other, but did not provide an absolute concentration value. In order to achieve optimal naphthalene analysis, substantial sample dilutions would have been required, which would have caused most benzene results to be non-detectable. Given the objectives of the mobile GC field screening exercise and the requirement for rapid sample turnaround to support decision-making, it was determined that analysis of undiluted samples was the most appropriate approach because: 1) it provided quantitative benzene results; and 2) it provided semi-quantitative naphthalene results that were still useful for identification of the transverse limits of the dissolved plume core and vertical intervals that contain the maximum concentrations.

Evidence that the semi-quantitative naphthalene data were useful for identifying the plume core maximum concentration intervals is provided by comparison of mobile GC results and laboratory results, as shown in Section A-A' in Figure 4-2. This comparison indicates that the relative ranking of mobile GC results are comparable to the ranking of laboratory results (i.e., that the sample with the highest mobile GC result also had the highest result from laboratory analysis). Consequently, it is considered that the mobile GC data provided a reasonable indication of the vertical location of maximum concentrations. It is also considered that the mobile GC data provided a reasonable indicator of whether additional transect points were required to delineate the core of the plume.

As shown in Section A-A' of Figure 4-2, the mobile GC data indicate that along the transect in the North Area, the core of the plume generally occurs within the bottom half of the shallow aquifer. Benzene was detected in four of the seven transect points and naphthalene was detected in all seven points. In the four transects points where both benzene and naphthalene were detected, maximum concentrations were measured at the same depth interval, providing an indication that the maximum concentration occurrence of one parameter reasonably predicts the maximum concentration occurrence for the other parameter. In all transect points except one (DPN-TS3), the highest naphthalene concentration (and benzene, if it was detected) occurred in one of the two deepest samples from the depth profile. On this basis, it appears that the most highly concentrated portion

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of the plume is located at or near the bottom of the shallow aquifer and that the groundwater in the upper portion of aquifer generally contains negligible COI concentrations.

In terms of horizontal trends, the mobile GC results for benzene and naphthalene in the North Area indicated that concentrations at both ends of the transect show a decreasing trend, relative to central transect points. Endpoint concentrations for naphthalene were 172 µg/L (DPN-TN3) and 296 µg/L (DPN-TS3), as compared to the maximum transect concentration of >697 µg/L at DPN-TS1. Benzene concentrations at both endpoint locations were less than the detection limit of 5 µg/L in all samples. These data were used as field evidence that the core of the plume downgradient of the PDSA in the Northern Area was reasonably delineated by the seven transect points.

Laboratory analytical data for the points along the north area transect are provided in Table 4-2 and are shown in cross-section on Section A-A' in Figure 4-2. A plan view of the North Area plume, as indicated by the laboratory data from the transect points and other sampling locations, is shown for benzene and naphthalene on Figures 4-4 and 4-5 respectively. The two figures partially support the conclusion from the mobile GC data: that the plume core is reasonably delineated by the seven points in the north area transect. However, naphthalene data from the southern endpoint of the transect (DPN-TS3; 4600 µg/L) indicates that the plume core likely extends some distance to the south of the transect. Nevertheless, it is apparent the plume core is strongly represented within the transect. Furthermore, closure on the southern core extent is provided by the data from PSG-6, also shown on Figures 4-4 and 4-5, which is located approximately 400 feet south of DPN-TS3. At PSG-6, naphthalene was detected at a concentration of 2.1 µg/L.

Benzene data for the northern transect satisfy the Work Plan criteria for delineation. The benzene concentrations at the endpoint locations, DPN-TN3 and DPN-TS3, were <5 and 7.6 µg/L, respectively. The maximum benzene concentrations within the plume core, 24 µg/L was measured at location DPN-TN1.

The sequential use of mobile GC data and then fixed laboratory data has provided some bounds on the plume core location along the North Area transect. Further delineation is provided by the Work Plan definition of the core as: that portion of the plume that extends downgradient from the source through all the transect points that contain concentrations that are greater than 50% of the maximum concentration in the transect. The footprint of the plume core thus-defined is shown on Figures 4-4 and 4-5. The southern boundary of the plume is shown as approximate, due the detection of 4600 µg/L naphthalene at DPN-TS3, which is greater than 50% of the maximum transect concentration (7400 µg/L at DPN-TS1). Nevertheless, the figures clearly show that the monitoring point used for the GFTER modeling analysis of the north area plume (MW-01) is within the plume core. According to the Decision Rules described in Section 4.1.4, this indicates that the data from this

monitoring point are sufficiently representative of maximum plume concentrations, and supportive of the model conclusions.

Evaluation of Plume Core Location - South Area

The approach used in the north area to evaluate whether the monitoring locations used in the GFTER were located within the plume core was also implemented in the south area. Mobile GC data obtained from the direct push borings along the south area transect are provided in Table 4-1 and are shown in cross-section in Section C-C' of Figure 4-3. According to the mobile GC analysis, naphthalene concentrations greater than the method detection limit (5 μg/L) were only detected in one transect sample (18 μg/L at DPS-TN2; 16 to 18 feet). Benzene concentrations were reported as less than the method detection limit in all samples. However, these data are considered suspect because subsequent fixed-laboratory analysis showed detectable concentrations of naphthalene in six of the seven transect groundwater samples.

The most likely cause of the non-detectable or the low concentrations in mobile GC samples collected at the south area transect points is considered to be rapid infiltration of rainfall. These samples were collected on the afternoon of December 2, 1999, during and immediately following a heavy rainfall event. It is considered likely that this precipitation either caused rapid, widespread and short term dilution of the plume , or that rainwater flowed down the borehole and was captured by the sampling pump. A rainfall dilution effect is further indicated by the mobile GC samples from boring DPS-L1, located approximately 100 feet upgradient of the south area transect on December 6, 1999. DPS-L1 was installed and sampled using the same methodology as that used for the transect points, but sampling was conducted four days after the transect points were sampled. The three groundwater samples collected at DPS-L1 contained naphthalene at concentrations that saturated the detector of the instrument (>688 μg/L, >682 μg/L and >685 μg/L).

The potential effect of dilution on the mobile GC data was not recognized until the fixed-laboratory data were received, after the conclusion of the field screening program. Consequently, and given the absence of significant differentiation in mobile GC results, the sampling interval for collection of fixed-laboratory samples was selected to coincide with the bottom interval of the vertical profile. This decision was made on the basis of data from the North Area, where it was determined that the plume core was located in the lower half of the aquifer. Also, the screening data from boring DPS-L1 indicated elevated concentrations at the base of the aquifer. It is notable that the North Area mobile GC samples were collected before the heavy rainfall event that is considered to have affected the south area transect results. Although the vertical profile data from the mobile GC are not considered representative of groundwater at the sampling locations, the assumption that the highest plume concentrations occur at or near the bottom of the aquifer is considered reasonable.

Consequently, it is considered that the results of the fixed-laboratory analysis are still reasonably representative of maximum concentrations in the vertical profile, even though mobile GC data for the south area transect are considered unrepresentative.

On the basis of the South Area mobile GC data, it was also determined that the seven transect points were sufficient to delineate the plume core. While this determination was based on data that may have been unrepresentative, a review of the subsequent fixed-laboratory data provided evidence that the plume core was indeed delineated within the seven transect locations. Fixed laboratory data are compiled in Table 4-2 and are plotted in Section C-C'on Figure 4-3. As shown in the figure, one of the seven transect points (DPS-TN1) contained concentrations of benzene and naphthalene that were substantially higher than the other six points. At this transect point, naphthalene was detected at 14,000 μg/L and benzene was detected at 290 μg/L. The next highest concentrations of these COIs detected in the South Area transect were less than 10% of those detected at DPS-TN1.

The COIs detected at DPS-TN1 are believed to be indicative of an extension of the southern PDSA. Data acquired from the immediately adjacent transect points indicate that this appendage to the southern PDSA is limited in width. As a result, the data from DPS-TN1 is not considered in the determination of the plume core related to the on-Site PDSA, or the evaluation of the GFTER modeling results through the comparison of measured concentrations of dissolved COI concentrations to model predictions. However, the potential presence of source material at DPS-TN1 is significant for the evaluation of the downgradient extent of COIs and is further discussed in Section 4.3.

Plan views of the South Area plume, as indicated by the laboratory data for transect points and other sampling locations, is shown for benzene and naphthalene in Figures 4-6 and 4-7, respectively. Excluding the data from location DPS-TN1, the maximum naphthalene concentration along the southern transect (1,000 μg/l) was measured in the groundwater sample collected from DPS-TS1. The naphthalene concentrations detected at the endpoint transect locations, (69 μg/l at DPS-TN3; and 190 μg/l at DPS-TS3), are less than 50% of the maximum concentration detected at DPS-TS1. Therefore, the Decision Rule criteria, as described in Section 4.1.4 for determination of the dissolved plume core are considered to have been met for the southern transect. Extension of the plume core downgradient of the transect in the direction of groundwater flow shows that the monitoring point used for the GFTER modeling analysis for the south area (MW-08) is within the dissolved plume core. Thus, the data from monitoring well MW-08 are sufficiently representative of maximum plume concentrations from the on-Site source, and supportive of the model conclusions.

Additional Evaluation of GFTER Monitoring Points

An additional component of work was conducted to further evaluate whether the areas assessed in the GFTER were representative of "worst case" conditions in shallow groundwater. This work was outside the scope of the Work Plan. The need for this work, not necessarily as part of the GFTER verification, but at some point in the future, was discussed among EPA and Beazer during the July 2, 1998 meeting. Beazer elected to perform these activities in conjunction with implementation of the Work Plan. The scope of work for this task was developed to determine whether any other dissolved phase plumes are present at the Site that are comparable in size to, or more extensive than, those associated with the north and south area PDSAs. This evaluation involved installation and sampling of temporary well screens at six locations near the southern and western Site boundaries. These points are indicated by a "PSG" designation and their locations are shown on Figure 3-1 (PSG-1 through PSG-6).

Groundwater analytical data from these locations are provided in Table 4-2 and benzene and naphthalene concentrations are plotted in Figure 4-1. From the distribution of COI concentrations shown on Figure 4-1, it is apparent that five of the PSG monitoring points (excluding PSG-2) did not reveal new locations where source areas may exist or where COIs may occur at concentrations that are greater than those areas evaluated in the GFTER. In the case of PSG-2, elevated concentrations of COIs were detected (particularly naphthalene at 19000 µg/L), which may indicate the presence a of creosote DNAPL near this location. This result is likely due to the position of boring PSG-2, located due south of the former wood treatment process area in close proximity to on-Site DNAPL Recovery Well RWS-2. In addition, historical maps of the wood treating plant showed that a pond once existed during the plant operations period in the area north of PSG-2. Thus, the presence of COI's at PSG-2 may be attributable to past groundwater mounding in the vicinity of this pond.

Given the current westward groundwater flow direction in the area (as shown on Figure 3-3), the dominant direction of any dissolved plume migration away from PSG-2 is expected to be toward several downgradient monitoring points (e.g., PSG-01, DPS-TS1, DPS-TS2, DPS-TS3 and MW-08). The absence of significantly elevated COIs at these points indicates that downgradient plume migration from PSG-02 is rapidly attenuated, and that the southern monitoring points used in the GFTER (MW-08) are reasonably representative of worst-case conditions.

4.2 INTRINSIC BIODEGRADATION

4.2.1 Objectives

Biodegradation is one of the natural attenuation processes accounted for in the GFTER fate and transport model. The model allowed for relatively slow rates of dissolved constituent biodegradation, on the basis that most creosote compounds are known to be biodegradable to some degree. In keeping with the inclusion of biodegradation in the GFTER transport model, groundwater and soil sampling was conducted to:

- Determine whether differences in concentrations of biodegradation indicator parameters between background locations, potential source areas and locations within the dissolved phase plume are consistent with the occurrence of biodegradation;
- Evaluate whether conditions in the vicinity of the plume are favorable for the biodegradation of dissolved COIs; and,
- Evaluate whether biodegradation of COIs is leading to the accumulation of substantial quantities of organic by-products or metabolites in groundwater.

4.2.2 Evaluation Data

Groundwater samples were analyzed for dissolved COIs, electron acceptors, inorganic biodegradation by-products, microbial nutrients, general chemistry parameters, Total Organic Carbon (TOC), Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD). Soil samples were analyzed for specialized microbial indicators to evaluate the following:

- The presence of naphthalene-degrading microbes;
- The degree of microbial activity;
- The availability and utilization of microbial nutrients and electron acceptors; and,
- Microbial environmental conditions.

The selection of data to demonstrate intrinsic biodegradation was based in part on the following references:

- *Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater* (Wiedemeier et al., 1995);

- *BIOSCREEN Natural Attenuation Decision Support System User's Manual* (Newell et al., 1996); *and,*

- *Migration and Natural Fate of a Coal Tar Creosote Plume* (King and Barker, 1999).

The specific sampling and analytical program is summarized in Table 3-1. Groundwater sample collection, preservation and analysis was conducted according to accepted methods.

The observation of diminished electron acceptor concentrations (dissolved oxygen, nitrate, sulfate) and the accumulation of biodegradation by-products (ferrous iron, carbon dioxide, methane) in groundwater zones containing organic constituents, relative to upgradient or background conditions, is an indication that COI mass is undergoing biodegradation. The presence of microbial nutrients provides an indication of whether subsurface conditions are favorably supporting microbial activity. Phosphorous, in particular, is an important nutrient for BTEX- and PAH-degrading bacteria. General chemistry parameters (chloride, alkalinity, pH, ORP, biochemical oxygen demand, chemical oxygen demand, conductivity) are utilized for general characterization of chemical conditions of the aquifer and may provide additional information pertaining to whether groundwater environmental conditions are amenable to microbial activity.

TOC, COD and BOD provide an indication of whether substantial quantities of organic by-products or metabolites may be accumulating in groundwater downgradient of the source. It is probable that such intermediates are formed through the biodegradation of parent compounds. However, these intermediates are generally expected to be short-lived and highly biodegradable. A wide and unpredictable range of intermediates may be formed during biodegradation, depending on the parent compound, the governing redox condition and other environmental factors. Consequently, TOC, COD and BOD were used as "surrogate" parameters to evaluate the quantity of by-products that may have formed as a result of the biodegradation of plume-derived organic compounds that may be present but not detectable through the analysis of BTEX and PAHs.

Analysis of soils samples for Phospholipid Fatty Acids (PLFA) and a naphthalene-degrading gene provides an indication of the presence and relative activity of microbes capable of degrading aromatic compounds within the subsurface. PLFA is a component of intact microbial cells, and can be used as an indicator of microbial numbers and growth. The naphthalene gene probes test for a

specific gene associated with the microbial ability to degrade naphthalene. These analyses were conducted by Microbial Insights in Knoxville, Tennessee.

4.2.3 Sampling Locations and Frequency

One round of groundwater intrinsic biodegradation indicator data was collected from the locations shown on Figure 3-1 as summarized in Table 3-1. Groundwater sampling points were selected to be representative of one of the following four types of locations:

- *background* - expected to indicate relatively oxidizing conditions, due to the absence of COIs or low-level COI concentrations;
- *within the source* - expected to show highly reducing conditions due to abundant biodegradable COIs and corresponding depletion of electron acceptors;
- *within the plume / near-source* - expected to show moderate COI concentrations and relatively reducing conditions; expected to be somewhat less reducing than the source location; and,
- *within the plume / far-source* - expected to show relatively low COI concentrations and redox conditions that are between background and near-source levels.

A correlation between individual sampling locations and each of the four areas described above is provided in Table 3-1. At each location, groundwater samples were also collected for analysis of BTEX and PAH compounds to evaluate whether groundwater chemistry is representative of the target zones. The distribution of dissolved COI in groundwater is shown using SEQUENCE diagrams on Figure 4-8. Single soil samples for analysis of microbial parameters were collected from direct-push soil borings at the seven locations shown on Figure 3-1 and listed Table 3-1.

4.2.4 Decision Rules

Concentrations of biodegradation indicators at background locations and within the dissolved-phase plume were evaluated to determine whether parameter distributions and concentration trends are consistent with the occurrence of intrinsic biodegradation. In general, a qualitative comparison was

used to compare sample groups from the four types of locations. The following general trends will be considered to be consistent with the occurrence of intrinsic bioremediation processes:

- Decrease in electron acceptors, ORP and nutrients from background locations to source zone locations;
- Increase in electron acceptors, ORP and nutrients from the source zone, to the near-source zone, to the far-source zone;
- Increase in dissolved iron, dissolved manganese, methane, carbon dioxide, TOC, COD and BOD from background to source zone locations;
- Decrease in dissolved iron, dissolved manganese, methane and TOC from the source zone, to the near-source zone, to the far-source zone; and,
- Increase in microbial biomass, and naphthalene-degrading genes from background locations to plume zone locations.

Biodegradation of organic compounds is complex and will depend on a number of Site-specific factors. Consequently, lack of expected change in any one of these parameters will be considered inconclusive with respect to natural attenuation.

4.2.5 Results

Natural Attenuation Indicators in Groundwater

Results of sampling for natural attenuation indicators in groundwater are provided in Table 4-3 (field parameter results) and Table 4-4 (laboratory analytical results). A summary of the implications of these results is provided in Tables 4-5 through 4-8. Natural attenuation indicators are plotted on Sequence-Redox Maps and Sequence-Geochemistry Maps in Figures 4-9 and 4-10. These figures are referenced in the summary tables for the natural attenuation indicators general geochemistry parameter and by-product/COI surrogate parameters (Tables 4-5 through 4-8).

For many of the natural attenuation indicator parameters, the evaluation "background" groundwater is somewhat obscured because COIs were detected in all three of the wells that were intended to be representative of background conditions. These constituents may originate from the highly industrialized area adjacent to and east of the Site. Consequently, there may be low COI concentrations in some of the groundwater flowing towards the Site. This adds a complicating factor

to the evaluation of COI biodegradation on the Site because biodegradation may be occurring in the groundwater even before it reaches the Site.

With the exception of dissolved oxygen, the data for all of the electron acceptor and inorganic by-product indicators provided evidence in support of the GFTER conclusions (Table 4-5, Figure 4-8). Dissolved oxygen is particularly difficult to measure reliability in the field, and thus the dissolved oxygen results are not considered to be as reliable as the other indicator parameters. Dissolved oxygen was generally detected at concentrations in excess of 1 mg/L, which is not consistent with the presence of COIs and the generally low ORP readings that were observed. Therefore, the dissolved oxygen data were not utilized further in this analysis.

Two of the general groundwater geochemistry parameters summarized in Table 4-6, and shown on Figure 4-9 (ORP and carbon dioxide) provided strong evidence of COI biodegradation. Data for the remaining parameters (pH, alkalinity, ammonia and ortho-phosphate) were inconclusive, with regard to biodegradation.

The concentration trends for TOC, COD and BOD were consistent with biodegradation, as shown in Table 4-7 and Figure 4-9. The general decreasing trends in these parameters in groundwater downgradient of the COI source zones provided evidence of COI biodegradation, and also indicated that substantial quantities of organic metabolic by-products are not accumulating in groundwater as a result of COI biodegradation.

Microbial Indicators in Soil Samples

Results of PLFA analysis are summarized graphically in Appendix E and are evaluated in terms of their support for the GFTER conclusions, in Table 4-8. With regard to the analysis for the naphthalene-degrading gene, the analytical laboratory (Microbial Insights) reported that is was not possible to perform the analytical, due to the presence of other constituents in the samples that interfered with the analysis method. A letter from Microbial Insights providing a description of this interference effect is provided in Appendix E.

PLFA is a component of intact cell membranes. A number of researchers (e.g., White et al., 1979[25]; Guckert et al., 1985[26]; Balkwill et al., 1988[27]; Ringelberg et al., 1989[28]) have contributed to the development of methods that correlate the quantity of PLFA in sediment samples to microbial biomass. Extensions of this technique have been reviewed by Tunlid and White (1992)[29] and have been used to relate the relative proportions of groups of PLFA compounds to microbial community structure and metabolic status.

Most of the microbial indicator parameters that are derived from PLFA analysis provide evidence that is consistent with the GFTER conclusion although, in general, the trends were not strong. As in the case of the groundwater parameters, the use of microbial indicators for evaluation of COI biodegradation on the Site is complicated by the occurrence of COIs in groundwater upgradient of the Site. It is likely that aquifer microbes in these upgradient areas have responded to the presence of COIs. The potential to identify differences between microbial characteristics on the Site and in upgradient areas is therefore decreased.

4.3 DOWNGRADIENT EXTENT OF COI

4.3.1 Objectives

The objective of the work described in this section was to acquire additional characterization of the longitudinal distribution of COIs in groundwater, along the approximate plume center lines. Recent analytical data was compared to past COI concentrations to evaluate whether concentrations at these points are increasing, decreasing or stable. Center line profiles will be compared with the GFTER simulations to characterize whether the plume is advancing, receding, or remaining stable over time.

4.3.2 Evaluation Data

This section utilizes the results of the laboratory analyses of groundwater samples collected from locations within the plume cores for BTEX and PAH. Assuming source concentrations of dissolved COIs are constant, these data can be compared to previous data and the GFTER modeling results to evaluate whether the dissolved-phase groundwater plume is receding, in a steady-state configuration, or if the potential for future plume migration exists. The sampling and analytical program is summarized in Table 3-1.

4.3.3 Sampling Locations and Frequency

Section 4.1 describes the groundwater sampling program along direct-push transects located downgradient of the North and South PDSAs, and oriented transverse to the direction of groundwater flow. COI concentration data from these transects were used to estimate the transverse locations (at the transect) of the plume cores (Section 4.1.4). This information was used to locate additional sampling points longitudinally within the estimated plume cores (or center lines) at locations both upgradient and downgradient of the transects.

A total of six additional sampling points were emplaced at points longitudinally within the plume core in the North Area, at the locations shown on Figure 3-1. Four plume core sampling points were

located between the northern transect and the North PDSA (DPN-L1 through DPN-L4, inclusive). Conventional monitoring wells MW-24 and MW-25 were located within the plume core at locations downgradient of the transect. These wells screen the entire thickness of the silty sand unit. The Work Plan also specified that a sample would be collected from MW-01, located between the transect and the PDSA. Construction specifications for the newly installed monitoring wells are provided in Appendix B and are similar to the previously installed monitoring wells at the Site.

In the South Area, only one longitudinal sampling point was installed between the transect and the PDSA (DPS-L1), due to the space and access restrictions within the railroad right-of-way. The location of DPS-L1 is shown on Figure 3-1. A groundwater sample was collected from MW-08 which is located within the plume core and downgradient of the transect. Mobil well MW-17 could not be sampled, as specified in the Work Plan, because Mobil denied Beazer's request for sampling areas. Groundwater samples were collected for laboratory analysis of BTEX and PAH from each of the above noted sampling locations.

As discussed in Section 4.1.5, the analytical data for DPS-TN1, indicated that the extent of potential source material in the South Area extends further to the west (i.e., downgradient) than the previously inferred limits of the South PDSA. Data from the adjacent transect points (DPS-T0 and DPS-TN-2) indicate that the width of the potential source material identified at DPS-TN1 is limited. A new monitoring well (MW-26) was installed to the west of DPS-TN1 in April 2000 in order to evaluate the extent of COIs downgradient of DPS-TN1.

4.3.4 Decision Rules

The objective of the decision rules pertaining to comparison of current and past concentration data from MW-01 and MW-08 is to evaluate for long term trends in groundwater concentrations (i.e., increasing, decreasing or stable). At the same time, the decision rule must allow for the following limitations:

- previous data available from these wells are limited (three sampling events for MW-01 and two sampling events for MW-08);
- variability associated with sampling and analytical techniques; and
- short term processes that affect concentration, such as seasonal effects or hydrologic events.

Given these limitations, the decision rule will rely on an overall assessment of data trends, rather than statistical methods. Details of the decision rules are as follows:

- If recent data from the existing monitoring wells are less than the maximum concentration observed at a given monitoring point in the past, then the data will be considered consistent with a stable plume at the given location and the natural attenuation conclusions in the GFTER.

- If recent concentrations are greater than the maximum observed in the past, then the analytical variability of the new data will compared with that of the previous data using the analytical quality control criteria stipulated for the particular COI and corresponding analytical method in EPA SW-846. If the ranges of error associated with these two measurements do not overlap, then the data will be considered inconsistent with a stable plume at the given location and the natural attenuation conclusions in the GFTER.

In any case, the comparison of time series data will be considered preliminary due to the limitations mentioned previously. The assessment of historical trends can be refined through subsequent data collection as part of a Monitored Natural Attenuation groundwater sampling and analysis program (should such a program be implemented at the Site).

The decision rule pertaining to plume center line data is based on comparison of center line concentrations (within the core of the plume) with the GFTER modeling results. If the actual plume profile shows concentrations that are comparable to, or lower than, the modeling results, then the model will be considered representative of existing conditions at the Site. If the actual plume profile shows concentrations that are greater than the modeling predictions, then the model will be re-run with updated, Site-specific fate and transport parameters. Results of the updated model will be evaluated to determine whether the overall GFTER conclusion, that a monitored natural attenuation remedy for shallow groundwater is feasible, is still supported.

4.3.5 Results

Assessment of Long Term Trends at MW-01 (North Area)

A comparison of COIs that have been detected in groundwater samples collected from monitoring well MW-01 during previous investigations and as part of this investigation is summarized in Table 4-9. Inspection of Table 4-9 indicates that concentrations of all the COIs detected during this investigation show a decreasing concentration trend from the RI (1986/1987) through the Collection Trench Pilot Study (1993) to the present study. These trends indicate that the plume is at least stable, if not receding.

Assessment of Long-Term Trends at MW-08 (South Area)

A comparison of COIs that have been detected at MW-08 during historical RI sampling and during the sampling conducted for the recent investigation, is shown in Table 4-10. Inspection of Table 4-10 indicates that, in general, the COI concentrations measured during the recent sampling event are significantly less than concentrations measured during past RI sampling events. It is difficult to make this comparison for chemicals where concentrations were not detected above the method detection limit (e.g. fluorene, anthracene, fluoranthene, and pyrene). However, the consistent trends for the other chemicals does indicate that the COI plume is at least stable, if not receding, in the vicinity of monitoring well MW-08.

Comparison of Measured and Simulated Center Line Concentrations

Table 4-11 presents a comparison of the measured and simulated concentrations for benzene and naphthalene at monitoring wells situated along the center lines of the north and south plumes. Inspection of Table 4-11 indicates that the measured center line concentrations of benzene are comparable or significantly lower than the modeled concentrations of benzene for both the North and South Areas. For example, in the North Area, measured concentrations of benzene at MW-01 and MW-24 were 4.1 and 1.8 ug/L, respectively. Meanwhile in the modeled concentrations for these locations were 56 and 3 ug/L, respectively. In the South Area, measured benzene concentrations were 6.9 ug/L and non-detectable (<1 ug/L) at two points along the center line (DPS-T0 and MW-08). Concentrations predicted by the model were 32 and approaching 0 ug/L, respectively. This confirms the overall GFTER conclusion that natural attenuation processes are acting to limit the migration of benzene downgradient of the PDSA's.

The comparison between measured and simulated concentrations of naphthalene is not as straightforward as the comparison with benzene concentrations. For the monitoring wells, the measured and simulated naphthalene concentrations are comparable. For example, Table 4-11 shows that in the North Area the measured and simulated concentrations at MW-24 are 630 and 603 ug/L, respectively; the measured and simulated concentrations at MW-25 are non-detectable (<10 ug/L) and 60 ug/L, respectively. However, in the near-source zones in both the North and South Areas, the model predicts a faster rate of attenuation for naphthalene than was measured. In the South Area, measured and simulated concentrations at MW-08 are 7.3 ug/L and approaching 0 ug/L, respectively. For example, in the North Area at DPN-L2, DPN-L3, DPN-TN1, DPN-TS1 the measured naphthalene concentrations are relatively consistent between 6300 and 7400 µg/L while the model predicted a steady decline in naphthalene concentrations along the flowpath and lower concentrations at these monitoring stations. Similarly the model predicted greater attenuation in the near-source zone for the South Area than that indicated by the field data in the area between the

PDSA and transect point DPN-T0 (measured concentration 270 ug/L; simulated concentration 8 ug/L).

It is apparent that significant decrease in naphthalene concentration occurred in the North Area between samples from the transverse transect points (e.g. DPN-TN1 and DPN-TS1) and downgradient monitoring well MW-24. Undoubtedly, part of this difference is due to the sampling method: the direction-push points sample only a small highly concentrated portion of the vertical profile, while the conventional monitoring wells sample a larger section of the profile. However, inspection of the SEQUENCE-Geochemistry map for the North area (Figure 4-10) indicates that redox conditions at MW-24 are more oxidizing than conditions at the transect monitoring stations. This change in redox condition should be more favorable for the biodegradation of naphthalene, thus resulting in a significantly faster rate of attenuation between DPN-TN1/DPN-TS1 and MW-24 than between the PDSA and the transect.

It is also apparent in the South Area that significant attenuation of naphthalene is occurring in the area between the transverse transect point (DPS-T0 and DPS-TS1) and downgradient monitoring well MW-08. The SEQUENCE-Geochemistry map for the South Area show that the redox conditions are significantly more oxidizing than those observed at DPS-T0. It is probable that the transition from reducing conditions at DPS-T0 to oxidizing conditions at MW-08 resulted in more favorable conditions for the biodegradation of naphthalene.

Although the modeled rate of attenuation does not appear to represent the rapid attenuation rate observed in the field, both the model and the measured data indicate the same conclusion: natural attenuation processes are acting to reduce COI concentrations downgradient of the PDSA's.

Supplemental Evaluation of the Downgradient Extent of COIs

Additional downgradient monitoring wells were installed in April 2000 to further evaluate the downgradient extent of COIs in shallow groundwater. Monitoring well MW-25 was installed at an off-Site location downgradient of the northern PDSA within the lateral limits of the plume core defined by the transect data. Monitoring well MW-26 was installed at an off-Site location downgradient of the southern transect location DPS-TN1, where concentrations indicative of the presence of potential source material were measured. Groundwater samples were collected from both of these wells for analysis of COIs on two occasions: April and July 2000. The results of these analyses are included in Table 4-2. The July 2000 event also included the collection of samples for analysis of natural attenuation indicators.

The extent of COIs in groundwater downgradient of the North PDSA is sufficiently defined through the analysis of groundwater samples from monitoring well MW-25. Naphthalene concentrations were reported as less than the detection limits for both sampling events. Benzene was reported at a concentration of 2.6 μg/l and less than the detection limit of 1 μg/l for the April and July 2000 sampling events, respectively. The COI data from monitoring well MW-25 are further evidence of the occurrence of natural attenuation downgradient of the northern PDSA.

Naphthalene was reported in the groundwater samples collected from monitoring well MW-26 during April and July 2000 at concentrations of 4300 and 1800 μg/l, respectively. For the April 2000 sampling event, the laboratory reported benzene as non-detect at an elevated detection limit of 500 μg/l. These data were deemed unusable for the purpose of the investigation. The well was re-sampled in July 2000. The results of these analyses indicate that the benzene concentrations in shallow groundwater at location MW-26 are less than the detection limit of 1 μg/l.

The presence of elevated naphthalene and higher molecular weight (i.e., less mobile) PAHs in the groundwater at location MW-26 are suggestive of a nearby source of these constituents. However, the substantial decrease in COI concentrations MW-26 (e.g., naphthalene at 1.8 and 4 mg/L) and DPS-TN1 (naphthalene 14 mg/L), indicate conditions favorable for natural attenuation exist in the vicinity MW-26. Natural attenuation indicator data suggested that at least part of the decrease is due to biodegradation. ORP data indicate a transition from reducing conditions in the vicinity of the southern transect to oxidizing conditions at the MW-26 area. Also, the presence of biodegradation by-products (dissolved manganese and ferrous iron) in the sample collected from MW-26 (Figure 4-9) suggest that natural attenuation is occurring in the area of monitoring well MW-26.

5.0 SUMMARY AND CONCLUSIONS

The results of the GFTER Verification are supportive of the conclusion that a Monitored Natural Attenuation remedy is feasible for dissolved phase COIs in shallow groundwater at the South Cavalcade Site. Table 5-1 summarizes the GFTER Verification results relative to the decision rules established in the Work Plan. The results also indicate that the GFTER model is adequately representative of the Site and that an update to the model is not likely to change the conclusion of this evaluation. In fact, the GFTER has been demonstrated to be protective with regard to some parameters. The following investigative results provide the basis for this conclusion:

- The magnitude of the groundwater hydraulic gradient measured for the South Area are consistent with those used in the GFTER modeling.
- The direction of groundwater flow away from the PDSAs indicates that the plume monitoring has been conducted at locations that are representative of the plume core.
- The transect data sufficiently define the cores of the dissolved plumes downgradient of the northern and southern PDSAs and indicate that the well locations used for assessment of the GFTER modeling are representative of conditions within the plume core.
- The quantification of dissolved phase COI sorption used in the GFTER modeling was representative of Site conditions.
- The physical properties of the aquifer matrix (porosity and bulk density) were measured and are in reasonable agreement with values used in the GFTER.
- Measurement of DNAPL properties including density, viscosity and interfacial tension are consistent with those assumed in the Site conceptual model.
- A review of groundwater use information indicates there is negligible potential for shallow groundwater in the downgradient vicinity of the Site to be utilized as a resource.
- Evaluation of the natural attenuation indicator data suggest that natural attenuation is occurring and that conditions favorable for natural attenuation exist downgradient of the PDSAs.

- The data from southern transect location DPS-TN1 suggest that a potential source may exist further to the west (i.e., downgradient) of the previously inferred limits of the PDSA in the south area. Greater than expected concentrations for naphthalene and other PAHs further downgradient, at MW-26, are consistent with a linear extension of the PDSA in this area. However, natural attenuation data at MW-26 and from throughout the Site, suggest that natural attenuation should work to reduce dissolved constituent concentrations downgradient of MW-26. This is supported by recently acquired groundwater analytical data that indicate that the distribution of dissolved COI remain in relatively close proximity to the suspected appendage of the PDSA in the South Area. This observation further suggests that natural attenuation processes are not only at work, but that they are also effective at inhibiting the migration of dissolved COI in groundwater.

- Measured COI concentrations at downgradient sampling point locations show good agreement with those predicted by the GFTER model, particularly at those locations furthest from the PDSAs.

- The additional evaluation of other site areas demonstrated that there are no other dissolved phase plumes that are comparable in size to or more extensive than those associated with the north and south area PDSA's.

6.0 RECOMMENDATIONS

In consideration of the multiple lines evidence that were evaluated in this investigation, and the conclusion that a Monitored Natural Attenuation remedy is feasible for shallow groundwater at the Site, it is recommended that an MNA monitoring program be developed and implemented. The following components are proposed, to comprise an optimal MNA monitoring program:

COMPONENT	FEATURES
Monitoring locations for along approximate plume center lines (it is noted that additional monitoring locations would be required downgradient of MW-26)	*North Area:* MW-01, MW-24, MW-25 *South Area:* MW-08, MW-26, two additional monitor wells downgradient of MW-26
Monitoring locations for early identification of any future advance of the downgradient extent of dissolved phase COI distributions	*North Area:* MW-25 *South Area:* one of the two new wells (likely the well located furthest downgradient)
Monitoring locations for early identification of concentration increases in the more highly concentrated zones of dissolved phase COI distributions	*North Area:* MW-01 *South Area:* MW-26
Monitoring parameters that make optimal use of known COI trends at the Site	BTEX, Naphthalene
Monitoring parameters that make optimal use of known trends in MNA indicators at the Site	ORP, pH, Nitrate, Iron, Manganese, Sulfate, Total Organic Carbon
Optimal monitoring frequency	Year 1-2: semi-annual Year 3-5: annual Year 5 onward: every fifth year, to coincide with EPA 5-year reviews
Ongoing water usage and regulatory check	Review of water well records and the regulatory status of groundwater use as set forth by the City of Houston, HGCSD, and State of Texas

COMPONENT	FEATURES
Define circumstances under which modification to the monitoring program may be made	To be discussed with EPA

In total, the objective of the MNA monitoring program would be to provide ongoing confirmation that MNA is effective at addressing site constituents, and early detection of potential trends indicative of additional COI migration.

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TABLES

TABLE 3-1
Summary of Samples Submitted for Analysis
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Sample Location / *Matrix*	*COI Set (Groundwater)*	*MNA Set (Groundwater)*	*Microbial Set (Soil)*	*Porous Media Set (Soil)*	*DNAPL Set (DNAPL)*
DPN-TN3	X			(10-12') & (16-18)	
DPN-TN2	X				
DPN-TN1	X				
DPN-T0	X				
DPN-TS1	X				
DPN-TS2	X				
DPN-TS3	X			(10-12') & (18-20')	
DPN-L1	X	X (Near Source)	(17-19')		
DPN-L2	X	X (Near Source)	(16-18')		
DPN-L3	X				
DPN-L4	X				
DPS-TN3	X			(12-14') & (16-18')	
DPS-TN2	X				
DPS-TN1	X				
DPS-T0	X	X (Far Source)	(16-18')		
DPS-TS1	X				
DPS-TS2	X				
DPS-TS3	X			(10-12') & (18-20')	
DPS-L1	X	X (Near Source)	(17-19')		
MW-01	X	X (Far Source)			
MW-03	X	X (Background)	(16-18')		
MW-07	X	X (Background)	(14-16')		
MW-08	X	X (Far Source)			
MW-24	X	X (Far Source)			
MW-25	X	X (Far Source)			
MW-26	X	X (Far Source)			
OW-02	X	X (Source Area)			
OW-07	X	X (Background)	(13-15')		
OW-10	X	X (Source Area)			
RWS-1					X
RWS-2					X
RWS-5					X
RWS-4					X
PSG-01	X				
PSG-02	X				
PSG-03	X				
PSG-04	X				
PSG-05	X				
PSG-06	X				

COI Set	BTEX, PAHs
MNA Set	BOD, COD, TOC, Chloride, Nitrate (N) Ammonia (N), Sulfate, Dissolved Iron Dissolved Manganese, Methane, Carbon Dioxide, Alkalinity, Ortho-phosphate
Microbial Set	Phospholipid Fatty Acids (PLFAs) and PAH Gene Probes
Porous Media Set	Grain Size, Bulk Density, Particle Specific Gravity, TOC
DNAPL Set	Density, Viscosity, Interfacial Tension, BTEX, PAHs

TABLE 3-2
Groundwater Potentiometric Surface Elevations
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Piezometer/ Monitoring Well	*Measuring Point Elevation (ft-msl)*	*Depth to Water (ft-toc)*	*Groundwater Potentiometric Surface Elevation (ft-msl)*	*Date*	*Time*
MW-07	52.89	9.55	43.34	11/19/99	13:31
PZS-10	48.09	8.33	39.76	11/19/99	13:45
PZS-11	48.28	8.23	40.05	11/19/99	13:46
OW-10	50.94	10.45	40.49	11/19/99	13:50
PZS-20	48.64	6.83	41.81	11/19/99	14:07
PZS-21	48.57	6.78	41.79	11/19/99	14:08
PZS-31	49.27	6.88	42.39	11/19/99	14:15
PZS-30	49.39	6.93	42.46	11/19/99	14:17
PZS-41	49.55	6.58	42.97	11/19/99	17:11
PZS-40	49.64	6.64	43.00	11/19/99	17:13
MW-04	49.71	6.82	42.89	11/19/99	17:30
PZS-60	51.64	7.93	43.71	11/19/99	17:35
PZS-61	51.57	7.85	43.72	11/19/99	17:38
PZS-51	49.71	6.21	43.50	11/19/99	18:33
PZS-50	49.85	6.03	43.82	11/19/99	18:35
OW-11	51.75	8.15	43.60	11/19/99	18:37
MW-03	52.04	9.60	42.44	11/20/99	11:58
PZN-41	50.75	9.27	41.48	11/20/99	12:20
PZN-40	50.91	9.44	41.47	11/20/99	12:24
OW-02	53.89	12.37	41.52	11/20/99	12:27
PZN-11	51.11	10.84	40.27	11/20/99	12:35
PZN-10	51.03	10.34	40.69	11/20/99	12:37
MW-01	54.11	13.28	40.83	11/20/99	12:40
PZN-20	51.28	10.33	40.95	11/20/99	12:50
PZN-21	50.87	10.05	40.82	11/20/99	12:51
PZN-31	50.75	10.06	40.69	11/20/99	12:55
PZN-30	50.79	10.05	40.74	11/20/99	12:57
PZN-50	50.85	10.10	40.75	11/20/99	13:15
PZN-51	52.76	10.22	42.54	11/20/99	13:16
MW-02	53.79	12.90	40.89	11/20/99	13:20
OW-07	54.64	13.07	41.57	11/20/99	13:33
MW-06	48.83	6.50	42.33	11/20/99	13:45

TABLE 3-3
Summary of Total Organic Carbon Concentrations and f_{oc} in Aquifer Matrix
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Site Area	***Sample Identification***	***Result***		***Sample Depth***	***Method***
		(mg/kg)	***(foc)***	***(feet-bgs)***	
South Area	DPS-TN3-1214	1300	0.0013	12-14	Walkley-Black
South Area	DPS-TN3-1618	453	0.000453	16-18	Walkley-Black
South Area	DPS-TS3-1012	1070	0.00107	10-12	Walkley-Black
South Area	DPS-TS3-1820	921	0.000921	18-20	Walkley-Black
North Area	DPN-TN3-1012	1120	0.00112	10-12	Walkley-Black
North Area	DPN-TN3-1618	379	0.000379	16-18	Walkley-Black
North Area	DPN-TS3-1012	1230	0.00123	10-12	Walkley-Black
North Area	DPN-TS3-1820	1860	0.00186	18-20	Walkley-Black

TABLE 3-4
Summary of Geotechnical Testing Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Site Area	*Soil Boring*	*Depth (ft-bgs)*	*Bulk Density (g/cm^3)*	*Particle Specific Gravity*	*Porosity*	*Gravel (%)*	*Sand (%)*	*Silt/Clay (%)*	*USCS Code*
North Area	DPN-TS3	10.0-12.0	1.68	2.61	0.36	0	54.56	45.44	SC
North Area	DPN-TS3	18.0-20.0	1.86	2.62	0.29	0	85.43	14.57	SM
North Area	DPN-TN3	10.0-12.0	1.79	2.60	0.31	0	64.35	35.65	SC
North Area	DPN-TN3	16.0-18.0	1.89	2.60	0.27	0	90.15	9.85	SP-SM
South Area	DPS-TN3	12.0-14.0	1.75	2.63	0.33	0	45.94	54.06	CL
South Area	DPS-TN3	16.0-18.0	1.66	2.61	0.36	0.36	52.13	47.51	SC
South Area	DPS-TS3	10.0-12.0	1.85	2.63	0.30	10.82	37.89	51.29	CL
South Area	DPS-TS3	18.0-20.0	1.74	2.60	0.33	0.13	66.44	33.43	SC

TABLE 3-5
Summary of DNAPL Physical Property Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Sample	*Kinematic Viscosity (cSt at 22° C)*	*Absolute Viscosity (cp at 22° C)*	*Specific Gravity (at 22° C)*	*Interfacial Tension (dynes/cm)*
RWS-1	12.15	13.15	1.0819	43.5
RWS-2	14.62	15.39	1.0527	41.0
RWN-4	19.86	21.23	1.0692	41.5
RWS-5	17.65	19.04	1.0788	42.5

TABLE 3-6
DNAPL Analytical Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	RWN-4 12/15/1999		RWS-1 12/15/1999		RWS-2 12/15/1999		RWS-5 12/15/1999	
BTEX (EPA 8260)									
Benzene	(ug/l)	13000		220000		89000		8600	J
Ethylbenzene	(ug/l)	120000		460000		230000		190000	
Toluene	(ug/l)	75000		730000		280000		37000	
m/p-xylene	(ug/l)	320000		1200000		570000		280000	
o-Xylene	(ug/l)	170000		210000		76000		7400	J
PAH (EPA 8270)									
Acenaphthene	(ug/l)	26000000		40000000		28000000		42000000	
Acenaphthylene	(ug/l)	9800000	U	9900000	U	9600000	U	9900000	U
Anthracene	(ug/l)	9700000	J	12000000		9900000		9300000	J
Benzo(a)anthracene	(ug/l)	4800000	J	5000000	J	4300000	J	8200000	J
Benzo(a)pyrene	(ug/l)	2100000	J	3000000	J	2000000	J	3400000	J
Benzo(b)fluoranthene	(ug/l)	1800000	J	2000000	J	1500000	J	2700000	J
Benzo(g,h,i)perylene	(ug/l)	1200000	J	2400000	J	2200000	J	1300000	J
Benzo(k)fluoranthene	(ug/l)	2000000	J	2700000	J	2100000	J	3900000	J
Chrysene	(ug/l)	4400000	J	4800000	J	4200000	J	6900000	J
Dibenzo(a,h)anthracene	(ug/l)	9800000	U	9900000	U	1700000	J	9900000	U
Fluoranthene	(ug/l)	33000000		38000000		30000000		44000000	
Fluorene	(ug/l)	17000000		27000000		23000000		24000000	
Indeno(1,2,3-cd)pyrene	(ug/l)	9800000	U	9900000	U	9600000	U	9900000	U
2-Methylnaphthalene	(ug/l)	24000000		40000000		30000000		27000000	
Naphthalene	(ug/l)	120000000		200000000		140000000		110000000	
Phenanthrene	(ug/l)	61000000		88000000		68000000		70000000	
Pyrene	(ug/l)	20000000		23000000		16000000		28000000	

U - Indicates the compound was analyzed for but not detected.

J - Indicates an estimated value between the Method Detection Limit and Reporting Limit.

TABLE 4-1
Field Screening Benzene and Naphthalene Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Site Area	Sample ID	Depth (ft-bgs)	Analysis Date	Benzene (ug/L)	Naphthalene (ug/L)
North Area	DPN-T0	10-12	12/1/99	<5	<5
North Area	DPN-T0	12-14	12/1/99	<5	<5
North Area	DPN-T0	14-16	12/1/99	<5	31
North Area	DPN-T0	16-18	12/2/99	5	263*
North Area	DPN-T0	18-20	12/2/99	<5	31
North Area	DPN-TN1	9-11	12/1/99	<5	<5
North Area	DPN-TN1	11-13	12/1/99	<5	<5
North Area	DPN-TN1	13-15	12/1/99	<5	<5
North Area	DPN-TN1	15-17	12/1/99	22	>566 sat
North Area	DPN-TN1	17-19	12/2/99	27	>587 sat
North Area	DPN-TN2	10.5-12.5	12/1/99	<5	<5
North Area	DPN-TN2	12.5-14.5	12/1/99	<5	<5
North Area	DPN-TN2	14.5-16.5	12/1/99	<5	260*
North Area	DPN-TN2	16.5-18.5	12/1/99	<5	364*
North Area	DPN-TN2	18.5-20.5	12/1/99	<5	269*
North Area	DPN-TN3	10-12	12/1/99	<5	<5
North Area	DPN-TN3	12-14	12/1/99	<5	<5
North Area	DPN-TN3	14-16	12/1/99	<5	<5
North Area	DPN-TN3	16-18	12/1/99	<5	5
North Area	DPN-TN3	18-20	12/1/99	<5	172*
North Area	DPN-TS1	9-11	12/2/99	<5	<5
North Area	DPN-TS1	11-13	12/2/99	<5	<5
North Area	DPN-TS1	13-15	12/2/99	5	291*
North Area	DPN-TS1	15-17	12/2/99	25	>697 sat
North Area	DPN-TS2	9-11	12/2/99	<5	<5
North Area	DPN-TS2	11-13	12/2/99	<5	<5
North Area	DPN-TS2	13-15	12/2/99	<5	21
North Area	DPN-TS2	15-17	12/2/99	11	263*
North Area	DPN-TS2	17-18	12/2/99	16	302*
North Area	DPN-TS3	10-12	12/3/99	<5	<5
North Area	DPN-TS3	12-14	12/4/99	<5	199*
North Area	DPN-TS3	14-16	12/3/99	<5	296*
North Area	DPN-TS3	16-18	12/2/99	<5	<5
North Area	DPN-TS3	18-20	12/2/99	<5	87

* - above calibration limits
sat - saturated detector

TABLE 4-1
Field Screening Benzene and Naphthalene Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Site Area	*Sample ID*	*Depth (ft-bgs)*	*Analysis Date*	*Benzene (ug/L)*	*Naphthalene (ug/L)*
North Area	DPN-L1	11-13	12/4/99	<5	<5
North Area	DPN-L1	13-15	12/4/99	<5	<5
North Area	DPN-L1	15-17	12/2/99	<5	242*
North Area	DPN-L1	17-19	12/2/99	8	298*
North Area	DPN-L2	12-14	12/4/99	<5	<5
North Area	DPN-L2	14-16	12/4/99	<5	255*
North Area	DPN-L2	16-18	12/2/99	13	>556 sat
North Area	DPN-L2	18-19	12/2/99	7	288*
South Area	DPS-T0	12-14	12/3/99	<5	<5
South Area	DPS-T0	14-16	12/3/99	<5	<5
South Area	DPS-T0	16-18	12/3/99	<5	<5
South Area	DPS-TN1	14-16	12/4/99	<5	<5
South Area	DPS-TN1	16-18	12/3/99	<5	<5
South Area	DPS-TN1	18-19	12/4/99	<5	<5
South Area	DPS-TN2	12-14	12/4/99	<5	<5
South Area	DPS-TN2	14-16	12/3/99	<5	<5
South Area	DPS-TN2	16-18	12/3/99	<5	18
South Area	DPS-TN3	12-14	12/4/99	<5	<5
South Area	DPS-TN3	14-16	12/7/99	<5	<5
South Area	DPS-TN3	16-18	12/7/99	<5	<5
South Area	DPS-TS1	16-18	12/4/99	<5	<5
South Area	DPS-TS1	18-20	12/3/99	<5	<5
South Area	DPS-TS1	20-21	12/3/99	<5	<5
South Area	DPS-TS2	15-17	12/4/99	<5	<5
South Area	DPS-TS2	17-19	12/4/99	<5	<5
South Area	DPS-TS2	19-20	12/3/99	<5	<5
South Area	DPS-TS3	16-18	12/3/99	<5	<5
South Area	DPS-TS3	18-20	12/3/99	<5	<5
South Area	DPS-L1	14-16	12/7/99	<5	>688 sat
South Area	DPS-L1	16-18	12/7/99	<5	>682 sat
South Area	DPS-L1	18-19	12/7/99	47	>685 sat

* - above calibration limits
sat - saturated detector

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	DPN-L1 12/07/1999 (17'-19')		DPN-L1(Dilution) 12/07/1999 (17'-19')		DPN-L2 12/06/1999 (16'-18')		DPN-L2 (Dilution) 12/06/1999 (16'-18')		DPN-L3 12/07/1999 (17'-19')		DPN-L3 (Dilution) 12/07/1999 (17'-19')	
BTEX (EPA 8021)													
Benzene	(ug/l)	10		NA		30		NA		20		NA	
Ethylbenzene	(ug/l)	12		NA		34		NA		30		NA	
Toluene	(ug/l)	16		NA		51		NA		52		NA	
m/p-xylene	(ug/l)	28.9		NA		84		NA		77		NA	
o-Xylene	(ug/l)	18		NA		48		NA		45		NA	
PAH (EPA 8270)													
Acenaphthene	(ug/l)	150		---		120		---		190		---	
Acenaphthylene	(ug/l)	10	U	---		10	U	---		10	U	---	
Anthracene	(ug/l)	4.3	J	---		7.5	J	---		8.4	J	---	
Benzo(a)anthracene	(ug/l)	10	U	---		10	U	---		10	U	---	
Benzo(a)pyrene	(ug/l)	1.8	J	---		1.9	J	---		2.4	J	---	
Benzo(b)fluoranthene	(ug/l)	1.6	J	---		1.6	J	---		1.8	J	---	
Benzo(g,h,i)perylene	(ug/l)	2.3	J	---		2.1	J	---		1.6		---	
Benzo(k)fluoranthene	(ug/l)	1.5	J	---		2.0	J	---		3.1	J	---	
Chrysene	(ug/l)	10	U	---		10	U	---		10	U	---	
Dibenzo(a,h)anthracene	(ug/l)	2.1	J	---		2.2	J	---		1.6	J	---	
Fluoranthene	(ug/l)	1	J	---		10	U	---		2.6	J	---	
Fluorene	(ug/l)	53		---		52		---		80		---	
Indeno(1,2,3-cd)pyrene	(ug/l)	2.2	J	---		2.1	J	---		1.3	J	---	
2-Methylnaphthalene	(ug/l)	210		---		220		---		260		---	
Naphthalene	(ug/l)	1500	E	5700	D	1600	E	6300	D	1300	E	6400	D
Phenanthrene	(ug/l)	29		---		20		---		51		---	
Pyrene	(ug/l)	10	U	---		10	U	---		10	U	---	

NA - Not Analyzed

U - Indicates the compound was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	DPN-L4 12/07/1999 (16'-18')		DPN-L4 (Dilution) 12/07/1999 (16'-18')		DPN-T0 12/07/1999 (16'-18')		DPN-T0 (Dilution) 12/07/1999 (16'-18')		DPN-TN1 12/07/1999 (17'-19')		DPN-TN1 (Dilution) 12/07/1999 (17'-19')	
BTEX (EPA 8021)													
Benzene	(ug/l)	14		NA		15		NA		24		NA	
Ethylbenzene	(ug/l)	26		NA		16		NA		30		NA	
Toluene	(ug/l)	28		NA		9.1		NA		25		NA	
m/p-xylene	(ug/l)	68		NA		33		NA		62		NA	
o-Xylene	(ug/l)	46		NA		21		NA		36		NA	
PAH (EPA 8270)													
Acenaphthene	(ug/l)	150		---		170		---		160		---	
Acenaphthylene	(ug/l)	10	U	---		10	U	---		10	U	---	
Anthracene	(ug/l)	5.6	J	---		3.7	J	---		4.3	J	---	
Benzo(a)anthracene	(ug/l)	10	U	---		10	U	---		10	U	---	
Benzo(a)pyrene	(ug/l)	2.9	J	---		2.2	J	---		2.6	J	---	
Benzo(b)fluoranthene	(ug/l)	2.0	J	---		1.9	J	---		2.4	J	---	
Benzo(g,h,i)perylene	(ug/l)	10	U	---		0.83	J	---		10	U	---	
Benzo(k)fluoranthene	(ug/l)	3.5	J	---		2.5	J	---		2.6	J	---	
Chrysene	(ug/l)	10	U	---		10	U	---		10	U	---	
Dibenzo(a,h)anthracene	(ug/l)	2.0	J	---		10	U	---		10	U	---	
Fluoranthene	(ug/l)	10	U	---		1.6	J	---		10	U	---	
Fluorene	(ug/l)	58		---		60		---		6.2		---	
Indeno(1,2,3-cd)pyrene	(ug/l)	2.3	J	---		0.79	J	---		0.82	J	---	
2-Methylnaphthalene	(ug/l)	250		---		200		---		200		---	
Naphthalene	(ug/l)	1800	E	6900	D	1300	E	4300D		1400	E	6100	D
Phenanthrene	(ug/l)	23		---		33		---		24		---	
Pyrene	(ug/l)	10	U	---		0.96	J	---		10	U	---	

NA - Not Analyzed

U - Indicates the compound was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	DPN-TN2 12/07/1999 (16.5'-18.5')		DPN-TN2 (Dilution) 12/07/1999 (16.5'-18.5')	DPN-TN3 12/07/1999 (18'-20')		DPN-TN3 (Dilution) 12/07/1999 (18'-20')	DPN-TS1 12/07/1999 (15'-17')		DPN-TS1(Dilution) 12/07/1999 (15'-17')
BTEX (EPA 8021)										
Benzene	(ug/l)	11		NA	2.0		NA	13		NA
Ethylbenzene	(ug/l)	22		NA	0.74	J	NA	20		NA
Toluene	(ug/l)	4.3		NA	0.89	J	NA	20		NA
m/p-xylene	(ug/l)	27		NA	3.1		NA	43		NA
o-Xylene	(ug/l)	18		NA	3.3		NA	28		NA
PAH (EPA 8270)										
Acenaphthene	(ug/l)	160		---	120		---	180		---
Acenaphthylene	(ug/l)	10	U	---	10	U	---	10	U	---
Anthracene	(ug/l)	3.6	J	---	1.4	J	---	10	U	---
Benzo(a)anthracene	(ug/l)	1.2	J	---	1.1	J	---	10	U	---
Benzo(a)pyrene	(ug/l)	2.9	J	---	4.2	J	---	2.9	J	---
Benzo(b)fluoranthene	(ug/l)	2.5	J	---	3.3	J	---	2.5	J	---
Benzo(g,h,i)perylene	(ug/l)	1.5	J	---	1.7	J	---	1.7	J	---
Benzo(k)fluoranthene	(ug/l)	3.2	J	---	5.2	J	---	2.6	J	---
Chrysene	(ug/l)	1.1	J	---	0.72	J	---	10	U	---
Dibenzo(a,h)anthracene	(ug/l)	10	U	---	1.4	J	---	1.5	J	---
Fluoranthene	(ug/l)	1.1	J	---	0.36	J	---	1.7	J	---
Fluorene	(ug/l)	77		---	65		---	65		---
Indeno(1,2,3-cd)pyrene	(ug/l)	1	J	---	1.6	J	---	1.4	J	---
2-Methylnaphthalene	(ug/l)	160		---	19		---	290		---
Naphthalene	(ug/l)	1300	E	3900D	480	E	800D	1800	E	7400D
Phenanthrene	(ug/l)	28		---	1.8	J	---	22		---
Pyrene	(ug/l)	1.0	J	---	10	U	---	10	U	---

NA - Not Analyzed

U - Indicates the compound was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	DPN-TS2 12/07/1999 (16'-18')		DPN-TS2 (Dilution) 12/07/1999 (16'-18')	DPN-TS3 12/07/1999 (14'-16')		DPN-TS3 (Dilution) 12/07/1999 (14'-16')	DPS-L1 12/8/99 (17'-19')		DPS-T0 12/08/1999 (16'-18')	
BTEX (EPA 8021)											
Benzene	(ug/l)	16		NA	7.6		NA	10		6.9	
Ethylbenzene	(ug/l)	26		NA	17		NA	26		1.5	
Toluene	(ug/l)	31		NA	9.0		NA	5.4		1.0	U
m/p-xylene	(ug/l)	57		NA	35		NA	60		1.7	
o-Xylene	(ug/l)	35		NA	24		NA	26		1.0	U
PAH (EPA 8270)											
Acenaphthene	(ug/l)	160		---	160		---	320	J	49	
Acenaphthylene	(ug/l)	10	U	---	10	U	---	1000	U	10	U
Anthracene	(ug/l)	4.6	J	---	5.2	J	---	1000	U	0.92	J
Benzo(a)anthracene	(ug/l)	1.0	U	---	10	U	---	1000	U	10	U
Benzo(a)pyrene	(ug/l)	4.1	J	---	2.7	J	---	1000	U	10	U
Benzo(b)fluoranthene	(ug/l)	3.0	J	---	2.1	J	---	1000	U	10	U
Benzo(g,h,i)perylene	(ug/l)	2.1	J	---	1.4	J	---	1000	U	10	U
Benzo(k)fluoranthene	(ug/l)	4.8	J	---	3.5	J	---	1000	U	10	U
Chrysene	(ug/l)	10	U	---	10	U	---	1000	U	10	U
Dibenzo(a,h)anthracene	(ug/l)	1.6	J	---	1.4	J	---	1000	U	10	U
Fluoranthene	(ug/l)	1.4	J	---	2.4	J	---	1000	U	0.93	J
Fluorene	(ug/l)	69		---	62		---	100	J	14	
Indeno(1,2,3-cd)pyrene	(ug/l)	1.7	J	---	1.4	J	---	1000	U	10	U
2-Methylnaphthalene	(ug/l)	140		---	180		---	270	J	20	
Naphthalene	(ug/l)	1100	E	4900D	1300	E	4600D	4000		270	
Phenanthrene	(ug/l)	10		---	15		---	46	J	4.2	J
Pyrene	(ug/l)	10	U	---	1.4	J	---	1000	U	1.4	J

NA - Not Analyzed

U - Indicates the compound was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	DPS-TN1 12/08/1999 (17'-19')		DPS-TN1(Dilution) 12/08/1999 (17'-19')	DPS-TN2 12/08/1999 (16'-18')		DPS-TN3 12/08/1999 (14'-16')		DPS-TS1 12/08/1999 (19'-21')		DPS-TS1 (Dilution) 12/08/1999 (19'-21')	
BTEX (EPA 8021)												
Benzene	(ug/l)	210	E	290D	1.0	U	1.0	U	5.2		NA	
Ethylbenzene	(ug/l)	64		---	1.0	U	1.0	U	8.6		NA	
Toluene	(ug/l)	2.0	U	---	1.0	U	1.0	U	1.0	U	NA	
m/p-xylene	(ug/l)	61		---	1.0	U	1.0	U	6.6		NA	
o-Xylene	(ug/l)	2.9		---	1.0	U	1.0	U	1.7		NA	
PAH (EPA 8270)												
Acenaphthene	(ug/l)	5000	U	NA	62		39		57	J	---	
Acenaphthylene	(ug/l)	5000	U	NA	10	U	10	U	10	U	---	
Anthracene	(ug/l)	5000	U	NA	1.6	J	1.6	J	1.3	J	---	
Benzo(a)anthracene	(ug/l)	5000	U	NA	10	U	0.35	J	10	U	---	
Benzo(a)pyrene	(ug/l)	5000	U	NA	10	U	10	U	10	U	---	
Benzo(b)fluoranthene	(ug/l)	5000	U	NA	10	U	10	U	10	U	---	
Benzo(g,h,i)perylene	(ug/l)	5000	U	NA	10	U	1	J	10	U	---	
Benzo(k)fluoranthene	(ug/l)	5000	U	NA	10	U	10	U	10	U	---	
Chrysene	(ug/l)	5000	U	NA	10	U	10	U	10	U	---	
Dibenzo(a,h)anthracene	(ug/l)	5000	U	NA	10	U	10	U	10	U	---	
Fluoranthene	(ug/l)	5000	U	NA	1.9	J	1.9	J	0.65	J	---	
Fluorene	(ug/l)	5000	U	NA	42		28		23		---	
Indeno(1,2,3-cd)pyrene	(ug/l)	5000	U	NA	10	U	0.71	J	10	U	---	
2-Methylnaphthalene	(ug/l)	690	J	NA	3	J	2.4	J	74		---	
Naphthalene	(ug/l)	14000		NA	31		69		800	E	1000	D
Phenanthrene	(ug/l)	5000	U	NA	11		16		9.2	J	---	
Pyrene	(ug/l)	5000	U	NA	1.5	J	1.8	J	0.78	J	---	

NA - Not Analyzed

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J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	DPS-TS2 12/08/1999 (18'-20')		DPS-TS3 12/08/1999 (18'-20')		MW-01 4/11/00 (9'-24')		MW-03 12/13/1999 (14.3'-24.3')		MW-07 12/14/99 (15'-25')		MW-08 12/14/1999 (11.6'-21.6')	
BTEX (EPA 8021)													
Benzene	(ug/l)	1.0	U	1.0	U	4.1		1.0	U	1.0	U	1.0	U
Ethylbenzene	(ug/l)	1.0	U	1.0	U	8.0		1.0	U	1.0	U	1.0	U
Toluene	(ug/l)	1.0	U	1.0	U	5.7		1.0	U	1.0	U	1.0	U
m/p-xylene	(ug/l)	1.0	U	1.0	U	14		1.0	U	1.0	U	1.0	U
o-Xylene	(ug/l)	1.0	U	1.0	U	6.9		1.0	U	1.0	U	1.0	U
PAH (EPA 8270)													
Acenaphthene	(ug/l)	1.8	J	34		14		1.6	J	10	U	0.31	J
Acenaphthylene	(ug/l)	10	U	10	U	0.66	JB	10	U	10	U	10	U
Anthracene	(ug/l)	10	U	0.75	J	0.76	J	1.9	J	0.34	J	10	U
Benzo(a)anthracene	(ug/l)	10	U	10	U	10	U	0.34	J	10	U	10	U
Benzo(a)pyrene	(ug/l)	0.74	J	0.71	J	0.88	JB	1.4	J	1.2	J	10	U
Benzo(b)fluoranthene	(ug/l)	0.68	J	10	U	0.71	JB	0.91	J	0.89	J	10	U
Benzo(g,h,i)perylene	(ug/l)	0.99	J	1.1	J	1.3	JB	2.5	J	4.6	J	3.3	J
Benzo(k)fluoranthene	(ug/l)	0.40	J	10	U	10	U	1.0	J	0.78	J	10	U
Chrysene	(ug/l)	10	U	10	U	10	U	10	U	10	U	10	U
Dibenzo(a,h)anthracene	(ug/l)	0.58	J	1.0	J	10	U	2.2	J	4.2	J	2.9	J
Fluoranthene	(ug/l)	10	U	1.2	J	0.58	J	10	U	10	U	10	U
Fluorene	(ug/l)	10	U	15		4.7	J	1.0	J	10	U	10	U
Indeno(1,2,3-cd)pyrene	(ug/l)	0.71	J	1.0	J	1.2	JB	2.7	J	4.1	J	2.9	J
2-Methylnaphthalene	(ug/l)	10	U	5.2	J	15		1.4	J	10	U	0.51	J
Naphthalene	(ug/l)	10	U	190		340		20		0.72	J	7.3	J
Phenanthrene	(ug/l)	10	U	3.0	J	2.8	JB	1.9	J	10	U	0.61	J
Pyrene	(ug/l)	1.8	J	1.3	J	10	U	10	U	10	U	10	U

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E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	MW-24 12/14/1999 (10.5'-20.5')		MW-24 (Dilution) 12/14/1999 (10.5'-20.5')	MW-25 4/17/00 (7.75'-17.75')		MW-25 7/5/00 (7.75'-17.75')		MW-26 4/17/00 (8.25'-18.25')		MW-26 (Dilution) 4/17/00 (8.25'-18.25')	
BTEX (EPA 8021)												
Benzene	(ug/l)	1.8		NA	2.6		1.0	U	500	U	NA	
Ethylbenzene	(ug/l)	2.4		NA	0.14	J	1.0	U	500	U	NA	
Toluene	(ug/l)	1.0	U	NA	1.1		1.0	U	500	U	NA	
m/p-xylene	(ug/l)	4.6		NA	0.33	J	1.0	U	500	U	NA	
o-Xylene	(ug/l)	2.1		NA	0.16	JB	1.0	U	500	U	NA	
PAH (EPA 8270)												
Acenaphthene	(ug/l)	28		---	0.62	J	2.4	J	320		---	
Acenaphthylene	(ug/l)	0.7	J	---	10	U	10	U	1.9	J	---	
Anthracene	(ug/l)	0.82	J	---	10	U	10	U	28		---	
Benzo(a)anthracene	(ug/l)	10	U	---	10	U	10	U	1.9	J	---	
Benzo(a)pyrene	(ug/l)	10	U	---	10	U	10	U	0.66	J	---	
Benzo(b)fluoranthene	(ug/l)	10	U	---	10	U	10	U	0.73	J	---	
Benzo(g,h,i)perylene	(ug/l)	2.8	J	---	10	U	10	U	10	U	---	
Benzo(k)fluoranthene	(ug/l)	10	U	---	10	U	10	U	10	U	---	
Chrysene	(ug/l)	10	U	---	10	U	10	U	2.3	J	---	
Dibenzo(a,h)anthracene	(ug/l)	2.4	J	---	10	U	10	U	10	U	---	
Fluoranthene	(ug/l)	1.3	J	---	10	U	10	U	42		---	
Fluorene	(ug/l)	12		---	10	U	10	U	220		---	
Indeno(1,2,3-cd)pyrene	(ug/l)	2.5	J	---	10	U	10	U	10	U	---	
2-Methylnaphthalene	(ug/l)	26		---	10	U	10	U	250		---	
Naphthalene	(ug/l)	400	E	630D	10	U	10	U	2100	E	4300	D
Phenanthrene	(ug/l)	3.4	J	---	10	U	10	U	330		---	
Pyrene	(ug/l)	0.72	J	---	10	U	10	U	26		---	

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E - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	MW-26 7/5/00 (8.25'-18.25')		MW-26 (Dilution) 7/5/00 (8.25'-18.25')		OW-02 12/14/1999 (15'-20')		OW-02 (Dilution) 12/14/1999 (15'-20')		OW-07 12/13/33 (11.1'-16.1')		OW-10 12/13/1999 (18'-23')	
BTEX (EPA 8021)													
Benzene	(ug/l)	1.0	U	NA		16		NA		1.0	U	650	
Ethylbenzene	(ug/l)	4.4		NA		35		NA		1.0	U	260	
Toluene	(ug/l)	0.45	J	NA		49		NA		1.0	U	660	
m/p-xylene	(ug/l)	6.6		NA		82		NA		1.0	U	650	
o-Xylene	(ug/l)	1.4		NA		45		NA		1.0	U	300	
PAH (EPA 8270)													
Acenaphthene	(ug/l)	250		---		280		---		0.77	J	700	
Acenaphthylene	(ug/l)	1.2	J	---		13		---		10	U	32	J
Anthracene	(ug/l)	22		---		32		---		10	U	130	
Benzo(a)anthracene	(ug/l)	1.3	J	---		6.8	J	---		10	U	44	J
Benzo(a)pyrene	(ug/l)	10	U	---		4.9	J	---		10	U	20	J
Benzo(b)fluoranthene	(ug/l)	10	U	---		5	J	---		10	U	20	J
Benzo(g,h,i)perylene	(ug/l)	10	U	---		5.6	J	---		1.2	J	23	J
Benzo(k)fluoranthene	(ug/l)	10	U	---		4.1	J	---		10	U	15	J
Chrysene	(ug/l)	1.2	J	---		6.4	J	---		10	U	48	J
Dibenzo(a,h)anthracene	(ug/l)	10	U	---		4.9	J	---		10	U	13	J
Fluoranthene	(ug/l)	29		---		56		---		10	U	320	
Fluorene	(ug/l)	150		---		130		---		10	U	470	
Indeno(1,2,3-cd)pyrene	(ug/l)	10	U	---		5.5	J	---		0.96	J	16	J
2-Methylnaphthalene	(ug/l)	110		---		210		---		10	U	1200	
Naphthalene	(ug/l)	890	E	1800	D	760	E	11000D		6.9	J	26000	E
Phenanthrene	(ug/l)	270		---		190		---		0.66	J	900	
Pyrene	(ug/l)	15		---		35		---		10	U	190	

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D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	OW-10 (Dilution) 12/13/1999 (18'-23')		PSG-1 12/09/1999 (17'-19')		PSG-2 12/09/1999 (17'-19')		PSG-2 (Dilution) 12/09/1999 (17'-19')	PSG-3 12/09/1999 (18'-20')		PSG-4 12/09/1999 (17'-19')	
BTEX (EPA 8021)												
Benzene	(ug/l)	NA		1.0	U	7.6		---	1.0	U	1.0	U
Ethylbenzene	(ug/l)	NA		1.0	U	53		---	1.0	U	1.0	U
Toluene	(ug/l)	NA		1.0	U	24		---	1.0	U	1.0	U
m/p-xylene	(ug/l)	NA		1.0	U	130	E	140D	1.0	U	1.0	U
o-Xylene	(ug/l)	NA		1.0	U	54		---	1.0	U	1.0	U
PAH (EPA 8270)												
Acenaphthene	(ug/l)	---		23		790	J	NA	1.4	J	10	U
Acenaphthylene	(ug/l)	---		10	U	5000	U	NA	10	U	10	U
Anthracene	(ug/l)	---		0.37	J	5000	U	NA	0.51	J	10	U
Benzo(a)anthracene	(ug/l)	---		10	U	5000	U	NA	10	U	10	U
Benzo(a)pyrene	(ug/l)	---		0.64	J	5000	U	NA	10	U	10	U
Benzo(b)fluoranthene	(ug/l)	---		0.54	J	5000	U	NA	10	U	10	U
Benzo(g,h,i)perylene	(ug/l)	---		0.74	J	5000	U	NA	0.67	J	10	U
Benzo(k)fluoranthene	(ug/l)	---		10	U	5000	U	NA	10	U	10	U
Chrysene	(ug/l)	---		10	U	5000	U	NA	10	U	10	U
Dibenzo(a,h)anthracene	(ug/l)	---		10	U	5000	U	NA	10	U	10	U
Fluoranthene	(ug/l)	---		2.5	J	5000	U	NA	10	U	10	U
Fluorene	(ug/l)	---		8.6	J	420	J	NA	0.88	J	10	U
Indeno(1,2,3-cd)pyrene	(ug/l)	---		10	U	5000	U	NA	10	U	10	U
2-Methylnaphthalene	(ug/l)	---		10	U	1300	J	NA	1.2	J	10	U
Naphthalene	(ug/l)	24000D		10	U	19000		NA	8.1	J	2.5	J
Phenanthrene	(ug/l)	---		1.5	J	660	J	NA	1.3	J	10	U
Pyrene	(ug/l)	---		1.6	J	5000	U	NA	10	U	10	U

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TABLE 4-2
Groundwater BTEX and PAH Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

CONSTITUENT	UNITS	PSG-5 12/09/1999 (17'-19')		PSG-6 12/09/1999 (19'-21')	
BTEX (EPA 8021)					
Benzene	(ug/l)	1.0	U	1.0	U
Ethylbenzene	(ug/l)	1.0	U	1.0	U
Toluene	(ug/l)	1.0	U	1.0	U
m/p-xylene	(ug/l)	1.0	U	1.0	U
o-Xylene	(ug/l)	1.0	U	1.0	U
PAH (EPA 8270)					
Acenaphthene	(ug/l)	0.59	J	10	U
Acenaphthylene	(ug/l)	10	U	10	U
Anthracene	(ug/l)	0.53	J	10	U
Benzo(a)anthracene	(ug/l)	10	U	10	U
Benzo(a)pyrene	(ug/l)	10	U	10	U
Benzo(b)fluoranthene	(ug/l)	10	U	10	U
Benzo(g,h,i)perylene	(ug/l)	10	U	10	U
Benzo(k)fluoranthene	(ug/l)	10	U	10	U
Chrysene	(ug/l)	10	U	10	U
Dibenzo(a,h)anthracene	(ug/l)	10	U	10	U
Fluoranthene	(ug/l)	0.37	J	10	U
Fluorene	(ug/l)	10	U	10	U
Indeno(1,2,3-cd)pyrene	(ug/l)	10	U	10	U
2-Methylnaphthalene	(ug/l)	10	U	0.6	J
Naphthalene	(ug/l)	1.1	J	2.1	J
Phenanthrene	(ug/l)	0.51	J	0.46	J
Pyrene	(ug/l)	10	U	10	U

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D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-3
Field Parameter Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Sample Location	Temperature (°C)	pH (S.U.)	Specific Conductivity (mS/m)	ORP (mV)	Turbidity (NTU)	D.O. Probe (mg/L)	D.O. Ampoule (mg/L)
MW-01	21.7	6.7	0.1	-84	250	6.55	0.8
MW-03	22.98	6.4	110	25	2	0.4	0.2
MW-07	25.0	6.79	55.0	-80	18	0.45	0.4
MW-08	28.0	6.70	78.9	70	38	0.52	0.35
MW-24	25.0	6.50	75.3	-43	63	2.91	3.0
MW-25	24.1	6.6	69	12	41	1.53	1.0
MW-26	23.8	6.8	0.11	105	-10	4.37	4.0
OW-02	24.08	6.3	85	-88	-10*	0.4	0.6
OW-07	26.57	6.9	150	134	430	3.3	1.5
OW-10	24.40	6.7	75	-77	590	2.1	2.0
DPN-T0	24.33	6.7	87	-97	>990	2.3	1.5
DPN-L1	22.06	6.8	81	-153	280	1.3	1.5
DPN-L2	22.07	7.0	84	-132	130	3.8	4.0
DPN-L3	22.31	6.5	80	-83	690	2.9	1.0
DPN-L4	22.50	6.6	79	-102	>990	1.0	1.5
DPN-TN1	24.25	6.8	86	-151	>990	1.6	2.5
DPN-TN2	18.38	6.7	84	-103	160	2.6	1.0
DPN-TN3	23.09	7.2	85	-98	250	2.4	2.0
DPN-TS1	24.17	6.4	81	-91	700	1.5	1.5
DPN-TS2	23.89	6.6	94	-82	>990	2.3	1.5
DNP-TS3	23.18	6.5	88	-66	590	2.0	2.0
DPS-T0	23.64	7.0	49	-88	220	3.7	2.0
DPS-L1	23.22	7.0	72	-126	160	2.7	1.5
DPS-TN1	23.56	7.0	67	-74	680	3.0	3.0
DPS-TN2	22.86	7.1	49	-117	320	3.5	3.0
DPS-TN3	23.97	6.9	44	-110	>990	0.5	---
DPS-TS1	25.70	6.93	69.2	-121	310	3.28	4.5
DPS-TS2	24.8	5.84	75.9	5	>990	3.03	5.5
DPS-TS3	23.83	6.8	80	-117	690	2.6	4.0
PSG-1	24.49	7.0	58	-66	12	4.2	2.5
PSG-2	22.84	6.6	89	-70	46	2.2	1.5
PSG-3	24.90	7.1	42	-166	>990	1.5	2.5
PSG-4	25.41	6.9	64	-96	130	3.0	4.0
PSG-5	23.70	7.1	110	-97	250	2.5	2.0
PSG-6	23.30	6.8	100	-66	100	3.4	4.0

* - turbidity less than standard

TABLE 4-4
Groundwater Intrinsic Biodegradation Indicator Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

PARAMETERS	UNITS	DPN-L1 12/06/1999 (17'-19')		DPN-L1 (Dilution) 12/06/1999 (17'-19')		DPN-L2 12/06/1999 (16'-18')		DPN-L2 (Dilution) 12/06/1999 (16'-18')		DPS-L1 12/08/1999 (17'-19')		DPS-T0 12/08/99 (16'-18')	
Alkalinity (as CaCO3)	(mg/l)	360		NA		340		NA		320		220	
Ammonia (as N)	(mg/l)	0.17		NA		0.39		NA		0.071		0.03	U
Biochemical Oxygen Demand	(mg/l)	21		NA		22		NA		8.9		12	
Carbon Dioxide	(mg/l)	39	E	43	D	40	E	38	D	8.2		9.7	
Chemical Oxygen Demand	(mg/l)	83		NA		110		NA		140		34	
Chloride	(mg/l)	15		NA		14		NA		16		4.3	
Iron (Dissolved)	(mg/l)	8.7		NA		22		NA		2.1		0.84	
Manganese (Dissolved)	(mg/l)	6		NA		9.1		NA		1.3		0.51	
Methane	(mg/l)	1.2		1.6	D	1.1		0.99	D	0.035	J	12	J
Nitrate (as N)	(mg/l)	0.05	U	NA		0.05	U	NA		0.37		0.05	U
Orthophosphate	(mg/l)	0.093		NA		0.1		NA		0.14		0.12	
Sulfate as (SO4)	(mg/l)	5.0	U	NA		5.0	U	NA		5.0	U	5.0	U
Total Organic Carbon	(mg/l)	39		NA		48		NA		11		4.2	

NA - Not Analyzed

U - Indicates the parameter was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies parameters whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-4
Groundwater Intrinsic Biodegradation Indicator Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

PARAMETERS	UNITS	MW-01 04/11/00 (9'-24')		MW-01(Dilution) 04/11/00 (9'-24')		MW-03 12/13/99 (14.3'-24.3')		MW-07 12/14/1999 (15'-25')		MW-08 12/14/1999 (11.6'-21.6')		MW-24 12/14/1999 (10.5'-20.5')	
Alkalinity (as CaCO3)	(mg/l)	460		NA		470		250		390		360	
Ammonia (as N)	(mg/l)	0.03	U	NA		0.05		0.11		0.031		0.067	
Biochemical Oxygen Demand	(mg/l)	2.0	U	NA		8.1		2.0	U	2.0	U	2.0	U
Carbon Dioxide	(mg/l)	61	EB	59	DB	12		9.7		5.4		18	
Chemical Oxygen Demand	(mg/l)	20	U	NA		20	U	20	U	20	U	20	U
Chloride	(mg/l)	68		NA		29		5.5		8.5		11	
Iron (Dissolved)	(mg/l)	2.8		NA		0.013	B	0.7		0.033	B	0.77	
Manganese (Dissolved)	(mg/l)	0.48		NA		0.3		3.2		0.56		1.1	
Methane	(mg/l)	1.1		NA		0.047	U	0.047	U	0.047	U	0.32	
Nitrate (as N)	(mg/l)	0.05	U	NA		0.05	U	0.05	U	0.05	U	0.34	
Orthophosphate	(mg/l)	0.23		NA		0.16		0.1		0.14		0.18	
Sulfate as (SO4)	(mg/l)	5.0	U	NA		36		61		15		17	
Total Organic Carbon	(mg/l)	6.0		NA		5.6		8.3		2.8		4.5	

NA - Not Analyzed

U - Indicates the parameter was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies parameters whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-4
Groundwater Intrinsic Biodegradation Indicator Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

PARAMETERS	UNITS	MW-25 04/11/00 (7.75'-17.75')		MW-26 04/11/00 (8.25'-18.25')		OW-02 12/14/1999 (15'-20')		OW-02 (Dilution) 12/14/1999 (15'-20')		OW-07 12/13/1999 (11.10'-16.10')		OW-10 12/13/1999 (18'-23')	
Alkalinity (as CaCO3)	(mg/l)	300		450		410		NA		230		410	
Ammonia (as N)	(mg/l)	0.03	U	0.03	U	0.19		NA		0.03	U	0.04	
Biochemical Oxygen Demand	(mg/l)	2.0	U	2.8		32		NA		8.6		45	
Carbon Dioxide	(mg/l)	40		34		100	E	110000	D	12		17	
Chemical Oxygen Demand	(mg/l)	20	U	20	U	120		NA		20	U	160	
Chloride	(mg/l)	56		37		14		NA		130		49	
Iron (Dissolved)	(mg/l)	0.27		1.5		5.0		NA		0.05	U	1.3	
Manganese (Dissolved)	(mg/l)	0.39		0.58		4.5		NA		0.022		1.1	
Methane	(mg/l)	0.02		0.022		14		NA		47	U	0.17	
Nitrate (as N)	(mg/l)	0.13		0.05	U	0.05	U	NA		14		0.05	U
Orthophosphate	(mg/l)	0.071		0.086		0.17		NA		0.074		0.18	
Sulfate as (SO4)	(mg/l)	72		38		24		NA		140		5.0	U
Total Organic Carbon	(mg/l)	2.8		5.8		49		NA		2.3		42	

NA - Not Analyzed

U - Indicates the parameter was analyzed for but not detected.

J - Indicates an estimated value between the MDL and Reporting Limit.

E - Identifies parameters whose concentrations exceed the upper level of the calibration range of the instrument.

D - Indicates the sample was reanalyzed at a higher dilution.

TABLE 4-5
Evaluation of Natural Attenuation
Electron Acceptors and Inorganic Metabolic By-Products in Groundwater
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Parameter	*Expected Behavior if Natural Attenuation is Occurring (see Section 2.0)*	*Observed Behavior*	*Implications with Regard to GFTER Conclusions*
Dissolved Oxygen (DO)	Highest concentrations in the absence of COIs, depleted in the presence of COIs and nondetectable in the COI source area.	DO measurements (Table 4-3) were all generally higher than expected, with only 4 of the 32 field measurements (by each of the two methods) showing concentrations below 1 mg/L. Field measurements are suspect and may be affected by sample contact with atmospheric oxygen.	Inconclusive
Nitrate	Qualitatively similar to dissolved oxygen	**Northern Area** trends (Figure 4-7) were consistent with expected behavior, except that nitrate was not detected in one of the background wells (MW-03). This result is likely due to the presence of COIs in groundwater at MW-03. Nitrate was also not detected in most of the **Southern Area** (Figure 4-8) samples which is consistent with expected behavior, since COIs were present in all samples.	Supports the GFTER conclusions
Manganese	Lowest concentrations in background, highest in the source area and gradual decrease downgradient.	**Northern Area** trends (Figure 4-7) are consistent with expected behavior. **In the Southern Area** (Figure 4-8), data are also consistent with expected behavior except that the highest manganese concentration was detected in the background well (MW-07). Elevated manganese at this location is likely due to the presence (and biodegradation) of COIs (see Figure 4-3).	Supports the GFTER conclusions
Iron	Qualitatively similar to manganese	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Figures 4-7 and 4-8, respectively).	Supports the GFTER conclusions
Sulfate	Qualitatively similar to dissolved oxygen	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Figures 4-7 and 4-8, respectively).	Supports the GFTER conclusions
Methane	Qualitatively similar to manganese	**Northern Area** trends (Figure 4-7) are consistent with expected behavior. Minimal methane was detected in **Southern Area** samples (Figure 4-8) indicating that groundwater in this area is more oxidizing.	Supports the GFTER conclusions

TABLE 4-6
Evaluation of Natural Attenuation
General Groundwater Geochemistry Potentially Related to Biodegradation
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Parameter	*Expected Behavior if Natural Attenuation is Occurring*	*Observed Behavior*	*Implication with Regard to GFTER Conclusions*
Oxidation / Reduction Potential (ORP)	Highest readings in background, lowest in the source area, and gradual increase downgradient of the source area.	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Figures 4-9 and 4-10, respectively).	Supports the GFTER conclusions
Carbon dioxide	Lowest concentration in background, highest in the source area, gradual decrease downgradient of the source area.	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Figures 4-9 and 4-10, respectively).	Supports the GFTER conclusions
pH	Highest reading in background, lowest in the source area, and gradual increase downgradient of the source area; strong trends not expected.	Systematic trends are not apparent.	Inconclusive
Alkalinity	Lowest concentrations in background, highest in the source area, gradual decrease downgradient of the source area; strong trends not expected.	Systematic trends are not apparent.	Inconclusive
Ammonia	Lowest concentrations in background, highest in the source area, and gradual decrease downgradient of the source area.	Systematic trends are not apparent.	Inconclusive
Ortho-phosphate	Highest concentration in background, lowest in the source area, and gradual increase downgradient of the source area.	Systematic trends are not apparent.	Inconclusive
Conductivity	No expectation; general background information	Not applicable	Not applicable
Chloride	No expectation; general background information	Not applicable	Not applicable

TABLE 4-7
Evaluation of Surrogate Parameters to Test for the Presence of COIs and Organic By-Products in Groundwater
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Parameter	*Expected Behavior if Natural Attenuation is Occurring*	*Observed Behavior*	*Implication with Regard to GFTER Conclusions*
Total Organic Carbon (TOC)	Lowest concentration in background, highest in the source area, and gradual decrease downgradient of the source area.	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Figures 4-9 and 4-10, respectively). Further indicates that substantial quantities of organic metabolic by-products are not accumulating in groundwater as a result of COI biodegradation.	Supports the GFTER conclusions
Chemical Oxygen Demand (COD)	Behavior is to expected to be similar to TOC.	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Table 4-4). Further indicates that substantial quantities of organic metabolic by-products are not accumulating in groundwater as a result of COI biodegradation.	Supports the GFTER conclusions
Biochemical Oxygen Demand (BOD)	Behavior is to expected to be similar to TOC.	**Northern Area** and **Southern Area** trends are consistent with expected behavior (Figures 4-9 and 4-10, respectively). Further indicates that substantial quantities of organic metabolic by-products are not accumulating in groundwater as a result of COI biodegradation.	Supports the GFTER conclusions

TABLE 4-8
Evaluation of Natural Attenuation
Indicators of Microbial Characteristics in Soils
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Parameter	*Expected Behavior if Natural Attenuation is Occurring*	*Observed Behavior*	*Implication with Regard to GFTER Conclusions*
PLFA - Biomass content	Lowest concentrations in background, highest within the plume	Some consistency with expected trends was observed: the lowest biomass was observed for MW-07 which also contained the lowest concentrations of COIs in groundwater.	Supports the GFTER conclusions, although supportive trends are not strong.
PLFA - Community diversity	Biodegradation process may enhance diversity of a microbial community under some conditions	Some consistency with expected trends was observed; the sample from MW-07 appeared to have a relatively unique community structure, and also contained the lowest concentrations of COIs in groundwater.	Supports the GFTER conclusions, although supportive trends are not strong.
PLFA - Principal components analysis	Separation expected between background and plume samples	Consistent with expected behavior: the sample from MW-07 plotted separately from the other samples. Groundwater at MW-07 contained the lowest concentrations of COIs.	Supports the GFTER conclusions
PLFA - Growth phase	Samples from within the plume are expected to show that microbes are growing more rapidly than those in background samples.	Systematic trends are not apparent.	Inconclusive
PLFA - Membrane permeability	Samples from within the plume are expected to show that microbial membranes are less permeable than those in background samples, due to adaptation to plume conditions.	Some consistency with expected trends was observed: samples with the highest concentrations of COIs (DPN-L1, DPN-L2, DPS-L1) tended to show a decrease in membrane permeability.	Supports the GFTER conclusions, although supportive trends are not strong.

TABLE 4-8
Evaluation of Natural Attenuation
Indicators of Microbial Characteristics in Soils
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Parameter	*Expected Behavior if Natural Attenuation is Occurring*	*Observed Behavior*	*Implication with Regard to GFTER Conclusions*
Naphthalene degrading gene	Lowest concentration in background, highest in the source area, and gradual decrease downgradient of the source area.	Analysis could not be conducted due to the presence of analytical interferences (see Appendix E)	Not applicable

TABLE 4-9
Data Record for PAHs and BTEX Detected at MW-01
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Detected Compound	*GFTER Verification Concentration (ug/L)*	*RI Concentration Round 1 (ug/L)*	*RI Concentration Round 2 (ug/L)*	*Pre-Design Sampling (ug/L)*
Naphthalene	340	3100	***3400***	1600
Acenaphthene	14	110J	***170***	65
Phenanthrene	2.8JB	28J	***50***	26
Indeno(1,2,3-cd)pyrene	1.2JB	<400	<50	<10
Dibenzo(a,h) anthracene	<10	<400	<50	<10
Benzo(g,h,i)perylene	1.3JB	<400	<50	<10
2-Methylnaphthalene	15	110J	***170***	---
Fluorene	4.7J	47J	***64***	43
Anthracene	0.76J	<400	<50	<1
Fluoranthene	0.58J	<400	<50	<1
Pyrene	<10	<400	<50	<1

Note: (J) = Estimated concentration between method detection limit and reporting limit.
(B) = Constituent detected in method blank.
- all concentration values in units of ug/L
- bold and italicized numbers represent the maximum concentrations measured during historical sampling

TABLE 4-10
Data Record for PAHs and BTEX Detected at MW-08
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Detected Compound	*GFTER Verification Concentration (ug/L)*	*RI Concentration Round 1 (ug/L)*	*RI Concentration Round 2 (ug/L)*
Naphthalene	7.3J	***24***	2J
Acenaphthene	0.31J	***22***	12J
Phenanthrene	0.61J	***57***	25
Indeno(1,2,3-cd)pyrene	2.9J	<10	<20
Dibenzo(a,h) anthracene	2.9J	<10	<20
Benzo(g,h,i)perylene	3.3J	<10	<20
2-Methylnaphthalene	0.51J	***7***	--
Fluorene	<10	***20***	4J
Anthracene	<10	7J	7J
Fluoranthene	<10	***19***	15J
Pyrene	<10	13	***15J***

Note: (J) = Estimated concentration between method detection limit and reporting limit.
- all concentration values in units of ug/L
- bold and italicized numbers represent the maximum concentrations measured during historical sampling

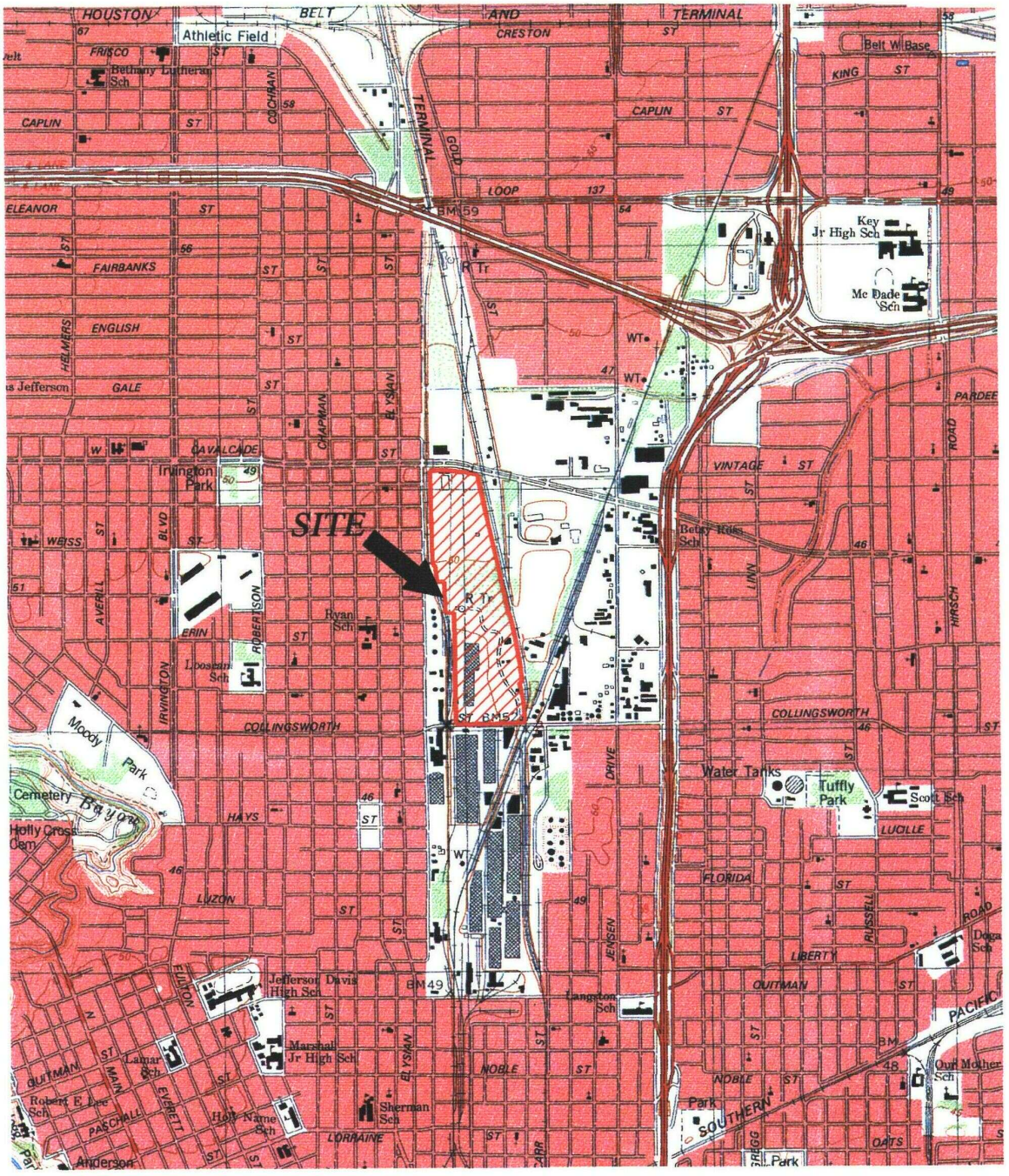
TABLE 4-11
Comparison of COI Concentrations with GFTER Model Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston Texas

Sampling Point with Largest Concentration at Given Distance	*Distance from Source[1] (ft)*	*Benzene (ug/L)*		*Naphthalene (ug/L)*	
		Measured[2]	*GFTER[3]*	*Measured[2]*	*GFTER[3]*
Northern Area					
OW-02	0	16	3799	11000	12730
DPN-L2	85	30	932	6300	6917
DPN-L3	185	20	229	6400	3759
MW-01	250	4.1	56	340	2043
DPN-TS1	555	13	~0[5]	7400	237
MW-24	420	1.8	3	630	603
MW-25	750	2.6/<1.0	~0[5]	<10	58
Southern Area					
OW-10	0	650	3799	24000	12730
DPS-L1	50	10	770	4000	1110
DPS-T0	135	6.9	32	270	8
MW-08	320	<1	~0[5]	7.3J[4]	~0[5]

Notes:
1. Source assumptions/location is identical to that used in the GFTER. Distances measured from assumed source to actual monitored location. Corresponding distances for the modeled GFTER concentrations approximate actual measured distances to monitoring locations.
2. Based on analysis of samples collected for the current evaluation
3. Based on model runs from the GFTER; model output is provided in Appendix H
4. (J) = Estimated concentration between method detection limit and reporting limit.
5. Simulated value approaches zero.

TABLE 5-1
Summary of Decision Rule Results
Verification of Groundwater Fate and Transport Evaluation
South Cavalcade Superfund Site
Houston, Texas

Parameter	*Comparison to Criteria*	*GFTER Implications*
Sampling to Verify Modeling Assumptions		
Hydraulic Gradient	Below Range (North); within Range (South)	GFTER is Protective (North); Supports GFTER (South)
Groundwater Flow Direction	Within Historic Range of Groundwater Flow Directions	Supports GFTER
Aquifer Organic Carbon Content	GFTER Range Overlaps 95% Confidence Interval	F_{oc} Used in GFTER Model Is Appropriate and Representative
Aquifer Porosity	GFTER Value > 95% Confidence Interval	Porosity Is Less Than Presumed in GFTER
Aquifer Bulk Density	GFTER <95% Confidence Interval	GFTER Is Protective
Product Specific Gravity	95% Confidence Interval within GFTER Range	Supports GFTER
Product Viscosity	95% Confidence Interval within GFTER Range	Supports GFTER
Product Interfacial Tension	Immobile Based on 95% Confidence Interval and Hydraulics	Supports GFTER
Potential Groundwater Usage	Groundwater Use Highly Unlikely	Supports GFTER
Groundwater Sampling to Evaluate Natural Attenuation of Dissolved-Phase Constituents		
Plume Core Location (BTEX and PAHs)	GFTER Monitoring Locations within Plume Core	Supports GFTER
Intrinsic Biodegradation	Consistent with Biodegradation	Supports GFTER
Downgradient Extent of COI	Concentrations Consistent with GFTER Modeling	Supports GFTER



QUADRANGLE LOCATION

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRAWN: BJS	DATE: 7/21/00	KEY ENVIRONMENTAL INCORPORATED GROUNDWATER INSIGHT
CHKD: JRH	DATE: 7/21/00	
APPD: JSZ	DATE: 7/21/00	
SCALE: 1" = 2000'		

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE OF SETTEGAST, TEXAS – 1982

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

ROSSLYN FARMS
INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

SITE LOCATION MAP

DRAWING NUMBER
99-785
FIGURE 1-1

FILE: G:\CAD-G\CAVALCAD\98587\FIG-1-36.DWG

EDITED BY:	DATE:	TIME:	EDITING TIME:	DRAWING NAME: C:\CAVALCAD\98118\FIG-1-2F.DWG

LEGEND:

SOUTH CAVALCADE SITE BOUNDARY

PROPERTY BOUNDARIES

AREAS COVERED WITH ASPHALT OR CONCRETE

CONCRETE CAP CONSTRUCTED BY BEAZER

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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CHKD: JRH	DATE: 7/21/00	
APPD: JSZ	DATE: 7/21/00	
SCALE: AS SHOWN		

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REV #	DATE	DESCRIPTION	APPD
3			
2			
1			

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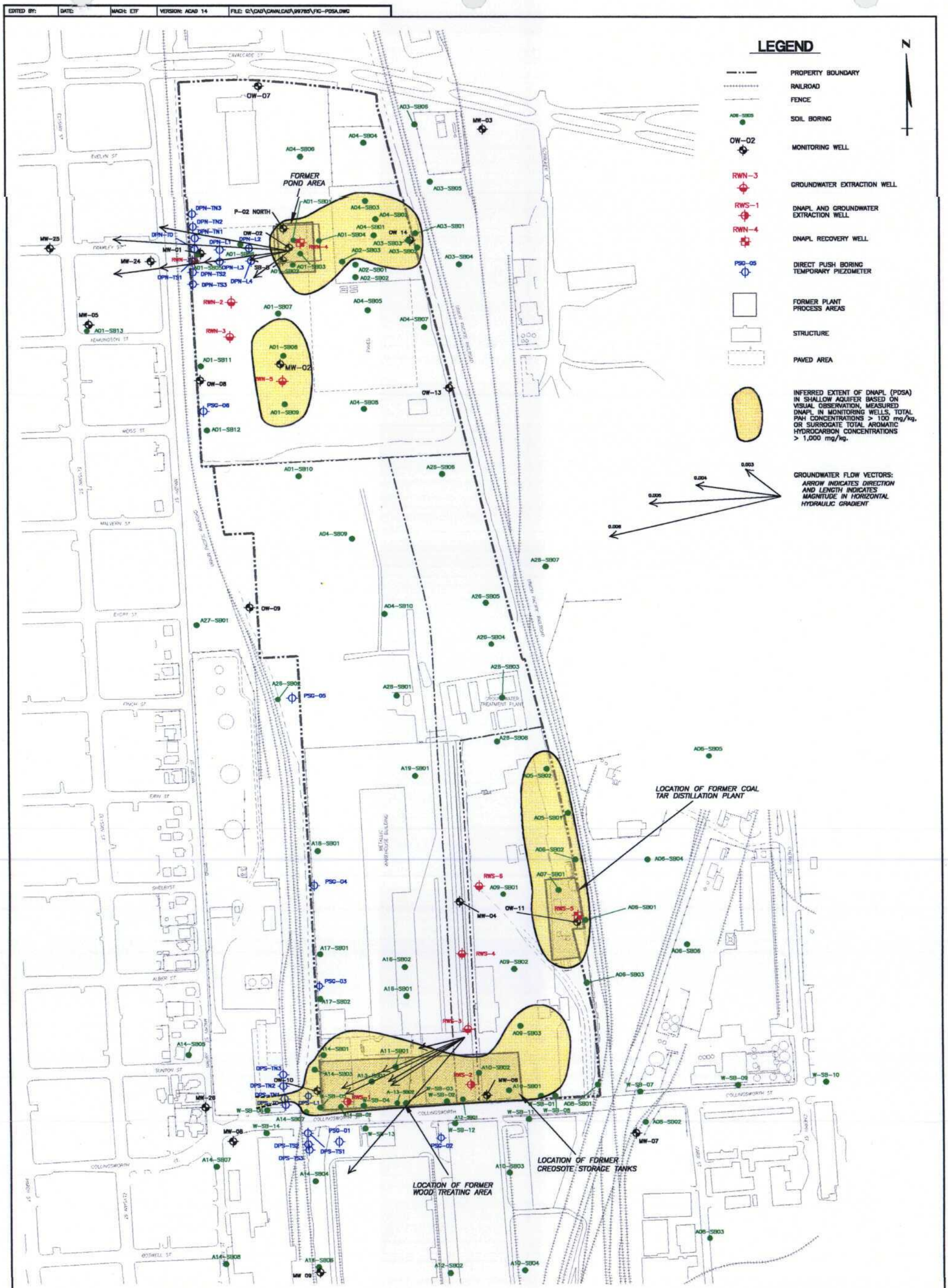
SITE PLAN

DRAWING NUMBER 99-785
FIGURE 1-2

EDITED BY:	DATE:	MACH: ETF	VERSION: ACAD 14	FILE: Q:\CAD\CAVALCAD\99780\FIG-PDSA.DWG



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PITTSBURGH, PENNSYLVANIA

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CHKD:	JRH	DATE:	7/21/00
APPD:	JSZ	DATE:	7/21/00
SCALE:	AS SHOWN		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

SITE CONDITIONS

DRAWING NUMBER 99-780
FIGURE 1-3

REV #	DATE	DESCRIPTION	APPD

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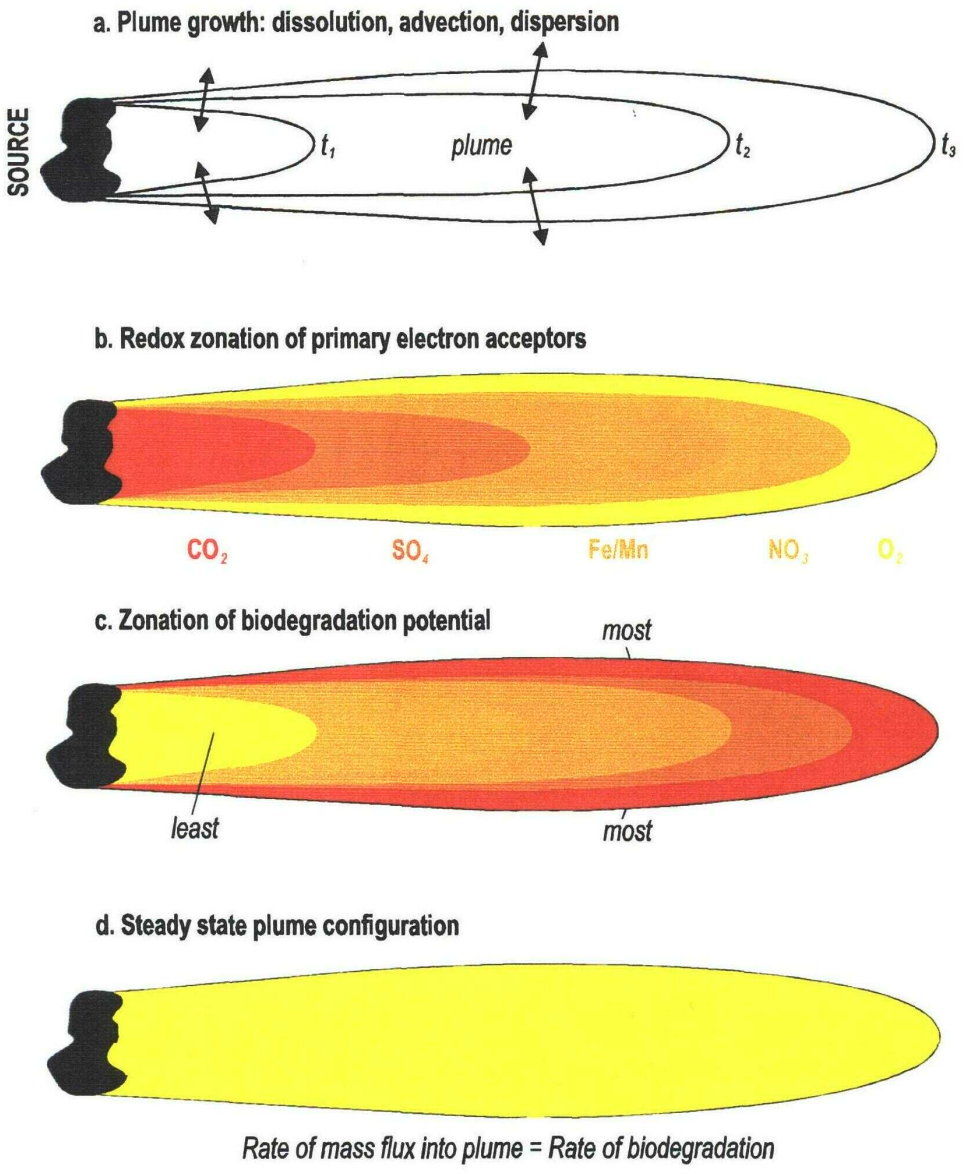

Note: Plan-view of the conceptual model for natural attenuation of aerobically degradable compounds in groundwater: a) plume expands through dissolution from an organic source (e.g., creosote) followed by advection and outward dispersive mixing of plume compounds; inward dispersive mixing of mobile electron acceptors also occurs b) preferential utilization of electron acceptors causes redox zonation c) general dependence of biodegradation on redox condition causes zonation of biodegradation potential d) plume stabilizes as the overall rate of biodegradation approaches the rate of source dissolution.

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PITTSBURGH, PENNSYLVANIA

DRWN:	BJS	DATE:	7/21/00
CHKD:	JRH	DATE:	7/21/00
APPD:	JSZ	DATE:	7/21/00
SCALE:	NOT TO SCALE		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

KEY ENVIRONMENTAL, INC.
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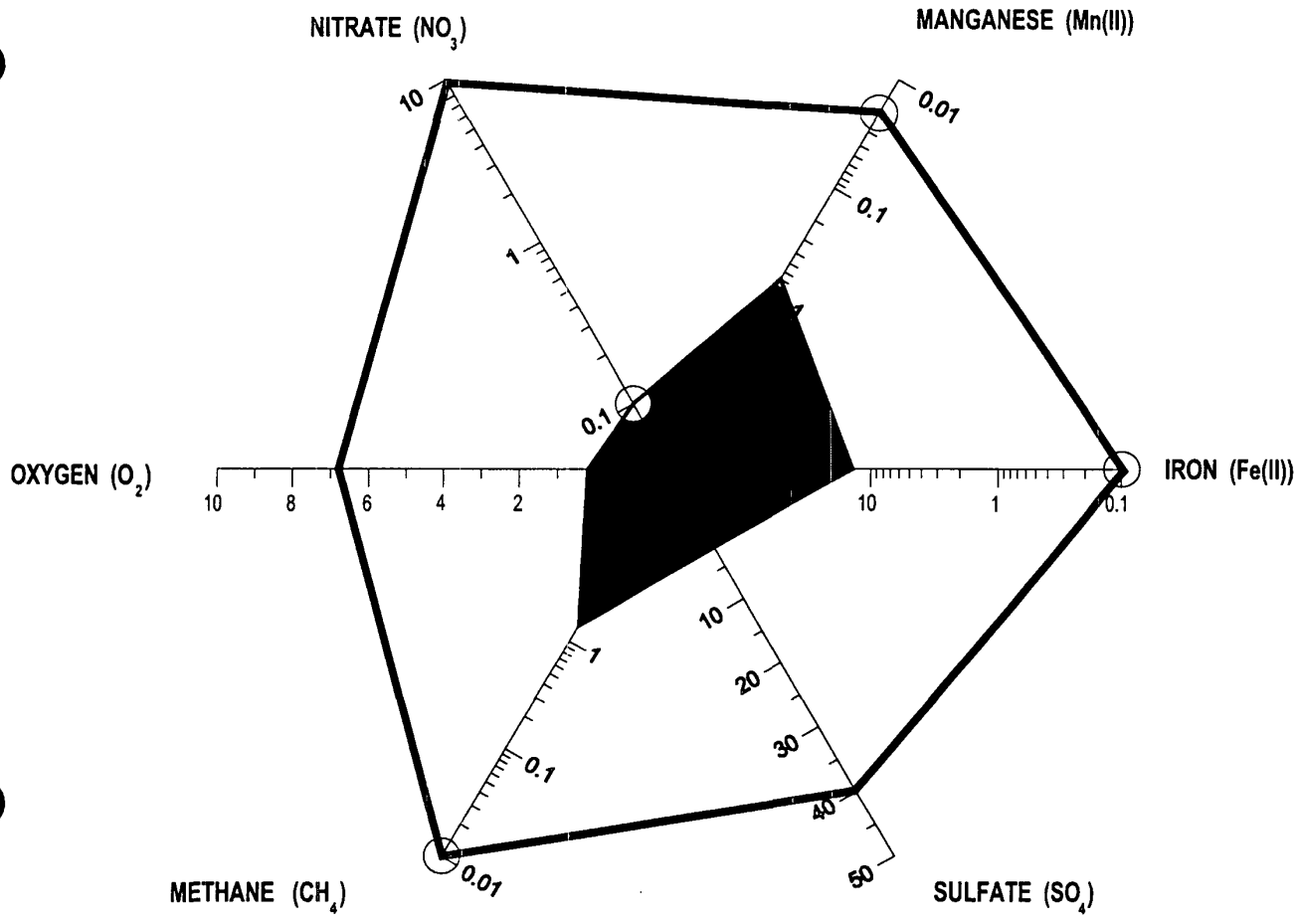
PLAN VIEW OF NATURAL ATTENUATION CONCEPTUAL MODEL

DRAWING NUMBER 99-785
FIGURE 2-1

ETF C:/CAD/CAD-G/CAVALCAD/99-785/FIG 2-2A



Parameter	Background Concentration	Monitoring Event Concentration
Oxygen	6.8	0.3
Nitrate	9.6	<0.1
Manganese(II)	<0.02	0.7
Iron(II)	<0.1	15
Sulfate	40	2
Methane	<0.01	1.5

LEGEND

Background concentrations

Monitoring event concentrations

Reporting limit (analyte not detected above reporting limit)

NOTE: All concentrations expressed in mg/L.

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BJS	DATE: 7/21/00	KEY ENVIRONMENTAL INCORPORATED GROUNDWATER INSIGHT	
CHKD: JRH	DATE: 7/21/00		
APPD: JSZ	DATE: 7/21/00		
SCALE: NOT TO SCALE			

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

KEY ENVIRONMENTAL, INC.
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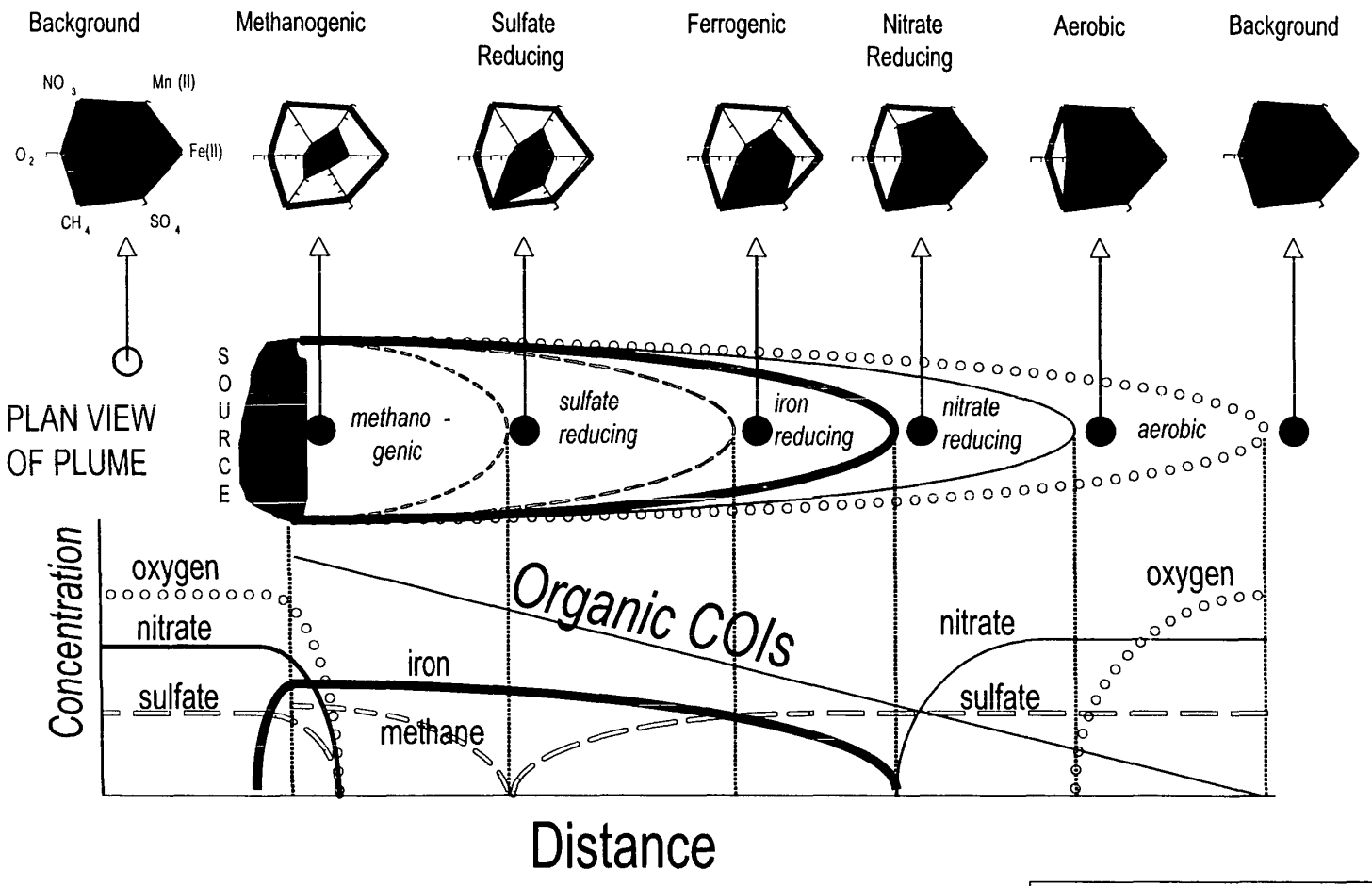
EXAMPLE OF SEQUENCE-REDOX DIAGRAM

DRAWING NUMBER 99-785

FIGURE 2-2

ETF C:/CAD/CAD-G/CAVALCAD/99-785/FIG 2-2A



Note: Conceptual illustration of a plume developing from a source of organic liquid (e.g., creosote), and the typical behavior of electron acceptors, shown in terms of centerline concentrations (bottom) and SEQUENCE plots (top).

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DRWN:	BJS	DATE:	7/21/00
CHKD:	JRH	DATE:	7/21/00
APPD:	JSZ	DATE:	7/21/00
SCALE:	NOT TO SCALE		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

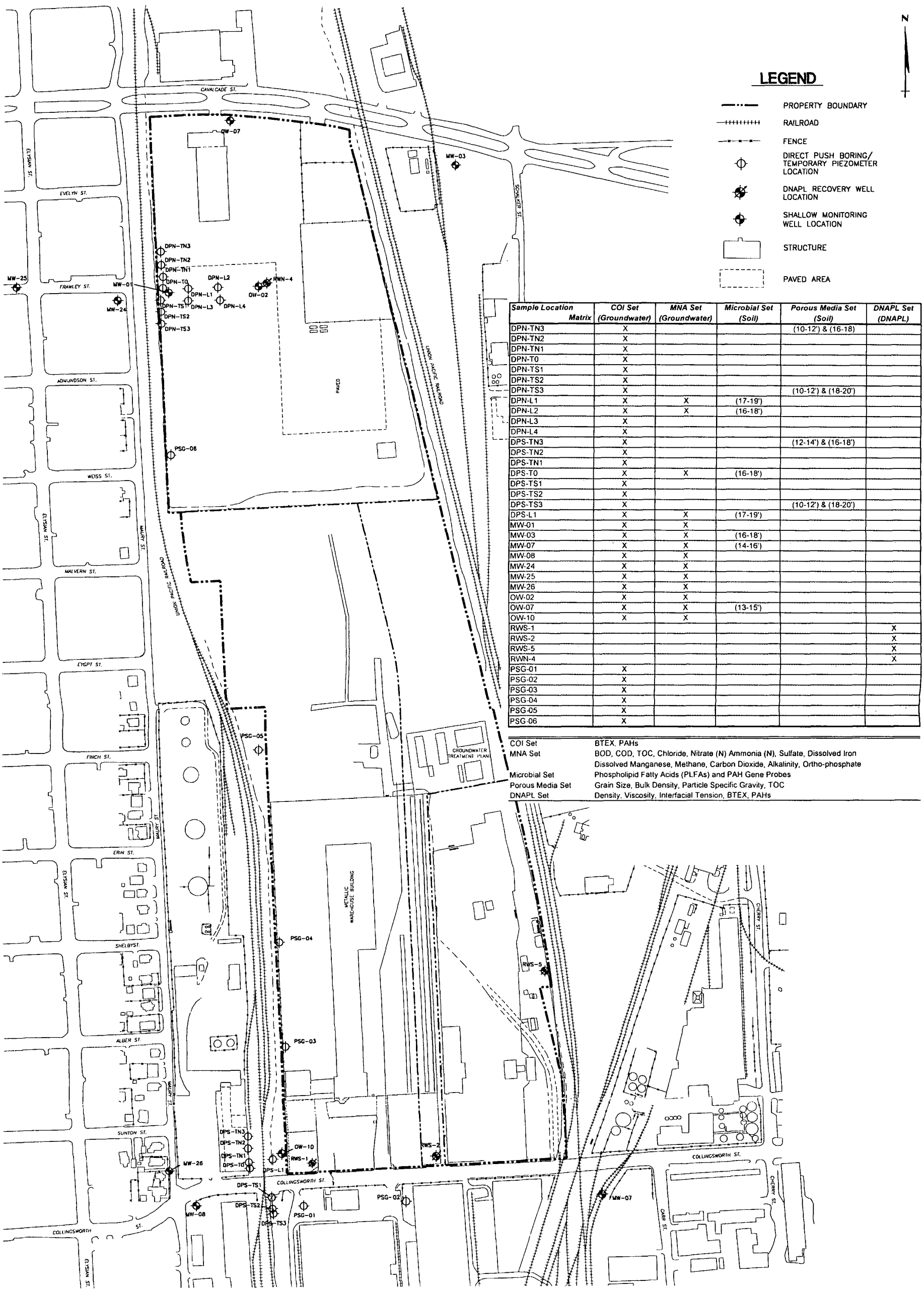
VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

CONCEPTUAL PLUME DEVELOPMENT AND ELECTRON ACCEPTOR BEHAVIOR

DRAWING NUMBER 99-785
FIGURE 2-3

ETF C:/CAD/CAD-G/CAVALCAD/99-785/FIG_2-3A

EDITED BY: | DATE: | MACH: ETF | VERSION: ACAD 14 | FILE: G:\CAD\CAVALCAD\99785\FIG_3-1F.DWG



Sample Location / Matrix	COI Set (Groundwater)	MNA Set (Groundwater)	Microbial Set (Soil)	Porous Media Set (Soil)	DNAPL Set (DNAPL)
DPN-TN3	X			(10-12') & (16-18)	
DPN-TN2	X				
DPN-TN1	X				
DPN-T0	X				
DPN-TS1	X				
DPN-TS2	X				
DPN-TS3	X			(10-12') & (18-20')	
DPN-L1	X	X	(17-19')		
DPN-L2	X	X	(16-18')		
DPN-L3	X				
DPN-L4	X				
DPS-TN3	X			(12-14') & (16-18')	
DPS-TN2	X				
DPS-TN1	X				
DPS-T0	X	X	(16-18')		
DPS-TS1	X				
DPS-TS2	X				
DPS-TS3	X			(10-12') & (18-20')	
DPS-L1	X	X	(17-19')		
MW-01	X	X			
MW-03	X	X	(16-18')		
MW-07	X	X	(14-16')		
MW-08	X	X			
MW-24	X	X			
MW-25	X	X			
MW-26	X	X			
OW-02	X	X			
OW-07	X	X	(13-15')		
OW-10	X	X			
RWS-1					X
RWS-2					X
RWS-5					X
RWN-4					X
PSG-01	X				
PSG-02	X				
PSG-03	X				
PSG-04	X				
PSG-05	X				
PSG-06	X				

COI Set	BTEX, PAHs
MNA Set	BOD, COD, TOC, Chloride, Nitrate (N) Ammonia (N), Sulfate, Dissolved Iron Dissolved Manganese, Methane, Carbon Dioxide, Alkalinity, Ortho-phosphate
Microbial Set	Phospholipid Fatty Acids (PLFAs) and PAH Gene Probes
Porous Media Set	Grain Size, Bulk Density, Particle Specific Gravity, TOC
DNAPL Set	Density, Viscosity, Interfacial Tension, BTEX, PAHs

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SCALE:	AS SHOWN		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

SAMPLING LOCATIONS

DRAWING NUMBER 99-785
FIGURE 3-1

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CARNEGIE, PA 15106

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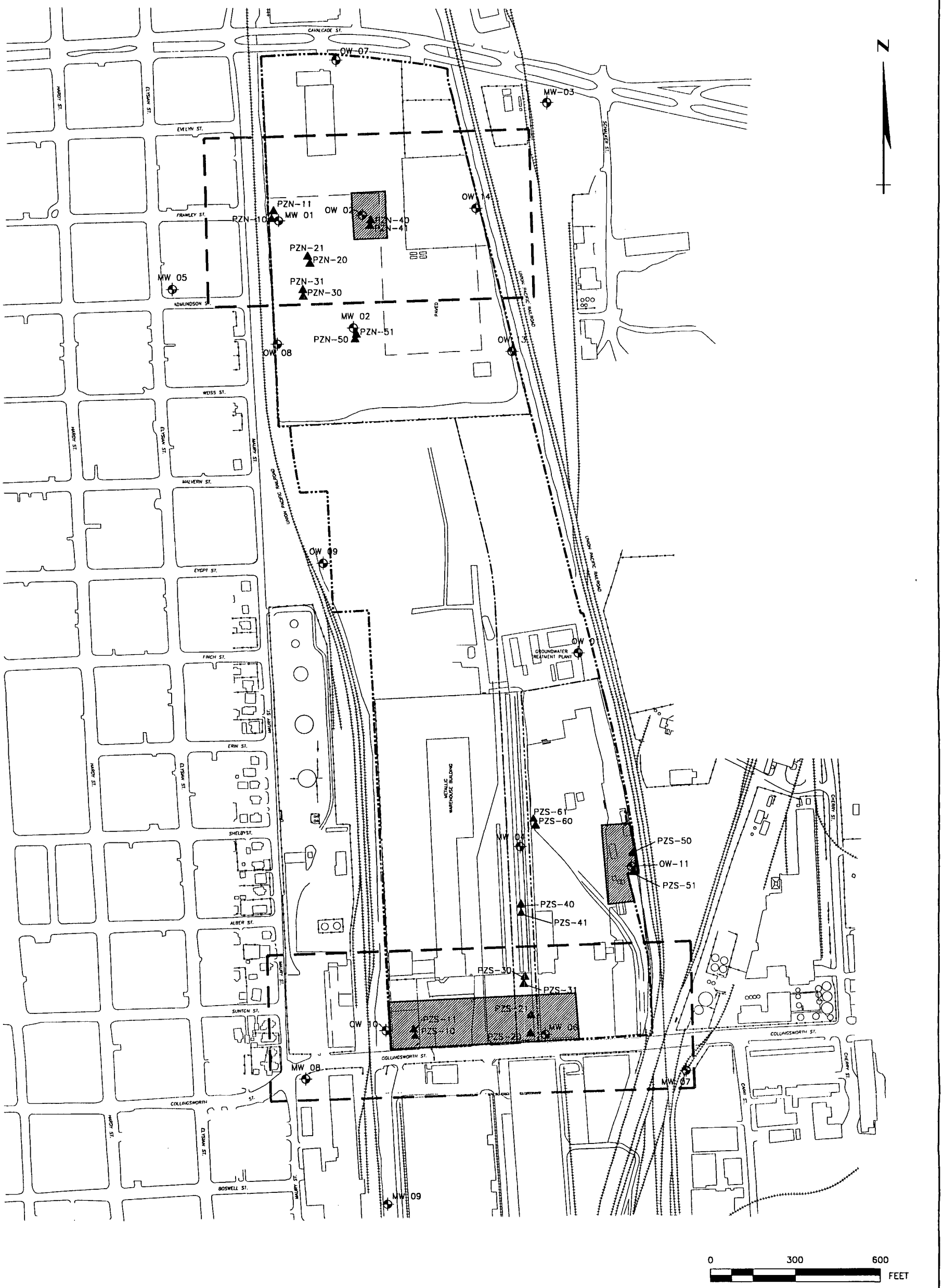

LEGEND:

- MONITORING WELL
- PIEZOMETER LOCATION
- PROPERTY BOUNDARY
- FORMER PROCESS AREA
- AREA DESIGNATED FOR HYDRAULIC GRADIENT AND GROUNDWATER FLOW DIRECTION DETERMINATION

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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SCALE: AS SHOWN			

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALACADE SUPERFUND SITE
HOUSTON, TEXAS

REV #	DATE	DESCRIPTION	APPD
3			
2			
1			

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

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AREAS FOR VERIFICATION OF GROUNDWATER FLOW DIRECTION AND HYDRAULIC GRADIENT

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FIGURE 3-2

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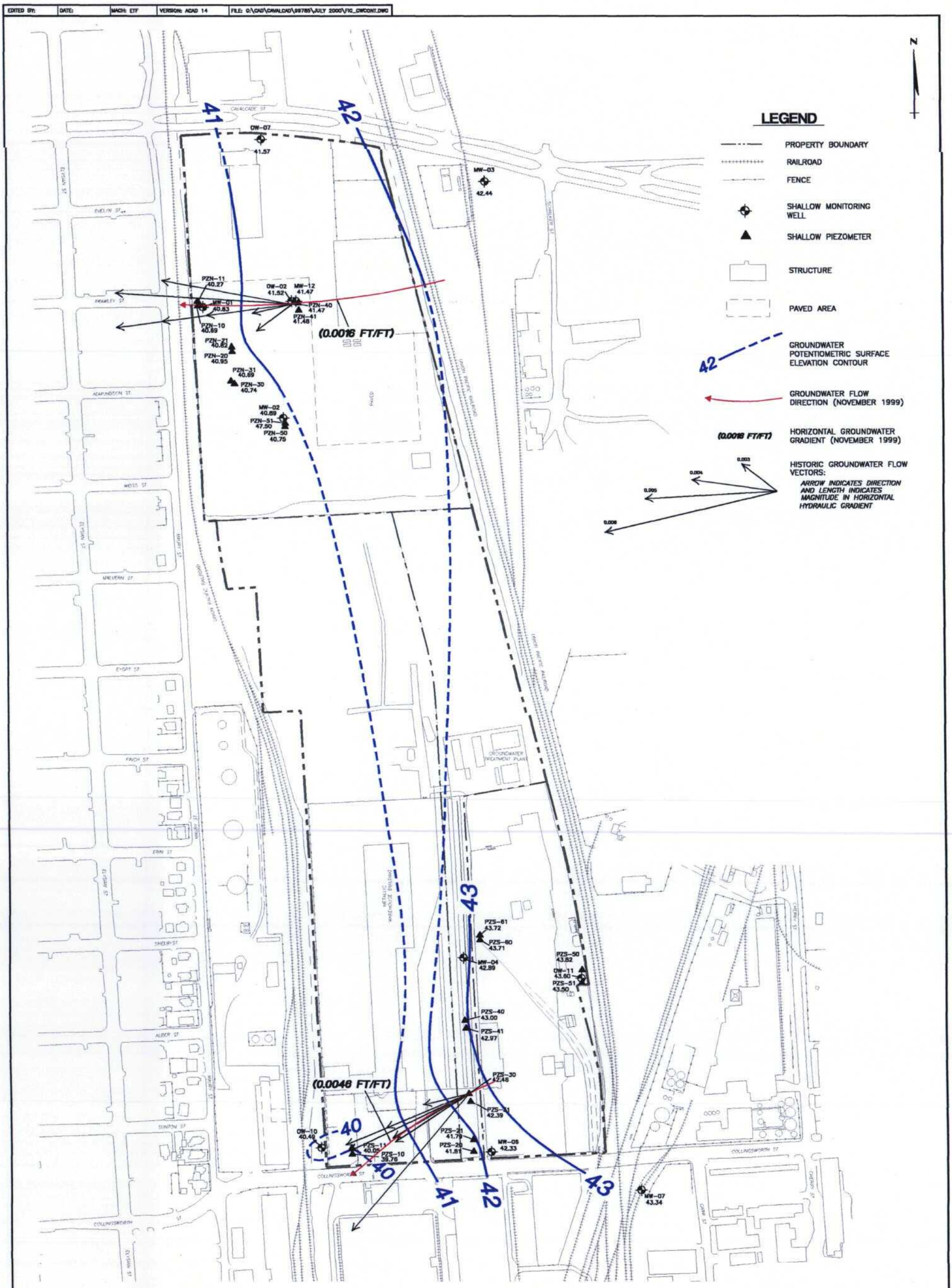

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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CHKD:	JRH	DATE:	7/21/00
APPD:	JSZ	DATE:	7/21/00
SCALE:	AS SHOWN		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

POTENTIOMETRIC SURFACE ELEVATION CONTOUR MAP

DRAWING NUMBER 99-785
FIGURE 3-3

REV #	DATE	DESCRIPTION	APPD
△			
△			
△			

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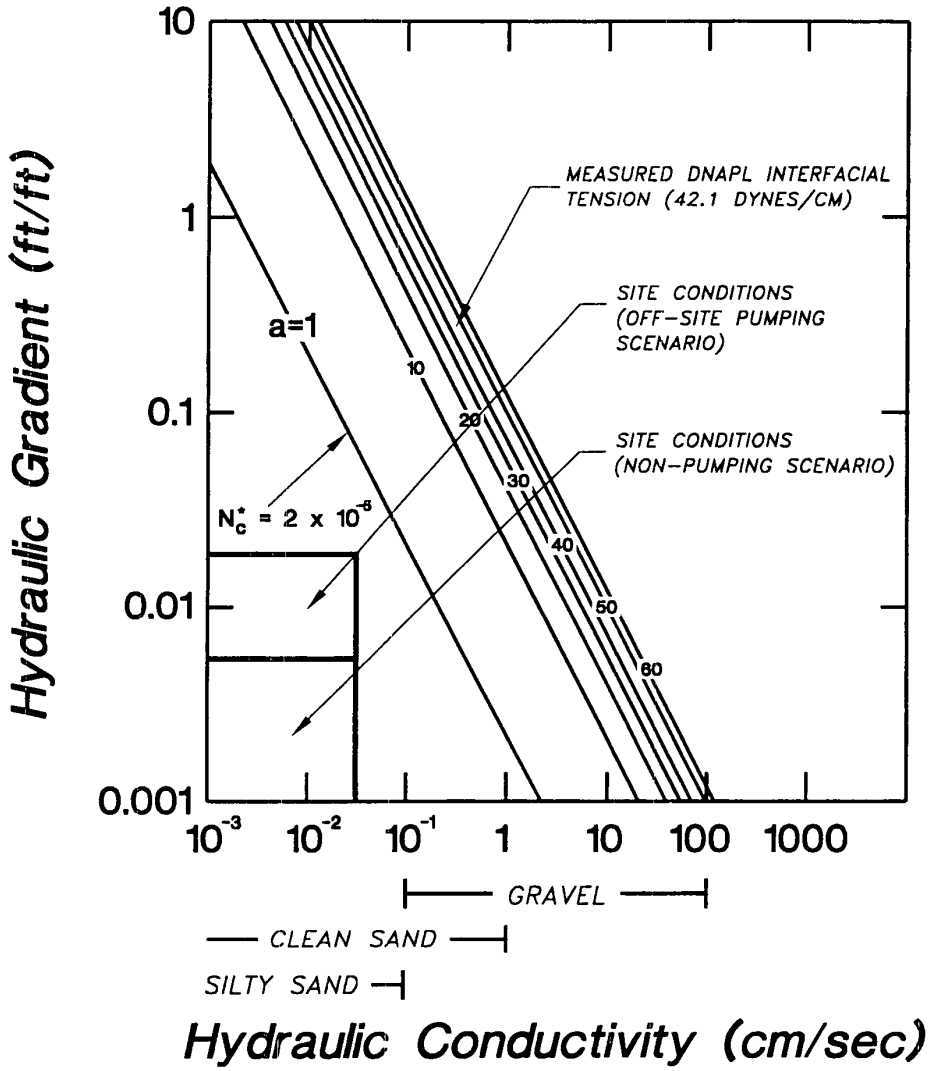

NOTE: "a" (ALPHA) INDICATES INTERFACIAL TENSION (DYNES/CM).
REFERENCE: WILSON AND CONRAD, 1984.

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BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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APPD: JSZ	DATE: 7/21/00	
SCALE: AS SHOWN		

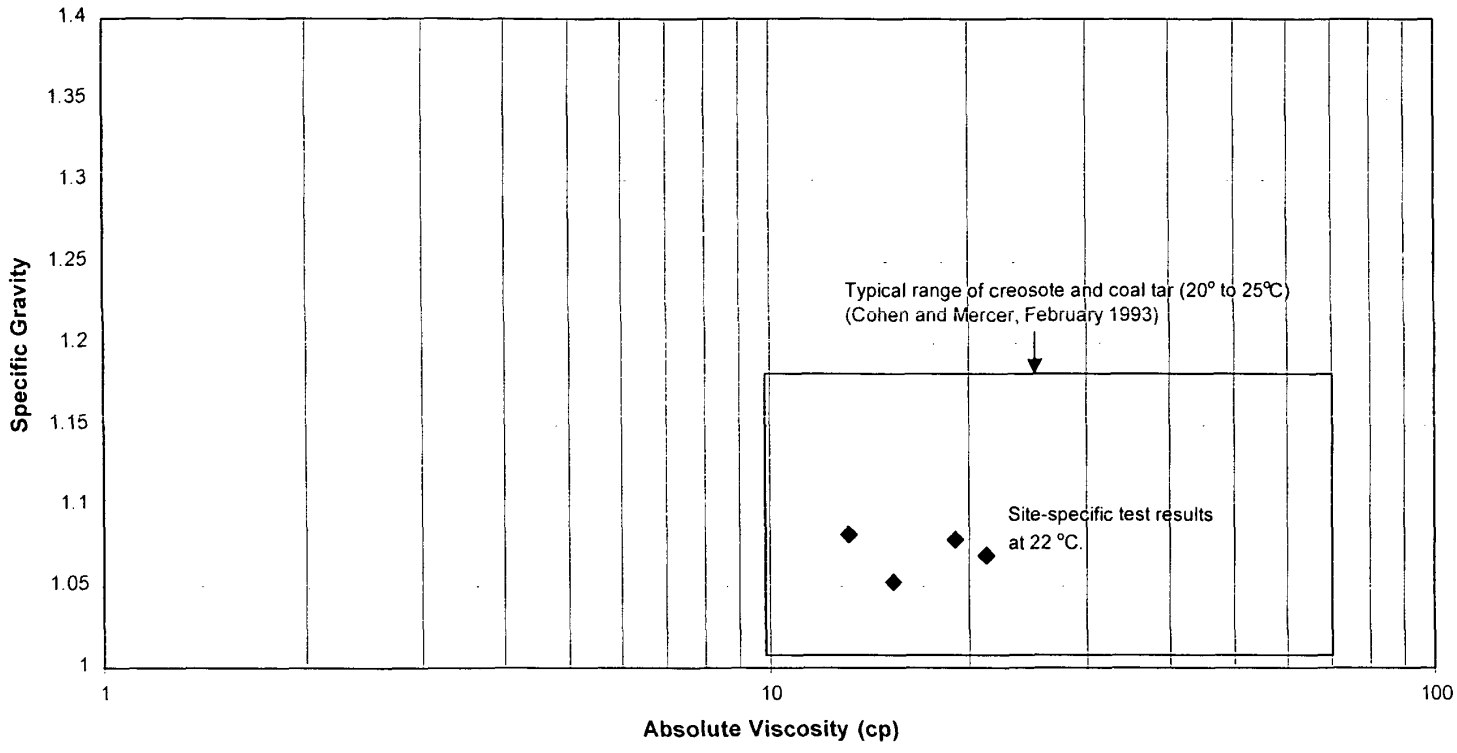
VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

INTERFACIAL TENSION, HYDRAULIC GRADIENT, AND HYDRAULIC CONDUCTIVITY RELATIONSHIP

DRAWING NUMBER 99-785
FIGURE 3-4

C:\CAVALCADE\97388\FIG-3-4.DWG

FIGURE 3-5
Absolute Viscosity and Specific Gravity Plot



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PITTSBURGH, PENNSYLVANIA

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CHKD: JRH	DATE: 7/21/00		
APPD: JSZ	DATE: 7/21/00		
SCALE: AS SHOWN			

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

KEY ENVIRONMENTAL, INC.
ROSSLYN FARMS INDUSTRIAL PARK
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ISSUE DATE:

ABSOLUTE VISCOSITY AND SPECIFIC GRAVITY PLOT

DRAWING NUMBER 99-785
FIGURE 3-5

ETF\CAD\CAVALCAD\99785\JULY2000\FIG-3-5.DWG

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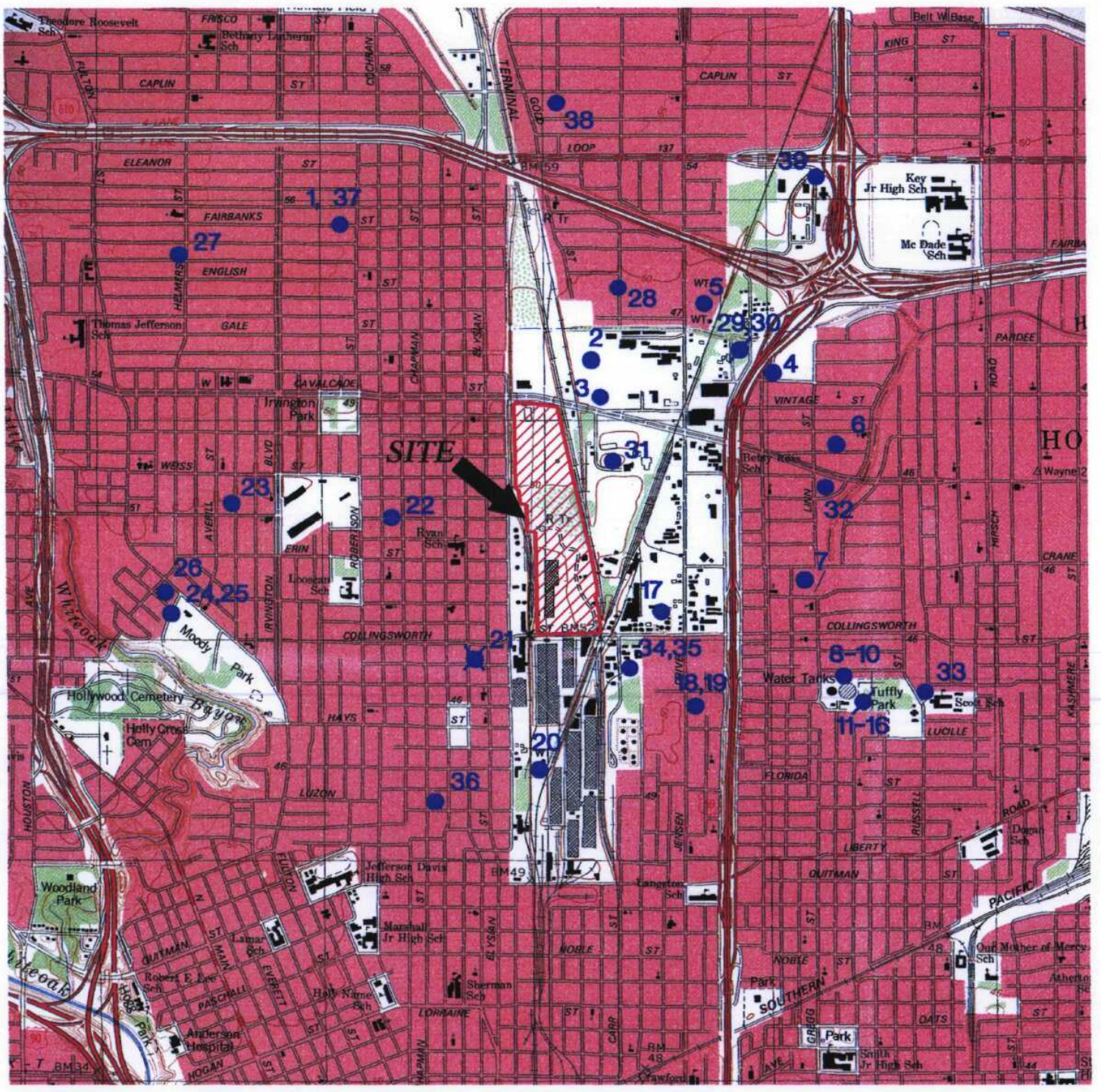
WATER WELL DATA				
NO.	OWNER	DEPTH	DIAMETER (IN.)	STATUS
1	D. ADAMS	175'	6.75"	DOMESTIC
2	T.V. TRAN	363'	6.75"	DOMESTIC
3	C.G. VAUGHN	292'	6.75"	DOMESTC
4	CITY OF HOUSTON	2080'	12"	PUBLIC SUPPLY
5	GOODWILL INDUSTRIES	561'	7.875"	PUBLIC SUPPLY/DOMESTIC
6	RAINBO BAKERY	345'	6.75"	DOMESTIC
7	CITY OF HOUSTON	1993'	12.75"	PUBLIC SUPPLY
8	HGCSD	1033'	7.875"	TEST WELL
9	HGCSD	487'	7.875"	TEST WELL
10	HGCSD	299'	7.875"	TEST WELL
11	HGCSD	1596'	2.5"	UNUSED
12	HGCSD	487'	2.5"	UNUSED
13	HGCSD	1035'	2.5"	UNUSED
14	HGCSD	298'	2.5"	UNUSED
15	HGCSD	2170'	5.5"	UNUSED
16	CITY OF HOUSTON	1291'	12.75"	UNUSED
17	HUNT FOODS	782'	7"	INDUSTRIAL
18	M. AUGUSTINE	61'	4.5"	DOMESTIC
19	M&N WELL SERVICE	346'	6.75"	DOMESTIC
20	HOUSTON INTL. TELEPORT	80'	4.75"	PUBLIC SUPPLY
21	MIS-LOCATED	–	–	MIS-LOCATED
22	KENT WONG	502'	4.0"	INDUSTRIAL
23	HENRY BAKER	378'	4.5"	DOMESTIC

WATER WELL DATA				
NO.	OWNER	DEPTH	DIAMETER (IN.)	STATUS
24	C.C. HERN	248'	3.88"	DOMESTIC
25	ASCRETE, INC.	167'	6.75"	DOMESTIC
26	METAL ENTERPRISES, INC.	200'	4.75"	IRRIGATION
27	PHIL MADDOX	174'	6.75"	DOMESTIC
28	BIG STATE FREIGHT	410'	6.75"	DOMESTIC
29	CHERRY DEMOLITION-METRO	48'	2"	ABANDONED
30	CHERRY DEMOLITION-METRO	47'	2"	ABANDONED
31	C.G. VAUGHN	292'	6.75"	DOMESTIC
32	DONALD HALL	240'	6"	IRRIGATION
33	CAROL HARBOR	82'	4"	DOMESTIC
34	OLDS PRESS & FORGE	302'	4"	INDUSTRIAL
35	OLDS PRESS & FORGE	302'	4"	INDUSTRIAL
36	SOUTHWESTERN PLATING CO.	462'	6.75"	INDUSTRIAL
37	J.D. PRICHARD	167'	6.75"	DOMESTIC
38	AM. PUMP & WELL	42'	–	DOMESTIC
39	CITY OF HOUSTON	1980'	12.75"	PUBLIC SUPPLY



LEGEND

- WATER WELL LOCATION
- WATER WELL ABANDONED OR UNUSED
- NEVER EXISTED (PREVIOUSLY MIS-LOCATED) VERIFIED BY WELL LOG

N

QUADRANGLE LOCATION

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVNIA

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SCALE:	1"=2000'		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REV #	DATE	DESCRIPTION	APPD

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE OF SETTEGAST, TEXAS – 1982

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WATER WELL LOCATION MAP

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FIGURE 3-6

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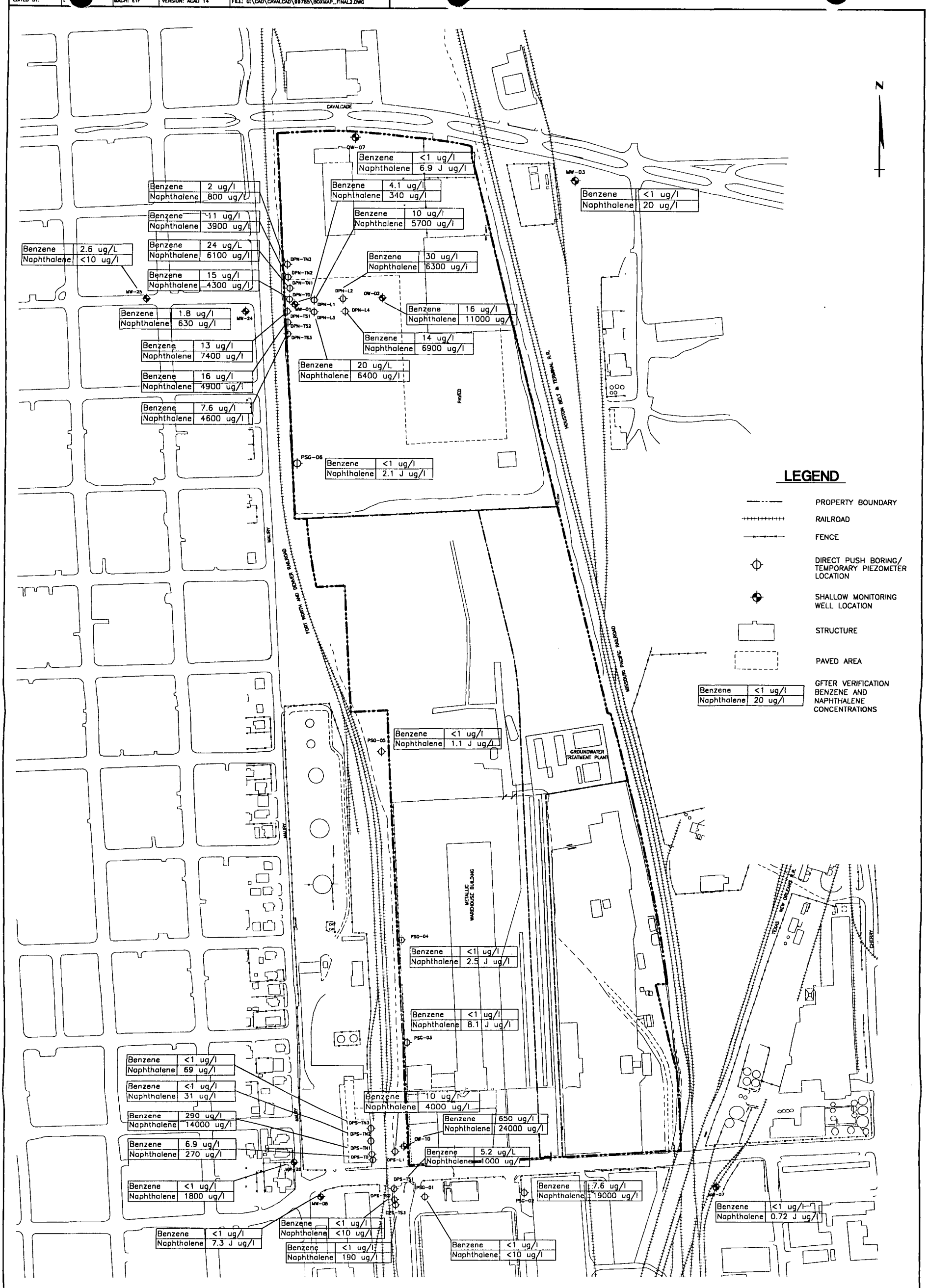

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PITTSBURGH, PENNSYLVANIA

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APPD: JSZ	DATE: 7/20/00	
SCALE: AS SHOWN		

VERIFICATION OF GROUNDWATER FATE AND TRANSPORT EVALUATION
SOUTH CAVALACDE SUPERFUND SITE
HOUSTON, TEXAS

GROUNDWATER CONSTITUENT CONCENTRATIONS

DRAWING NUMBER 99-785
FIGURE 4-1

REV #	DATE	DESCRIPTION	APPD

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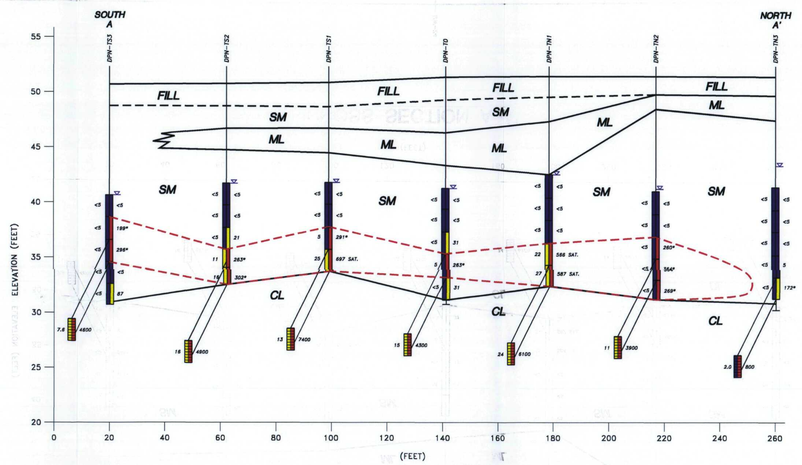
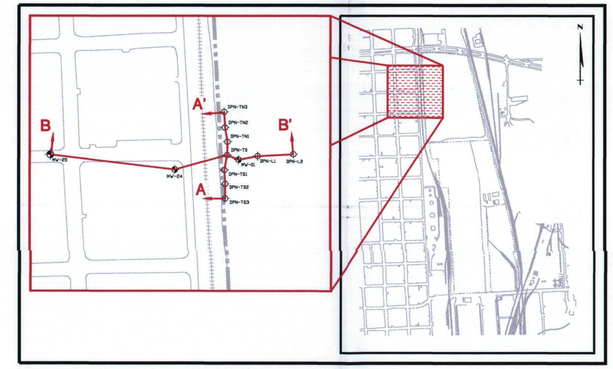
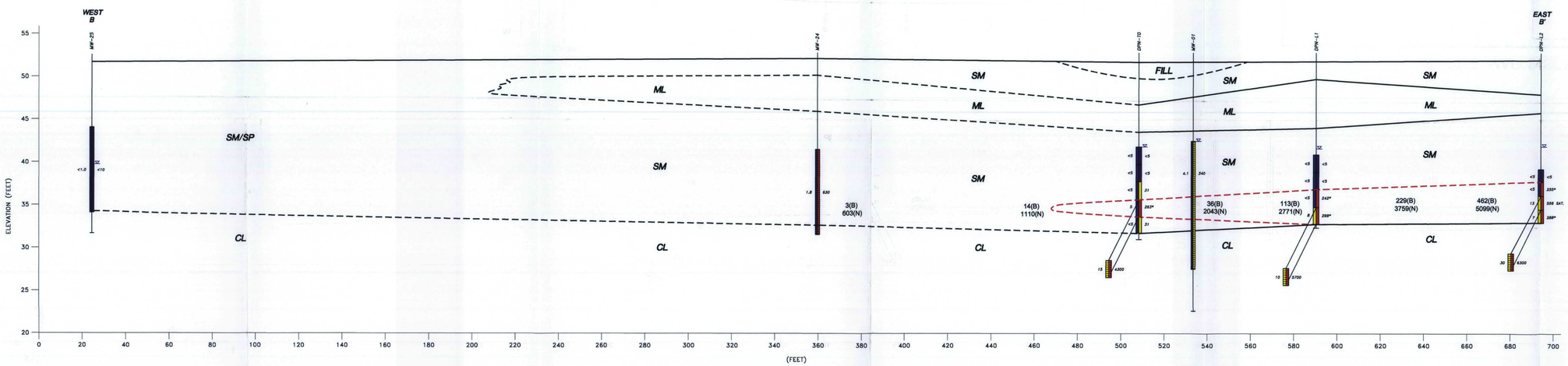


CROSS SECTION A-A'

SITE MAP INSET

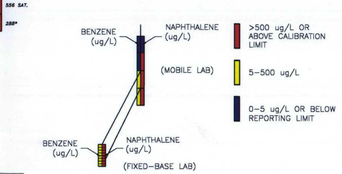




CROSS SECTION B-B'

LEGEND

229(B)	GFTER BENZENE CONC (APPENDIX L)
3759(N)	GFTER NAPHTHALENE CONC (APPENDIX I)
▽	WET TO SATURATED HORIZON
- - - -	PLUME CORE (SCREENING RESULTS)
DPW-TN1	SOIL BORING LOCATION
MW-24	MONITORING WELL/SCREEN INTERVAL LOCATION



5 0 20
SCALE IN FEET

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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APPD:	JSZ	DATE:	7/21/00
SCALE:	AS SHOWN		

KEY ENVIRONMENTAL INCORPORATED

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

NORTH AREA
GEOLOGIC CROSS SECTIONS

DRAWING NUMBER
99-785
FIGURE 4-2

REV #	DATE	DESCRIPTION	APPD
1			
2			
3			

NOTES: 1. * CONCENTRATION VALUE ABOVE CALIBRATION LIMIT
2. SAT. DETECTOR SATURATED
3. STRATIGRAPHY CLASSIFIED ACCORDING TO UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

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EDITED BY: DATE: TIME: VERSION: ACAD 14 FILE: ETF C:\CAD\CAD-C\CAVALCAD\99-785\JULY 2000\FIG-4-1.DWG

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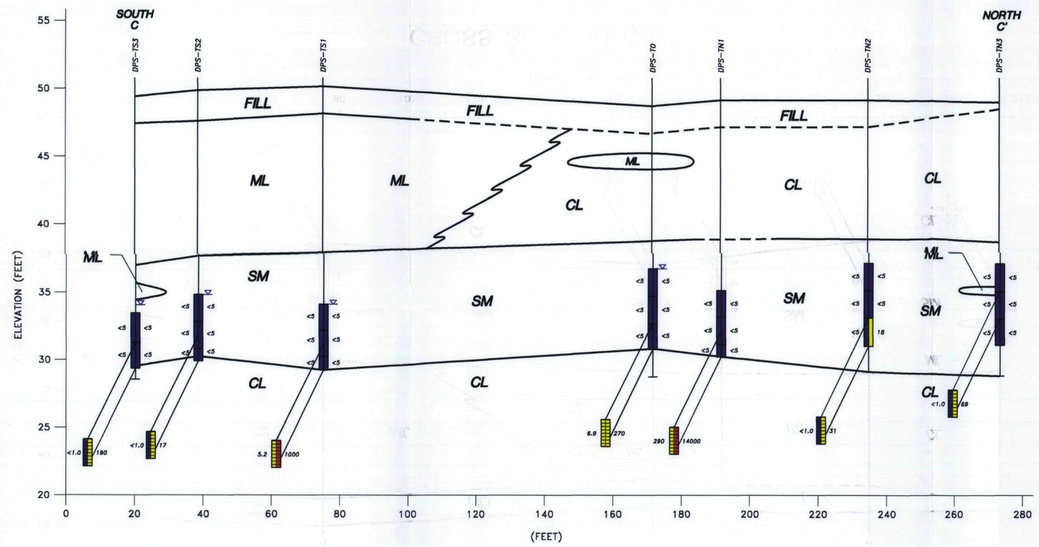
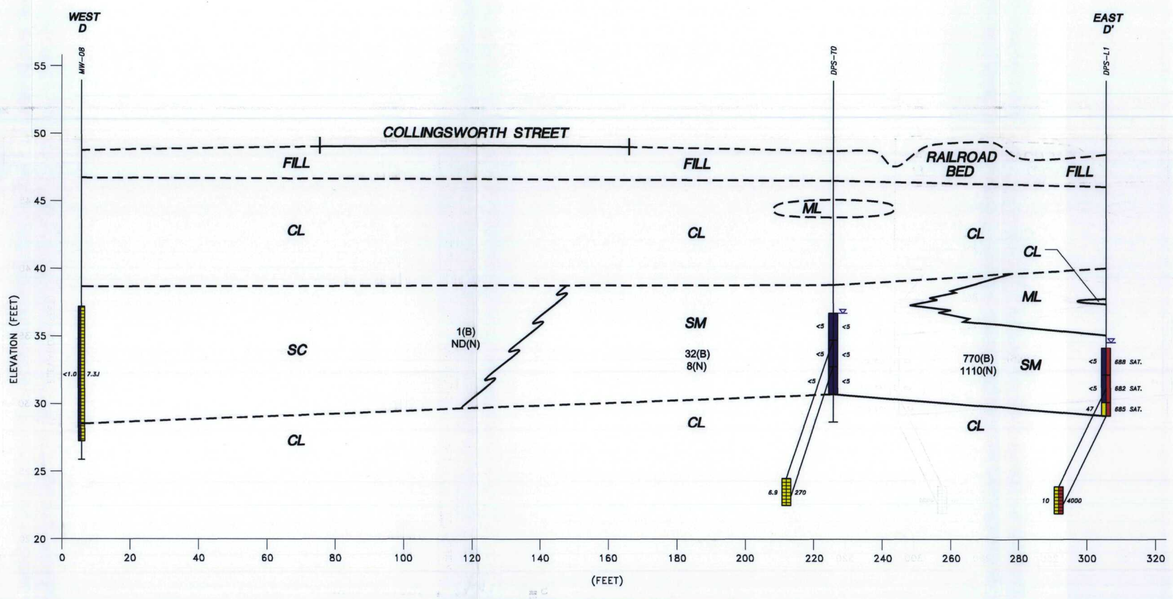
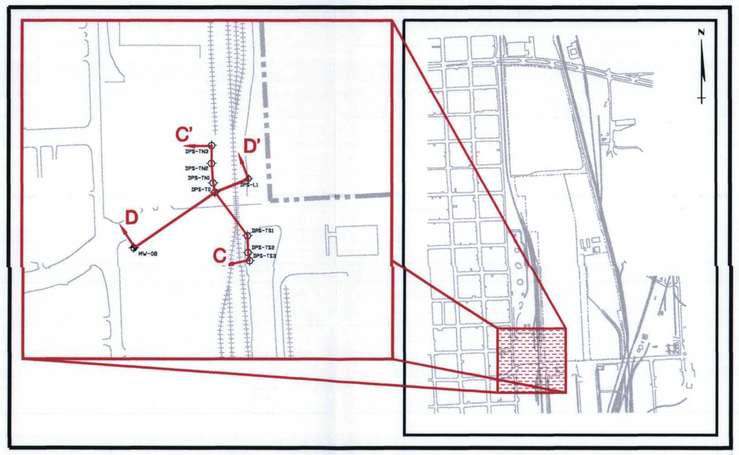


CROSS SECTION C-C'



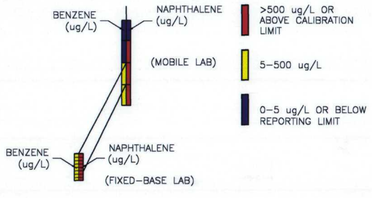
CROSS SECTION D-D'

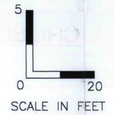
SITE MAP INSET



LEGEND

770(B)	GFTER BENZENE CONC (APPENDIX M)
1110(N)	GFTER NAPHTHALENE CONC (APPENDIX J)
▽	WET TO SATURATED HORIZON
DPS-TN1	SOIL BORING LOCATION
MW-08	MONITORING WELL/SCREEN INTERVAL LOCATION





NOTES:
1. * CONCENTRATION VALUE ABOVE CALIBRATION LIMIT
2. SAT. DETECTOR SATURATED
3. STRATIGRAPHY CLASSIFIED ACCORDING TO UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

REV #	DATE	DESCRIPTION	APPD
3			
2			
1			

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KEY ENVIRONMENTAL INCORPORATED

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

SOUTH AREA
GEOLOGIC CROSS SECTIONS

DRAWING NUMBER
99-785
FIGURE 4-3

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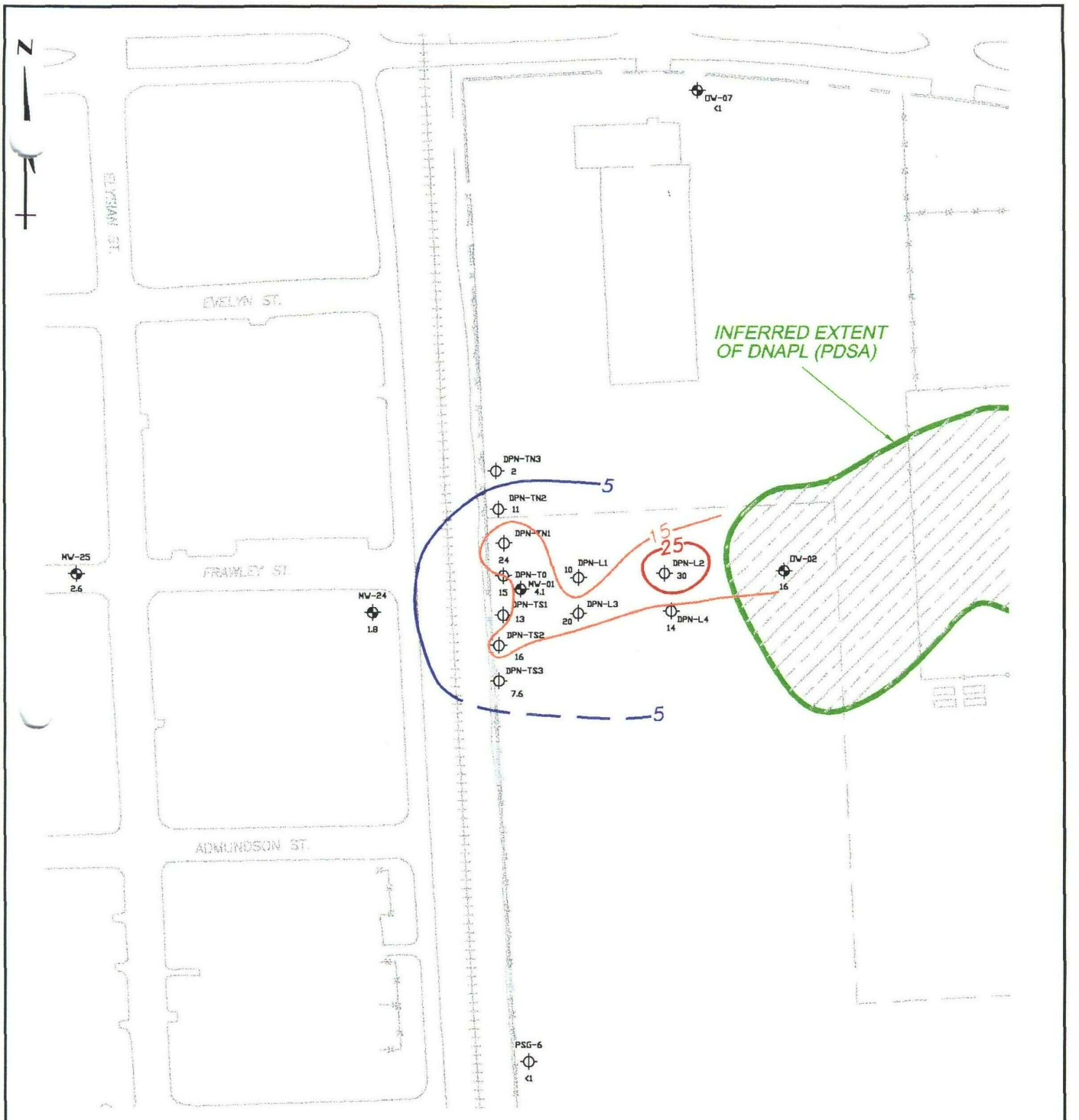

LEGEND

SITE BOUNDARY

ISO-CONCENTRATION CONTOURS

TEMPORARY PIEZOMETER

MONITORING WELL

1.8 BENZENE CONCENTRATION (ug/L)

0 75 150 300 FEET

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

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CARNEGIE, PA 15106

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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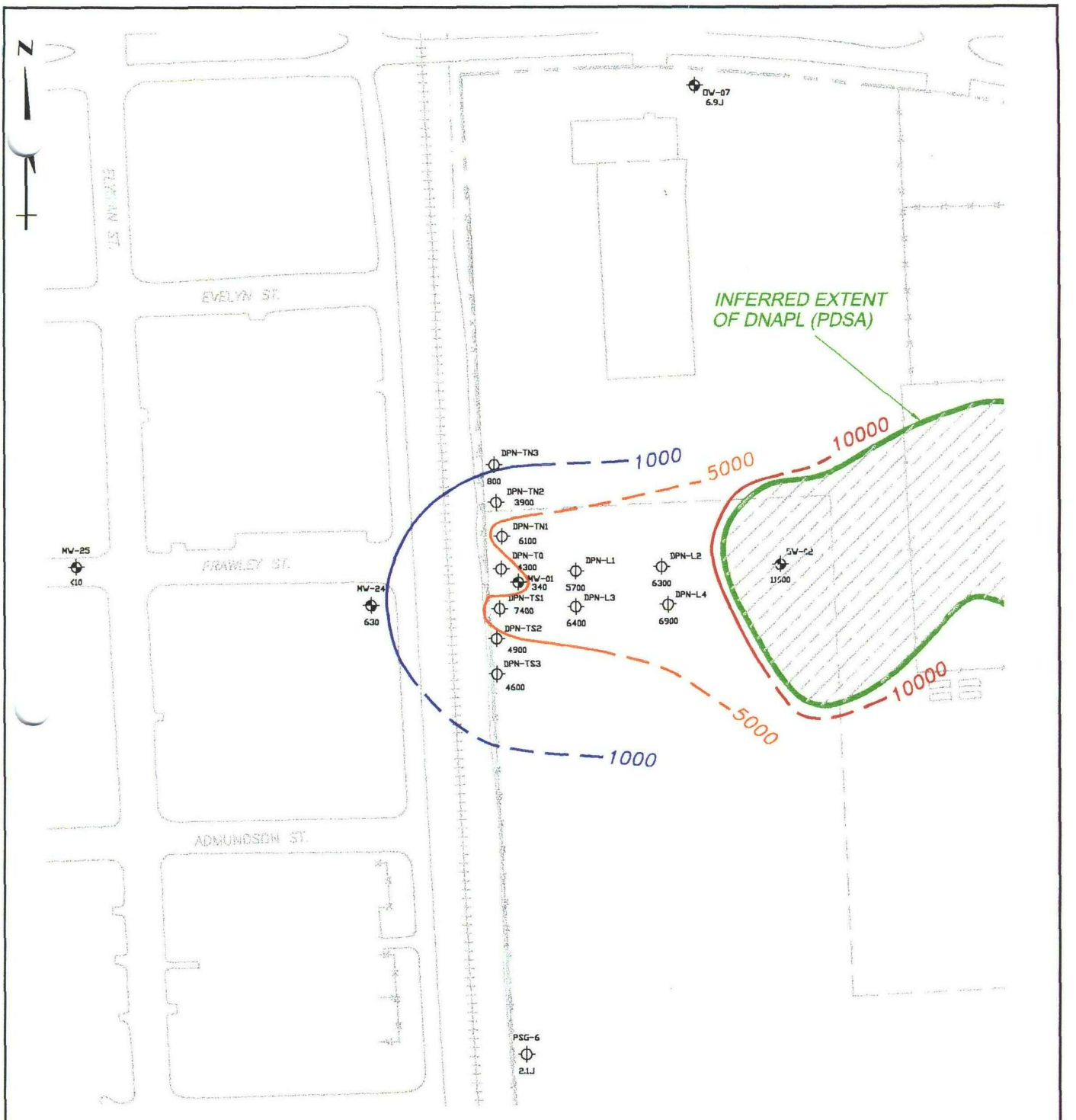
APPD: JSZ	DATE: 7/21/00	
SCALE: AS SHOWN		

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

NORTH AREA
BENZENE PLUME

DRAWING NUMBER
99-785
FIGURE 4-4

ETF\CAD-G\CAVALCAD\99785\JULY 2000\FIG-4-2.DWG



LEGEND

SITE BOUNDARY

1000 ISO-CONCENTRATION CONTOURS

TEMPORARY PIEZOMETER

MONITORING WELL

630 NAPHTHALENE CONCENTRATION (ug/L)

0 75 150 300 FEET

KEY ENVIRONMENTAL, INC.

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ROSSLYN FARMS INDUSTRIAL PARK
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CARNEGIE, PA 15106

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

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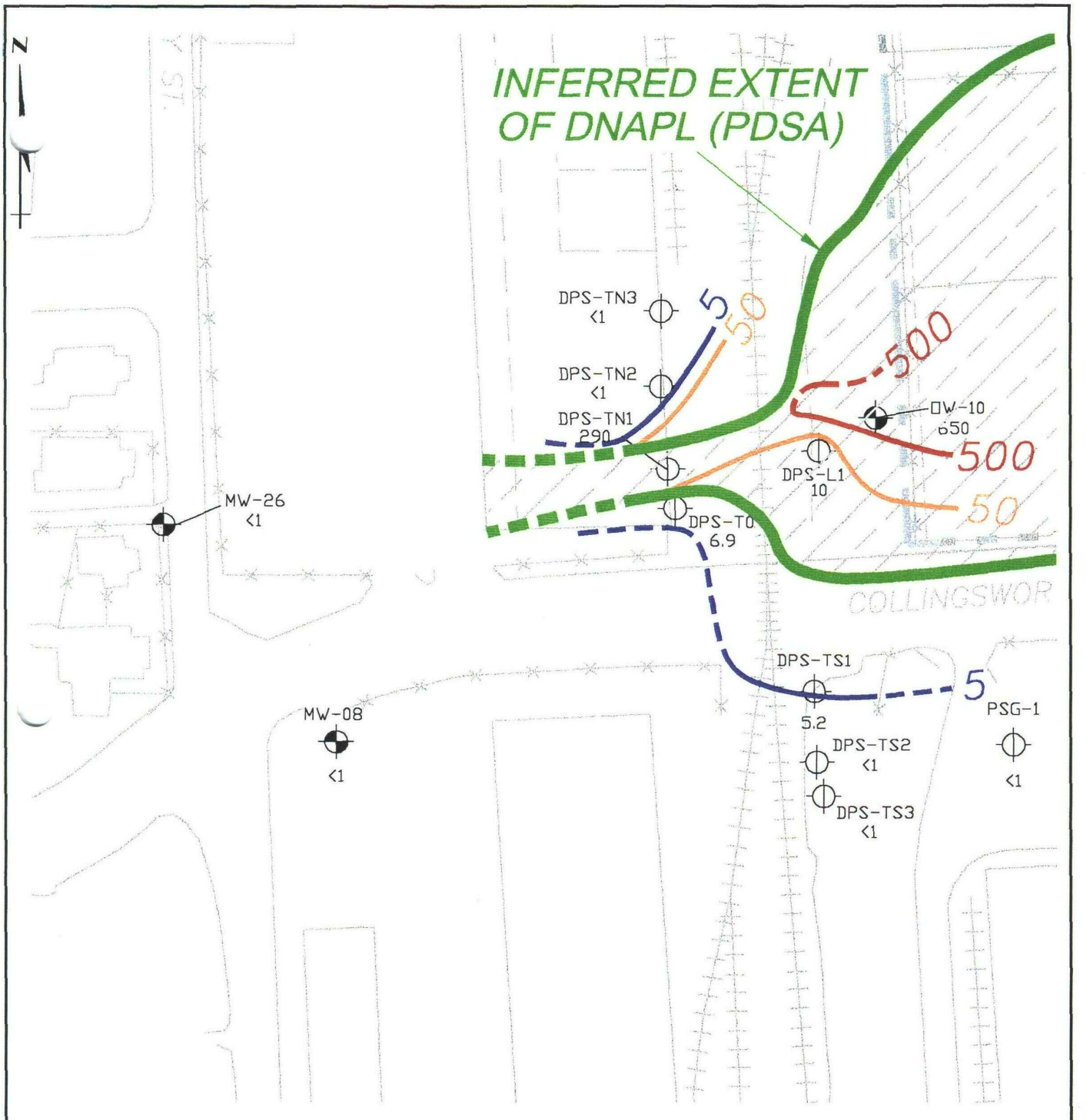
CHKD: JRH	DATE: 7/21/00	
APPD: JSZ	DATE: 7/21/00	
SCALE: AS SHOWN		

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

NORTH AREA
NAPHTHALENE PLUME

DRAWING NUMBER
99-785
FIGURE 4-5

ETF\CAD-G\CAVALCAD\99785\JULY 2000\FIG-4-3.DWG



LEGEND

SITE BOUNDARY

TEMPORARY PIEZOMETER

6.9 BENZENE CONCENTRATION (ug/L)

5 ISO-CONCENTRATION CONTOURS

MONITORING WELL

0 35 70 140 FEET

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

ROSSLYN FARMS INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

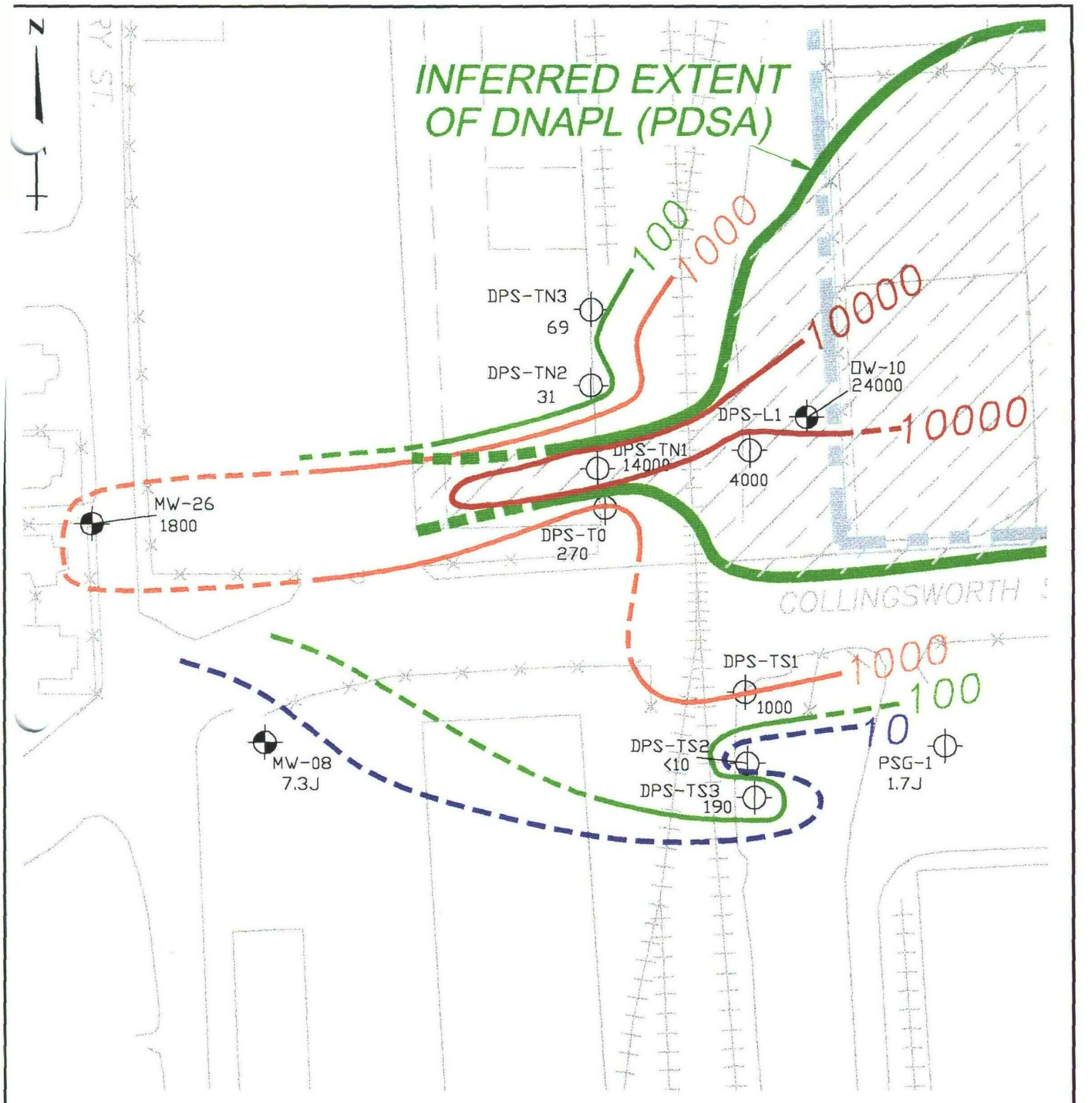
DRWN: BS ML	DATE: 7/21/00	KEY ENVIRONMENTAL INCORPORATED GROUNDWATER INSIGHT
CHKD: JRH	DATE: 7/21/00	
APPD: JSZ	DATE: 7/21/00	
SCALE: AS SHOWN		

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

SOUTH AREA
BENZENE PLUME

DRAWING NUMBER
99-785
FIGURE 4-6

ETF\CAD-G\CAVALCAD\99785\JULY 2000\FIG-4-4.DWG



LEGEND

SITE BOUNDARY

ISO-CONCENTRATION CONTOURS (10)

TEMPORARY PIEZOMETER

MONITORING WELL

270 NAPHTHALENE CONCENTRATION (ug/L)

0 35 70 140 FEET

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BS ML	DATE: 7/21/00	KEY ENVIRONMENTAL INCORPORATED GROUNDWATER INSIGHT
CHKD: JRH	DATE: 7/21/00	
APPD: JSZ	DATE: 7/21/00	
SCALE: AS SHOWN		

VERIFICATION OF GROUNDWATER FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

ROSSLYN FARMS INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

SOUTH AREA NAPHTHALENE PLUME

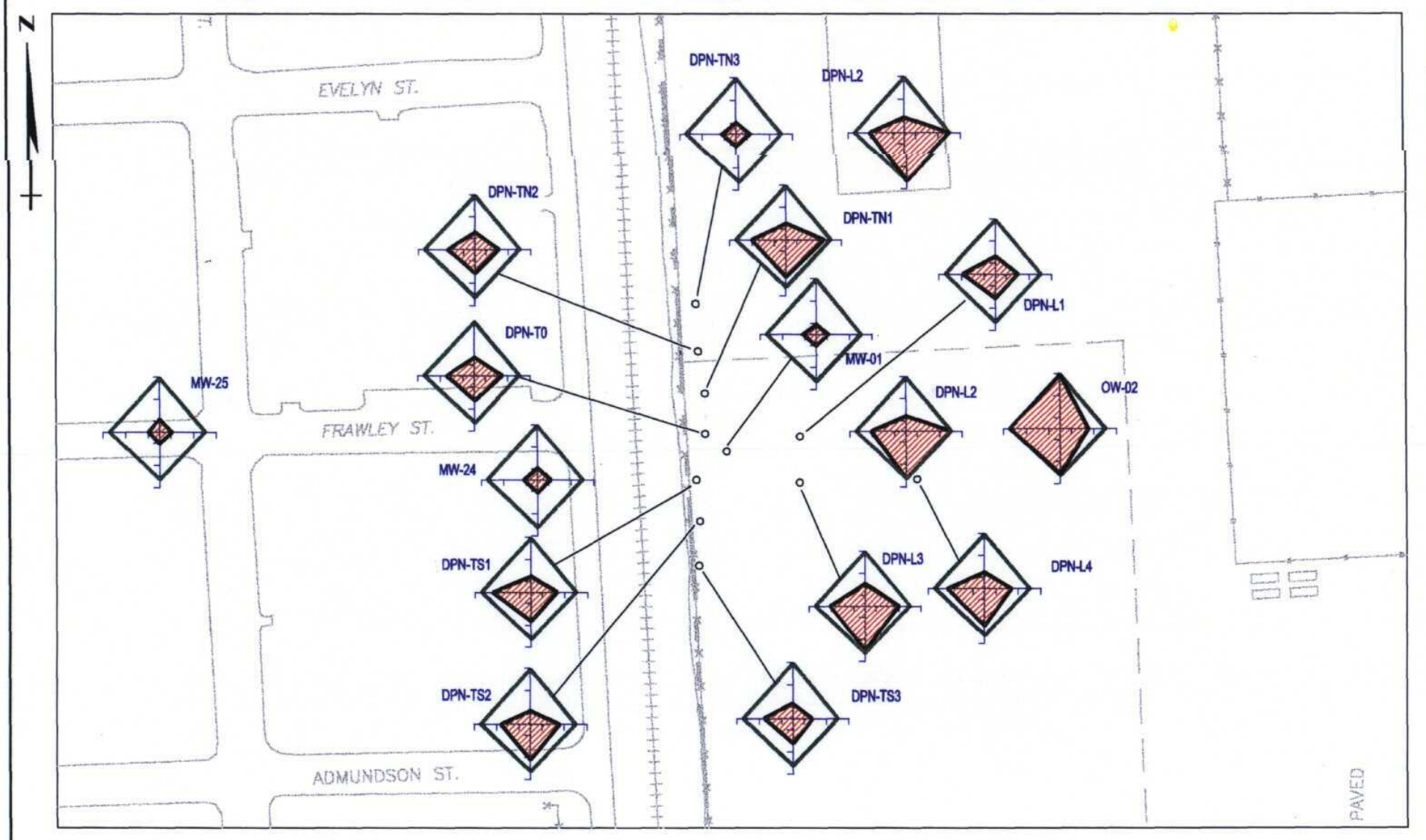
DRAWING NUMBER 99-785

FIGURE 4-7

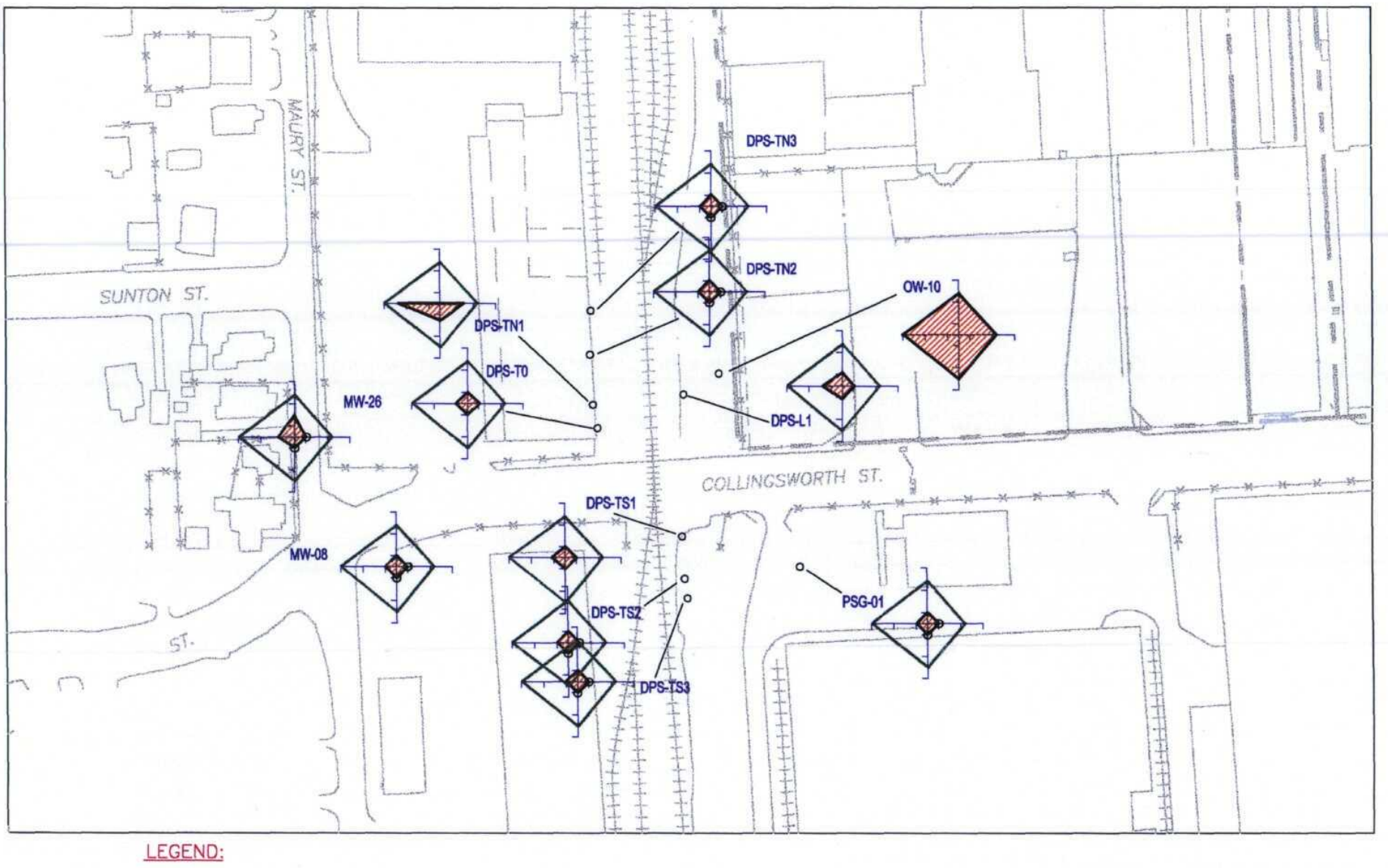
ETF\CAD-G\CAVALCAD\99785\JULY 2000\FIG-4-5.DWG

EDITED BY:	DATE:	TIME:	FILE: ETF\CAD\CAVALCADE\99765\SEQUENCE-FINAL.DWG

NORTH AREA TRANSECT-ORGANICS MAP



SOUTH AREA TRANSECT-ORGANICS MAP



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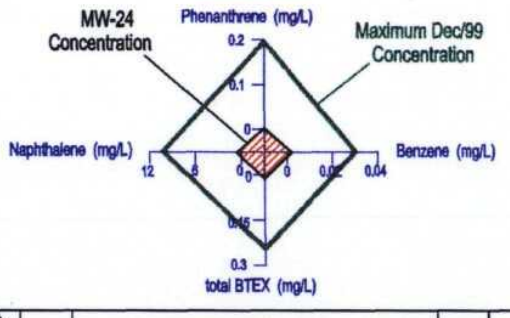

0 60 120 240 FEET

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN:	NEL	DATE:	7/21/00
CHKD:	JRH	DATE:	7/21/00
APPD:	JSZ	DATE:	7/21/00
SCALE:	AS SHOWN		

KEY ENVIRONMENTAL, INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REV #	DATE	DESCRIPTION	APPD
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△			

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

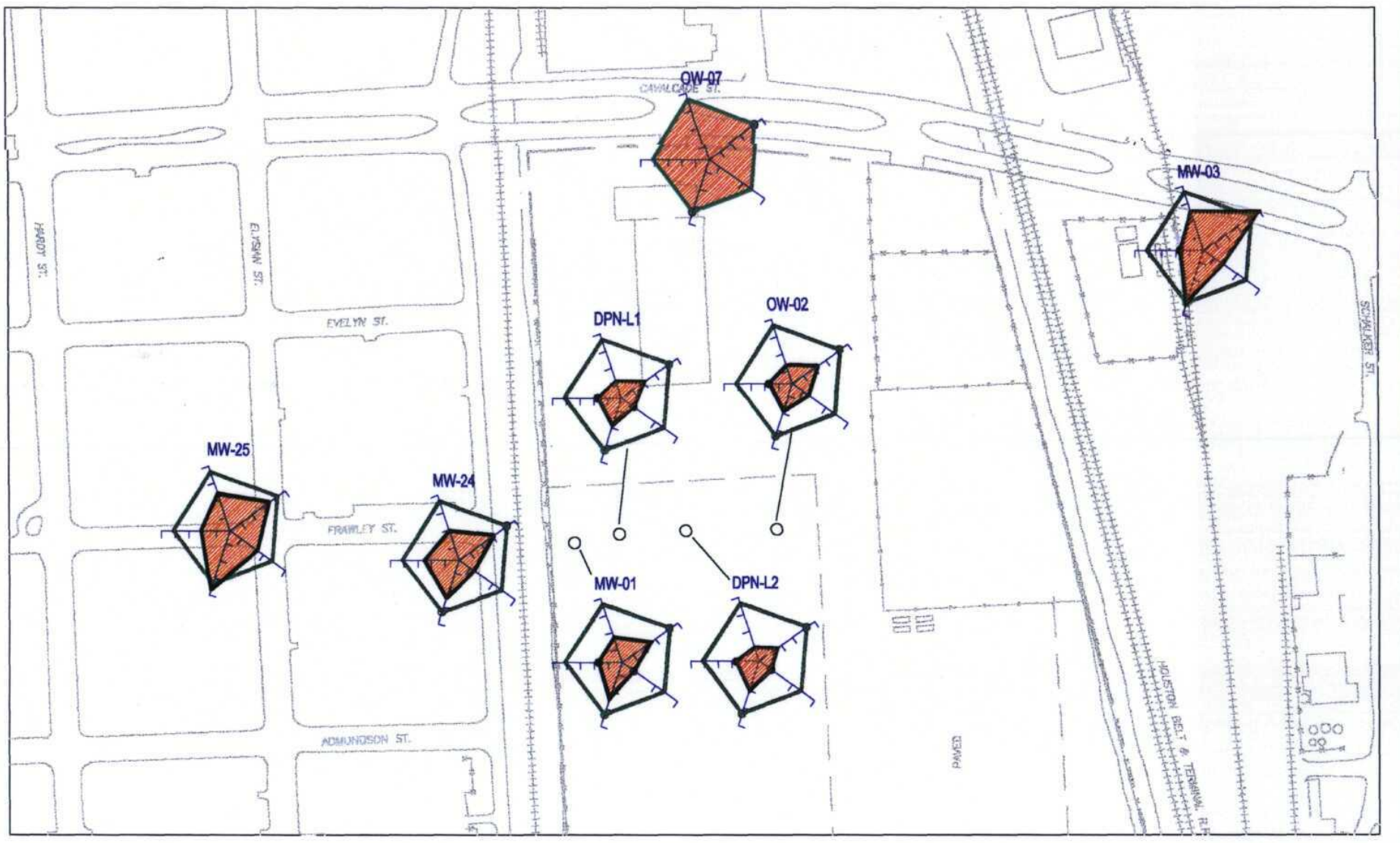
ROSSLYN FARMS INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

SEQUENCE – ORGANICS MAP

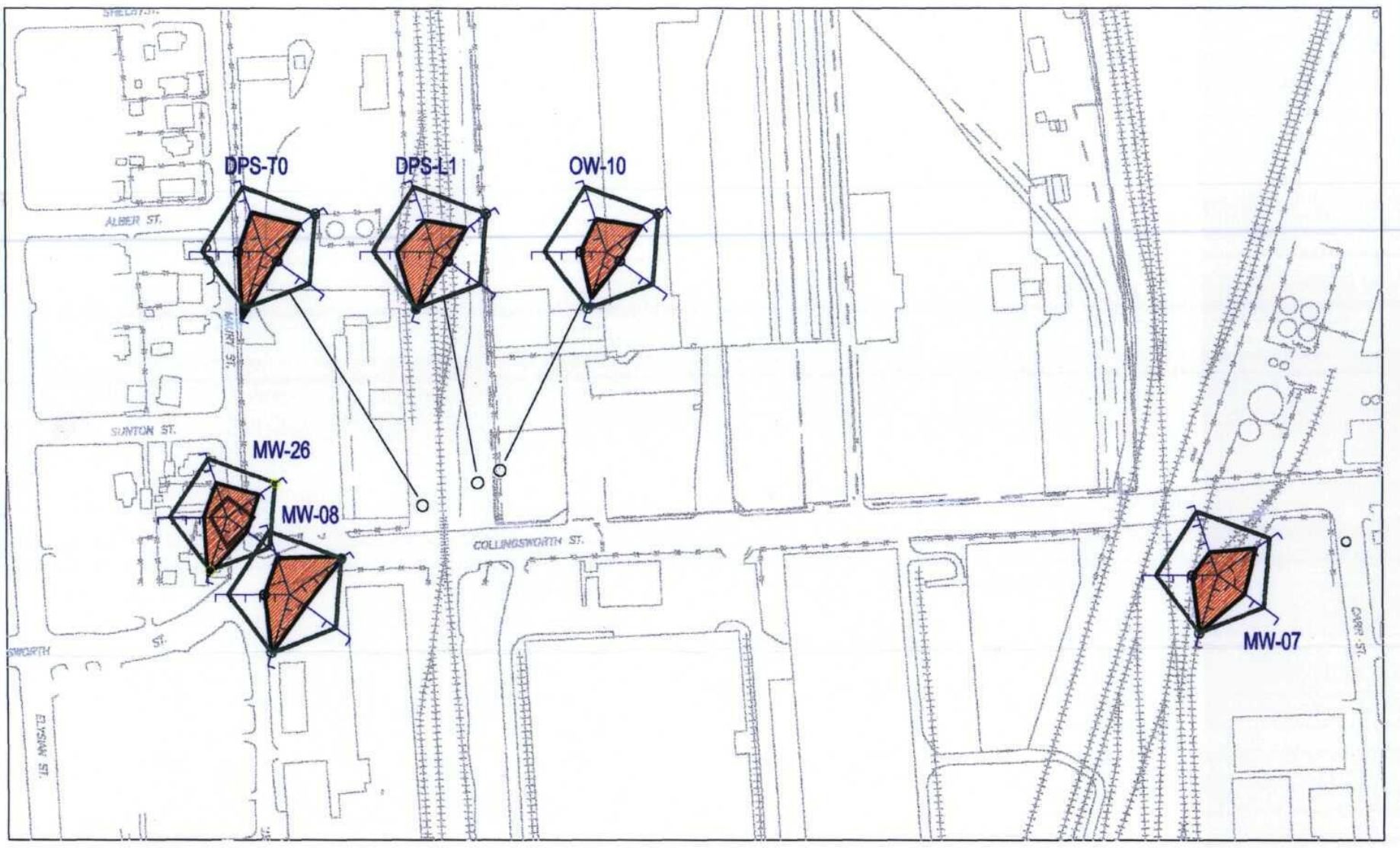
DRAWING NUMBER 99765
FIGURE 4-8

EDITED BY:	DATE:	TIME:	FILE: ETF\CAD\CAVALCADE\99785\SEQUENCE-FINAL.DWG

NORTH AREA-REDOX MAP



SOUTH AREA-REDOX MAP



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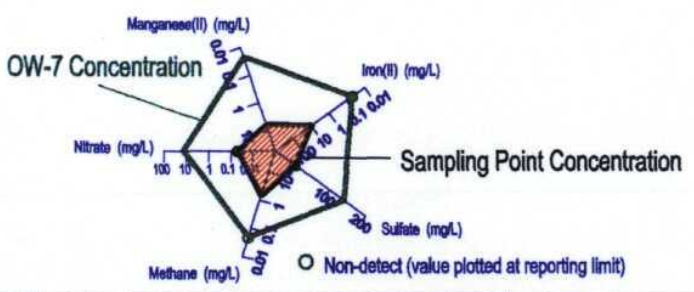


0 100 200 400 FEET

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN:	MEL	DATE:	7/21/00
CHKD:	JRH	DATE:	7/21/00
APPD:	JSZ	DATE:	7/21/00
SCALE:	AS SHOWN		

KEY ENVIRONMENTAL INCORPORATED
GROUNDWATER INSIGHT

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

SEQUENCE – REDOX MAP

DRAWING NUMBER 99785
FIGURE 4-9

REV #	DATE	DESCRIPTION	APPD
△			
△			
△			

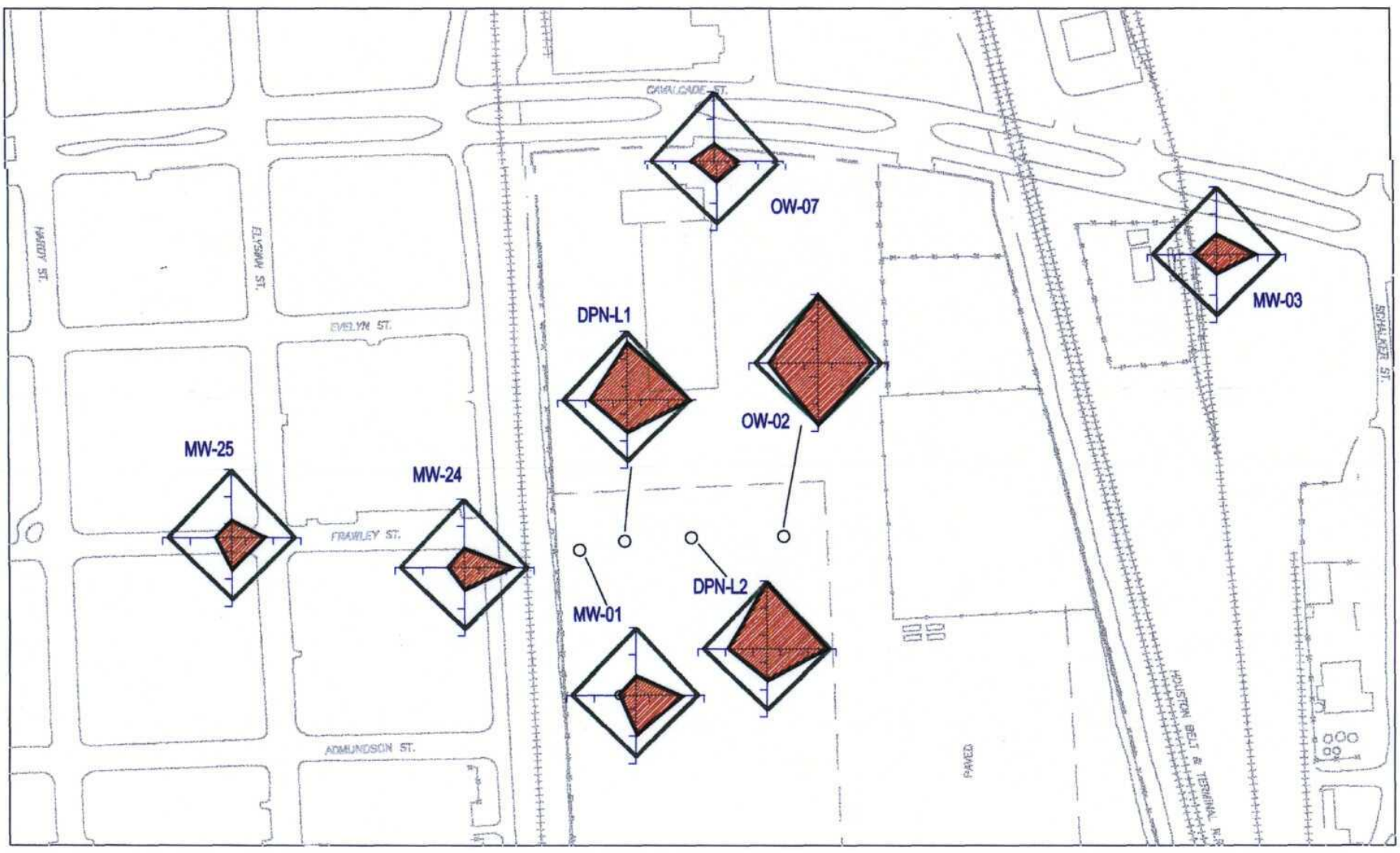
KEY ENVIRONMENTAL, INC.

ISSUE DATE:

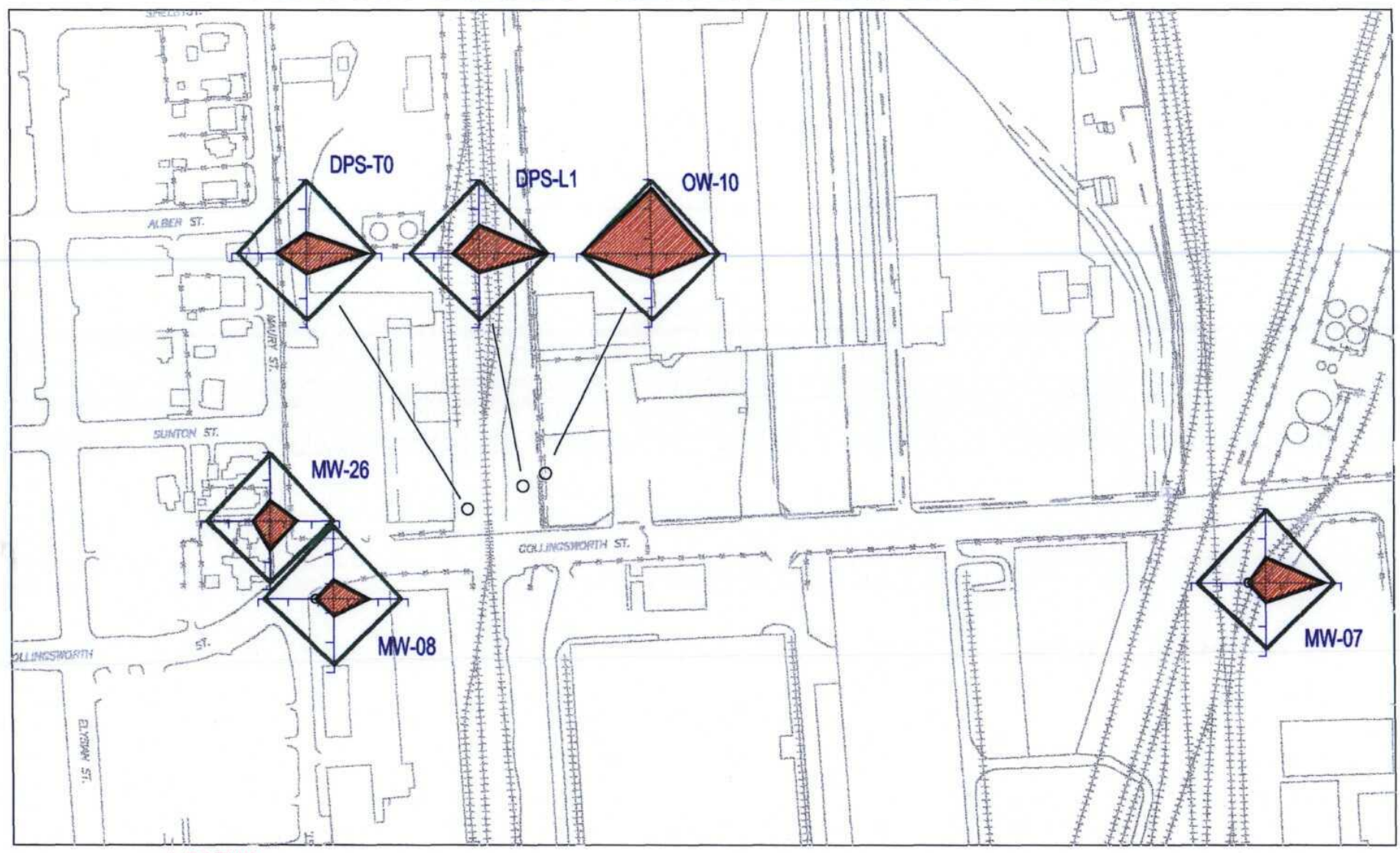
ROSSLYN FARMS INDUSTRIAL PARK
1300 ARCH ST., SUITE 200
CARNEGIE, PA 15106

EDITED BY:	DATE:	TIME:	FILE: ETP\CAD\CAVALCADE\99785\SEQUENCE-FINAL.DWG

NORTH AREA-GEOCHEMISTRY MAP



SOUTH AREA-GEOCHEMISTRY MAP



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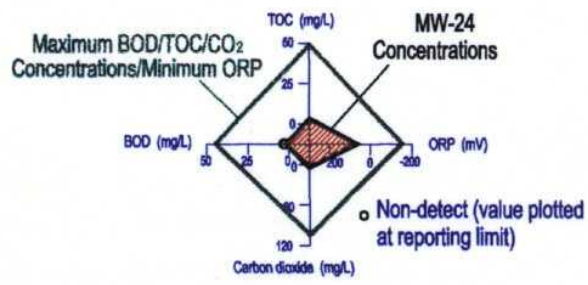


0 100 200 400 FEET

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: MEL	DATE: 7/21/00	KEY ENVIRONMENTAL INCORPORATED GROUNDWATER INSIGHT	
CHKD: JRH	DATE: 7/21/00		
APPD: JSZ	DATE: 7/21/00		
SCALE: AS SHOWN			

VERIFICATION OF GROUNDWATER
FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REV #	DATE	DESCRIPTION	APPD

KEY ENVIRONMENTAL, INC.

ISSUE DATE:

ROSSLYN FARMS INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

SEQUENCE – GEOCHEMISTRY MAP

DRAWING NUMBER 99785
FIGURE 4-10

APPENDIX A
DESCRIPTION OF FIELD IMPLEMENTATION

Hydraulic Gradients and Groundwater Flow Directions

Groundwater potentiometric measurements were obtained for the shallow silty sand unit using an electronic water level indicator tape graduated in hundredths of feet.

Organic Carbon Concentration

Soil samples were collected from within the aquifer in the north and south areas of the site by using direct push techniques (e.g. Geoprobe). The samples were collected from four direct-push boring locations, two in the north area (DPN-TN3 & DPN-TS3) and two in the south area (DPS-TN3 & DPS-TS3). There were two samples taken from each boring location, one from the upper half and one from the lower half of the silty sand unit. Immediately after the samples were collected they were placed on ice and shipped by way of Federal Express to STL Savannah Laboratories within the holding times for analyses.

Physical Properties of the Aquifer Matrix

Soil samples were collected from within the aquifer in the north and south areas of the site by using direct push techniques (e.g. Geoprobe). The samples were collected from four direct-push boring locations, two in the north area (DPN-TN3 & DPN-TS3) and two in the south area (DPS-TN3 & DPS-TS3). There were two samples taken from each boring location, one from the upper half and one from the lower half of the silty sand unit. Immediately after the samples were collected they were placed on ice and shipped by way of Federal Express to Geotechnics Laboratories for analyses.

DNAPL Properties

A total of four DNAPL samples were collected to evaluate the DNAPL physical properties. One sample was collected from each of the four existing DNAPL recovery wells. The sequence of recovery wells sampled were, RWS-1, RWS-2, RWS-5, and RWN-4. These samples were collected on the same day, then they were picked up by a laboratory representative from Texas Oiltech Laboratories for analyses.

Plume Core Location

Groundwater samples for BTEX and PAH analyses were collected along transects that were located transverse to groundwater flow direction and directly downgradient of the north and south PDSAs. Seven sample locations were selected in each area to define the plume core in the north and south

areas. The sample points were named and located as follows:

- Direct Push North - Transect 0 (DPN-T0)
  Located on the assumed axis of the north plume.

- Direct Push North - Transect North 1-3 (DPN-TN1 – DPN-TN3).
  These points are located north of DPN-T0, DPN-TN1 being the closest and DPN-TN3 being the farthest.

- Direct Push North - Transect South 1-3 (DPN-TS1 – DPN-TS3).
  These points are located south of DPN-T0, DPN-TS1 being the closest and DPN-TS3 being the farthest.

- Direct Push South - Transect 0 (DPS-T0)
  Located on the assumed axis of the south plume.

- Direct Push South - Transect North 1-3 (DPS-TN1 – DPS-TN3).
  These points are located north of DPS-T0, DPS-TN1 being the closest and DPS-TN3 being the farthest.

- Direct Push South - Transect South 1-3 (DPS-TS1 – DPS-TS3).
  These points are located south of DPS-T0, DPS-TS1 being the closest and DPS-TS3 being the farthest.

- All points are spaced approximately 40 feet apart.

Samples were collected from the shallow, saturated, silty sand unit as confirmed by stratigraphic logging (Appendix B). Groundwater samples were collected at two foot intervals throughout the saturated portion of the silty sand unit. The samples were collected through low density polyethylene tubing, siphoned by a syringe. Immediately after the samples were collected they were taken to the Mobile Laboratory that was on-Site to be analyzed for benzene and naphthalene.

After receiving the analytical results from the Mobile Laboratory, temporary one inch PVC piezometers were placed at each point with two foot screened intervals at the greatest concentration of benzene and/or naphthalene. Groundwater samples were collected from the temporary piezometers at each location using a peristaltic pump. Immediately after the samples were collected

they were placed on ice and then shipped by way of Federal Express to STL Savannah Laboratories within the holding times for analyses.

Intrinsic Biodegradation

One round of groundwater biodegradation indicator data were collected from select locations for the MNA set and Microbial set. Groundwater samples were collected by a peistaltic pump and soil samples were collected by direct push sampling at the screened interval. Immediately after the samples were collected they were placed on ice. The samples were shipped by way of Federal Express to the applicable laboratory within the holding times for analyses.

Downgradient Extent of COI

Groundwater samples for BTEX and PAH were collected at sample locations longitudinally along the estimated plume cores of the north and south areas. Four sample points were placed in the north area:

- Direct Push North - Longitudinal 1 & 2 (DPN-L1 & L2).
  These points are located upgradient and directly in line with DPN-T0, DPN-L1 being closest and DPN-L2 being the farthest.

- Direct Push North - Longitudinal 3 & 4 (DPN-L3 & L4).
  These points are located upgradient and directly in line with DPN-TS1, DPN-L3 being closest and DPN-L4 Being farthest.

- All points are spaced approximately 40 feet apart.

In the south area there was only one sample point placed, Direct Push South - Longitudinal 1 (DPS-L1). This point is located upgradient and directly in line with DPN-T0, approximately 40 feet apart. The sampling procedures for these locations were the same as described above, in the Plume Core Location section.

Groundwater samples were also collected from downgradient monitoring wells in both the north (MW-24 and MW-25) and south areas (MW-08 and MW-26). Monitoring wells MW-24, MW-25 and MW-26 are new wells. These wells are located off-site and downgradient of their respective PDSAs. Groundwater samples were collected from each of these wells using a peristaltic pump.

pump. Immediately after the samples were collected they were placed on ice and then shipped by way of Federal Express to STL Savannah Laboratories within the holding times for analyses.

Supplemental Locations

Groundwater samples for BTEX and PAH analyses were collected along the perimeter of the target zones. Two sample locations were placed south of the south PDSA, located in the American Warehouses facility. Four sample locations were placed in between the north and the south areas, located onsite. Using direct-push methods, there were temporary one inch PVC piezometers placed at each location with a 2-foot screened interval at the bottom of the silty sand unit. Groundwater samples were collected from each piezometer using a peristaltic pump. Immediately after the samples were collected they were placed on ice and then shipped by way of Federal Express to STL Savannah Laboratories within the holding times for analyses.

APPENDIX B
SOIL BORING / MONITORING WELL LOGS

KEY ENVIRONMENTAL INCORPORATED	Started: 12/01/99	Borehole ID: DPN-T0
	Completed: 12/01/99	Elevation: 51.45'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20.5'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JRH

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50								
		SS-1		Push		SM		
					1.2 ppm			Grayish brown, mottled; fine SAND w/silt; dry.
		SS-2		Push				
	5				0.3 ppm			Grayish brown, mottled; fine SAND w/silt; dry (0.2').
								Grayish brown, mottled; clayey SILT w/fine sand; dry.
45		SS-3		Push		SM/SC		
					1.3 ppm			
		SS-4		Push		SM		Grayish brown; sandy SILT w/clay; moist.
					1.9 ppm			
	10	SS-5		Push				Grayish tan; fine SAND; moist.
					1.8 ppm			
40								Grayish tan; fine SAND; wet.
	15							
35								
	20					CL		
30								Silty CLAY @ 20.25' bgs; dry-moist

KEY ENVIRONMENTAL INCORPORATED	Started: 12/01/99	Borehole ID: DPN-L1
	Completed: 12/01/99	Elevation: 51.45'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 19'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JZ

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50								
		SS-1		Push		ML		
					1.2 ppm			Brownish gray, orange mottles; clayey SILT, trace fine sand; dry.
		SS-2		Push				
	5				0.2 ppm			Brown gray, orange mottles; clayey SILT, some fine sand; dry.
45		SS-3		Push				
					0 ppm			Brown gray, orange mottles; clayey SILT, some fine sand; dry.
						SM		Brown gray, some black staining; silty SAND, trace clay; no odor. (7.75')
		SS-4		Push				
					0 ppm			Brown gray, orange mottles, some black staining; silty SAND, trace clay; no odor.
	10	SS-5		Push				
								Brown gray, orange mottles, some black staining; silty SAND, trace clay; wet; no odor.
40								Light gray; fine SAND, trace silt; slight odor; wet.
	15							
35								
						CL		
	20							Red brown; CLAY
30								

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPN-L2
	Completed: 12/02/99	Elevation: 51.67'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 19'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JRH

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push	0 ppm	SM		Brown; fine SAND w/ silt; dry
50		SS-2		Push	0 ppm			Brown; fine SAND w/silt, trace clay; dry.
		SS-3		Push		ML		Mottled, brown & gray; clayey SILT, w/fine sand; dry.
	5				0 ppm			
		SS-4		Push		SM		
45					0 ppm			Gray-tan; silty fine SAND; moist.
		SS-5		Push				Mottled brown-tan; silty fine SAND; moist (0.75').
					0 ppm			Gray-tan; fine SAND; moist (0.6').
	10	SS-6		Push				
					0 ppm			
40								Gray-tan; fine SAND; wet.
	15							
35								
						CL		
	20							Brown; plastic, stiff; clay; dry. (18.8-19')
30								

KEY ENVIRONMENTAL INCORPORATED	Started: 12/01/99	Borehole ID: DPN-TN1
	Completed: 12/01/99	Elevation: 51.41'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 19'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JZ

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50								
		SS-1		Push	0 ppm	SM		Grayish brown; fine SAND, some silt.
		SS-2		Push	0 ppm	ML		Brownish gray; clayey SILT, some fine sand.
	5							
45		SS-3		Push	0 ppm	SM		Brownish gray; sandy SILT, trace clay.
								Brownish gray; clayey SILT, some fine sand (7.5').
		SS-4		Push	0 ppm			Brownish gray: clayey silt, some fine sand.
	10							Brownish gray; silty SAND; wet; no odor.
								No sample; running sand unit.
40								
	15							
35								
						CL		Reddish brown/gray; silty CLAY.
	20							
30								

KEY ENVIRONMENTAL INCORPORATED	Started: 11/30/99	Borehole ID: DPN-TN2
	Completed: 11/30/99	Elevation: 51.52'
Project Name: Cavalcade GIS		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20.50'
Location: South Cavalcade Site		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JRH

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push	1.2 ppm	FL		Asphalt/concrete (0-1'). SAND/GRAVEL road base(1-1.5').
50		SS-2		Push	1.6 ppm	ML		Grayish brown; clayey SILT, trace fine sand(1.5-2'). Grayish brown; clayey SILT, trace fine sand (2-3'); dry to moist.
		SS-3		Push	1.8 ppm	SM		Grayish brown; silty SAND (3-4'); dry-moist. Grayish tan; fine SAND w/silt; dry-moist.
		SS-4		Push	2 ppm			Mottled, tan-brown; fine SAND w/silt; dry-moist.
		SS-5		Push	3.1 ppm			Mottled, gray-brown; silty SAND; dry-moist.
	10	SS-6		Push	0.8 ppm			Increased moisture below 9'. Mottled, gray-brown; silty SAND; moist (10-10.3').
40		SS-7		Push	2.3 ppm			Gray-tan; fine-medium SAND w/ silt; wet (10.3-12'). Gray-tan; fine-medium SAND w/silt; wet.
		SS-8		Push	3.5 ppm			Gray-tan; fine-medium SAND w/silt; wet-sat; borehole collapsing.
	20					CL		Red-brown; stiff; CLAY (20.5').
30								

KEY ENVIRONMENTAL INCORPORATED	Started: 11/30/99	Borehole ID: DPN-TN3
	Completed: 11/30/99	Elevation: 51.33'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 21'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JZ

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push		FL		Asphalt/concrete (0-1').
50								SAND/GRAVEL road base (1-1.5'). Grayish brown; clayey SILT, trace fine sand (1.5-2').
		SS-2		Push		ML		Grayish brown; clayey SILT, trace fine sand; dry.
		SS-3		Push		SM		
	5							Brown; fine SAND, some silt; dry.
45		SS-4		Push				Brown; fine SAND, some silt; dry.
		SS-5		Push				Grayish brown; silty CLAY (7-7.5'). Brown; silty SAND; damp(7.5-8').
								Brownish gray; silty SAND; wet.
	10	SS-6		Push				Gray; fine SAND, trace silt, trace medium sand; wet.
40								
		SS-7		Push				Gray; fine SAND, trace silt, trace medium sand; wet.
		SS-8		Push				
	15							Gray; fine SAND, trace silt, trace medium sand; wet.
35								No sample.
		SS-9		Push				Gray; fine SAND, trace silt, trace medium sand; wet.
		SS-10		Push				
	20							Gray; fine SAND, trace silt, trace medium sand; wet.
						CL		Red/brown-gray; silty CLAY (20.5').
30								

KEY ENVIRONMENTAL INCORPORATED	Started: 12/01/99	Borehole ID: DPN-TS1
	Completed: 12/01/99	Elevation: 50.19'
Project Name: Cavalcade GIS		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 17.00'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JZ

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50								
		SS-1		Push		SM		Brownish gray; silty SAND, trace clay; dry.
		SS-2		Push				Mottled brownish gray; sandy SLIT, trace clay; dry.
		SS-3		Push				Mottled brownish gray; sandy SILT, some clay; damp.
		SS-4		Push				Mottled brownish gray; sandy SILT, some clay; damp.
40	10							Gray; fine SAND, some silt; wet.
						CL		Red brown; silty CLAY.
30	20							

KEY ENVIRONMENTAL INCORPORATED	Started: 12/01/99	Borehole ID: DPN-TS2
	Completed: 12/01/99	Elevation: 50.69'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JRH

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50								
		SS-1		Push	0 ppm	SM		Mottled, gray-brown; silty fine SAND; dry.
		SS-2		Push	0 ppm	ML		Mottled, gray-tan brown; clayey SILT w/fine sand; dry.
	5							
45		SS-3		Push	0 ppm	SM		Mottled, gray-brown-tan; sily SAND, trace clay (6-7.3').
		SS-4		Push	0 ppm			Gray-tan; fine SAND; moist (7.3-8'). Gray-tan; fine SAND; moist 8-9', wet 9-10'
	10							
40								
	15							
35						CL		Brown CLAY (stiff & plastic).
	20							
30								

KEY ENVIRONMENTAL INCORPORATED	Started: 12/01/99	Borehole ID: DPN-TS3
	Completed: 12/01/99	Elevation: 50.66'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JRH

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50								
		SS-1		Push	0 ppm	SM		Mottled, gray-brown; silty fine SAND, trace clay, dry.
		SS-2		Push	0.3 ppm	ML		Mottled, gray/brown; silty SAND, trace clay; moist.
45	5	SS-3		Push	0.2 ppm	SM		Mottled, gray-brown; silty SAND; moist.
		SS-4		Push	0.2 ppm			Mottled, grayish tan-brown; fine SAND; moist-wet.
40	10	SS-5		Push	0 ppm			Greenish gray/tan; fine SAND, wet.
35	15							
30	20					CL		Brown; stiff, plastic; CLAY (19.7-20').

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPS-T0
	Completed: 12/02/99	Elevation: 48.74'
Project Name: Cavalcade GIS		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20.00'
Location: South Cavalcade Site		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JZ

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push		CL		Brownish gray, orange mottles; silty CLAY trace fine sand; dry.
						ML		Brownish gray, orange mottles; clayey SILT.
		SS-2		Push		CL		Brownish gray, orange mottles; clayey SILT; Mottled, brownish gray; CLAY fine sand as a separate lithology throughout; dry; Mn nodule.
		SS-3		Push				Mottled, brownish gray; CLAY, fine sand as a separate lithology throughout, 1" silty sand seam @ 7; dry.
		SS-4		Push				Mottled, brownish gray; CLAY, fine sand as a separate lithology throughout; dry.
40	10	SS-5		Push		SM		Brown-gray; sandy SILT, some clay, saturated lenses of silty sand @ 11.5.
		SS-6		Push				Brown-gray; silty fine SAND, some clay; wet; no odor.
						CL		Red brown, some gray mottling; dense; CLAY.
30	20							

KEY ENVIRONMENTAL INCORPORATED	Started: 12/03/99	Borehole ID: DPS-L1
	Completed: 12/03/99	Elevation: 48.23'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 19'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: EJW

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push		ML		Brown-black; SILT/SAND w/medium-coarse gravel fill, dry (0-2").
45					3.5 ppm			Mottled, grayish brown; silty CLAY w/fine sand, dry.
		SS-2		Push		CL		Mottled, grayish tan-orangish brown; silty CLAY w/fine sand; dry.
	5				1.1 ppm			Slight odor (bottom of sample).
		SS-3		Push				Mottled, grayish tan-orangish brown; silty CLAY w/fine sand; dry.
					2.0 ppm			Slight odor throughout sample.
40		SS-4		Push		ML		Mottled, grayish tan-orangish brown; silty CLAY w/fine sand; dry (0-3").
					1.3 ppm			Gray, w/black mottles; clayey SILT/SAND; moist-wet; stong odor.
	10	SS-5		Push		CL ML		Mottled, grayish tan-orangish brown; silty CLAY w/fine sand; dry (0-3").
					6.3 ppm			Gray, w/black mottles; clayey SILT/SAND; moist-wet (3-24"); strong odor.
		SS-6		Push				Gray w/black mottles; clayey SILT/SAND; moist-wet (0-12").
35					19.9 ppm	SM		Gray; SILT w/fine sand; moist; (12-24") slight odor.
		SS-7		Push				Gray; SILT w/fine sand; saturated (0-12").
	15				9.1 ppm			Grayish tan; silty fine-medium SAND; saturated (12-24"); odor pressent.
30						CL		Reddish brown; dense; CLAY; dry.
	20							

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPS-TN1
	Completed: 12/02/99	Elevation: 49.29'
Project Name: Cavalcade GIS		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 19.00'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: EJW

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
						UK		
		SS-1		Push	0 ppm	CL		Brownish gray, orange mottles; silty CLAY, trace fine sand; dry.
		SS-2		Push	0 ppm			Brownish gray, orange mottles; silty CLAY, trace fine sand, some gravel; dry.
		SS-3		Push	0 ppm			Brownish gray, orange mottles; silty CLAY, trace fine sand; dry.
		SS-4		Push	0 ppm			Brownish gray, orange mottles; silty CLAY, trace fine sand; dry
40	10							No recovery
30	20					CL		Brown/gray; stiff/plastic; CLAY.

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPS-TN2
	Completed: 12/02/99	Elevation: 49.26'
Project Name: Cavalcade GIS		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20.00'
Location: South Cavalcade Site		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: EJW

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push	4.7 ppm	CL		Brown; silty CLAY w/fine sand; moist (0-14").
		SS-2		Push	0.9 ppm			Brownish gray, w/orange mottles; silty CLAY w/fine sand; dry (14-24"). Brownish gray, w/orange mottles; silty CLAY w/fine sand; moist.
		SS-3		Push	1.1 ppm			Grayish tan, w/orange mottles; dense; silty CLAY w/fine sand; dry-moist.
		SS-4		Push	0.6 ppm			Grayish tan, w/orange mottles; dense; silty CLAY w/fine sand; dry-moist.
40	10	SS-5		Push	7.2 ppm	SM		Mottled, grayish tan-orange; 2" of mineralization; SILT and fine SAND; dry-moist.
30	20					CL		Reddish brown; dense; CLAY; dry-moist.

KEY ENVIRONMENTAL INCORPORATED	Started: 12/06/99	Borehole ID: DPS-TN3
	Completed: 12/06/99	Elevation: 49.00'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: EJW

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push		FL		
					0.2 ppm	CL		Brownish; shelly FILL (0-6").
								Brown; soft; silty CLAY w/fine sand; moist (6-20").
		SS-2		Push				
					2.1 ppm			Brown; soft; silty CLAY w/fine sand; moist (0-12").
45		SS-3		Push				Brownish gray, w/orange mottles; silty CLAY w/trace sand; dry.
	5				0 ppm			Brownish gray, w/orange mottles; silty CLAY w/trace sand; dry
		SS-4		Push				
					0 ppm			Brownish gray, w/orange mottles; silty CLAY w/sand; moist.
		SS-5		Push				
40					0 ppm			Brownish gray, w/orange mottles; silty CLAY w/ saturated clayey silt zones @ (4-6" and 13-17")
	10	SS-6		Push		SM		
					0 ppm			Brownish gray, w/orange mottles; silty SAND w/ trace clay; dry.
		SS-7		Push				
					0 ppm	ML		Brownish Gray; silty SAND; saturated (0-16").
35	10							Brownish gray; clayey SILT and SAND; dry (16-24").
30	20					CL		Mottled, red/gray; dense; CLAY; dry.

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPS-TS1
	Completed: 12/02/99	Elevation: 50.19'
Project Name: Cavalcade GIS		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 21.00'
Location: South Cavalcade Site		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: JRH

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
50		SS-1		Push	0 ppm	FL		Brown; fine-coarse FILL; dry (0-1.5'bgs).
		SS-2		Push	0 ppm	ML		Brown; silty CLAY; dry(1.5-1.7'bgs). Brown; clayey SILT/SAND; dry.
		SS-3		Push	0 ppm			Mottled, brown-gray; clayey SILT/SAND; dry-moist; fossiliferous.
		SS-4		Push	0 ppm			Brown/gray; clayey SILT; dry.
		SS-5		Push	0 ppm			Grayish tan, mottled (blk & yellow-br mottles); clayey SILT; dry.
40	10	SS-6		Push	0 ppm			Mottled, brown/gray; clayey SILT; dry.
		SS-7		Push	0 ppm	SM		Mottled, brown-gray-tan; clayey SILT; dry(12-12.5'). Grayish tan; fine sand; moist (12.5-14').
		SS-8		Push	0 ppm			Grayish tan; silty fine SAND; moist-wet.
		SS-9		Push	0 ppm			Grayish tan; fine SAND; wet-saturated.
		SS-10		Push	0.6 ppm			
30	20					CL		Brown-gray; CLAY; odor.

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPS-TS2
	Completed: 12/02/99	Elevation: 49.93'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 20'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: EJW

Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push	0 ppm	FL		Brown; fine-coarse FILL; dry.
		SS-2		Push	0 ppm	ML		Brown; clayey SILT; moist.
		SS-3		Push	0 ppm			Mottled, brown-gray; clayey SILT/SAND, moist; some shell fragments.
45	5	SS-4		Push	0 ppm			Mottled, brown-gray; clayey SILT/SAND; moist.
		SS-5		Push	0 ppm			Mottled, brown-gray; clayey SILT/SAND; moist.
40	10	SS-6		Push	0 ppm			Mottled, brown-gray; clayey SILT; moist.
		SS-7		Push	0 ppm	SM		Grayish tan; fine SAND; moist.
		SS-8		Push	0 ppm			Grayish tan; fine SAND; moist.
35	15							Grayish tan; fine SAND; saturated.
30	20					CL		Brown-gray; CLAY (19.8).

KEY ENVIRONMENTAL INCORPORATED	Started: 12/02/99	Borehole ID: DPS-TS3
	Completed: 12/02/99	Elevation: 49.50'
Project Name: South Cavalcade		Datum: Mean Sea Level
Project Number: 99785		Total Depth: 21'
Location: Houston, TX		Drilling Method: Direct Push (Split Spoon)
Contractor: TEG		Logged By: EJW

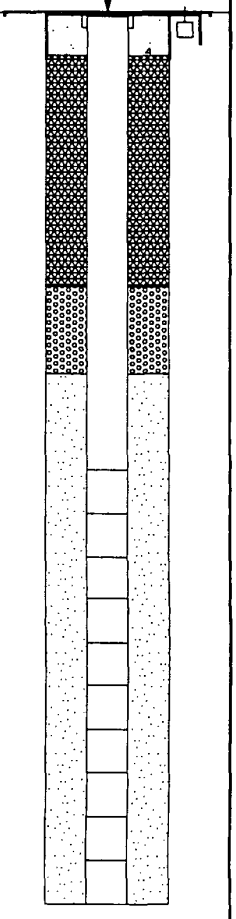
Elevation (ft)	Depth (ft)	Sample No.	Recovery	Blow Count	PID	USCS Code	Graphic Log	Material Description
		SS-1		Push	0 ppm	FL		Brown-tan; FILL w/shell pieces.
		SS-2		Push	0 ppm	ML		Brown; clayey SILT; dry (0-6").
								Mottled, brown-gray; clayey SILT w/some sand moist.
45		SS-3		Push				Mottled, brown-gray; clayey SILT w/some sand; moist.
	5				0 ppm			
		SS-4		Push	0 ppm			Mottled, brown-gray; clayey SILT w/trace sand; moist.
		SS-5		Push	0 ppm			Mottled, brown-gray; clayey SILT w/sand lenses; moist.
40	10	SS-6		Push	0 ppm			Mottled, brown-gray; clayey SILT; moist.
		SS-7		Push	0 ppm	SM		Mottled, brown-gray; clayey SILT; moist (0-5"). Grayish-tan; SAND/SILT; moist (5-17").
35	15	SS-8		Push	0 ppm	ML		Gray-tan; SILT/CLAY; moist (0-15").
						SM		Gray-tan; fine SAND; wet (15-24").
30	20					CL		Green/red, mottled; CLAY grading to a reddish CLAY; odor.

KEY ENVIRONMENTAL INCORPORATED	Site ID: MW-24	Location: South Cavalcade Site
	Contractor: FUGRO	Ground Surface Elevation (ft-msl): 52.01'
	Consulting Firm: Key Environmental	Datum: Mean sea Level
	Logged By: JRH	Date(s): 12/13/99 - 12/13/99
Type: Monitoring Well, Shallow		Riser Casing: type: PVC dia: 2.00in fm: 0.1' to: 10.50'
Drilling Method: 4 1/4" ID Hollow Stem Auger		Screens: type: Slotted size: 0.010in dia: 2.00in fm: 10.50' to: 20.50'
Well Construction Materials:: type: Portland Cement Surface Seal fm: 0.00' to: 1.00'; type: Bentonite Grout fm: 1.00' to: 6.30'; type: Bentonite Pellets fm: 6.30' to: 8.30'		SOUTH CAVALCADE SUPERFUND SITE HOUSTON, TEXAS

Elevation (ft-msl)	Depth (ft-bgs)	Recovery	Sample No.	Blow Count	USCS Code	PID (ppm)	Graphic Log	Material Description
			SS-1	Push	SM			Brown fine SAND; dry, organic debris @ top.
50			SS-2	Push	ML			Mottled, tan-gray-brown SILT w/sand, trace clay; dry.
			SS-3	3 4 4		0 ppm		Loose; mottled, tan-gray-brown SILT w/sand, trace clay; dry.
			SS-4	2 2 2	SM			Loose; mottled, brown-tan; fine SAND w/silt; dry.
			SS-5	2 3 3		0 ppm		Loose; mottled, brown-tan; fine SAND w/silt; moist @ 9.5'.
	10		SS-6	2 4 6		0 ppm		Loose; gray/tan fine SAND; wet.
40			SS-7	4 6 7		0 ppm		Loose; gray/tan fine SAND; wet.
			SS-8	4 6 7				Tan-gray; fine SAND; saturated.
			SS-9	5 6 11		0 ppm		Tan-gray; fine SAND; saturated (running sands).
			SS-10	3 4 5		0.3 ppm		Tan-gray; fine SAND; saturated (19-19.5').
	20				CL			Mottled, gray-brown; stiff plastic clay; odor; dry (19.5-20').
								Auger to 20.5' bgs.
30								

Well Construction

MP. EL. 51.99



KEY ENVIRONMENTAL INCORPORATED	Site ID: MW-25	Location: Houston, TX
	Contractor: Fugro Geosciences	Ground Surface Elevation (ft-msl): 51.79'
	Consulting Firm: Key Environmental	Datum: Mean Sea Level
	Logged By: J. Hale	Date(s): 04/11/00 – 04/15/00
Type: Monitoring Well, Shallow		Riser Casing: type: PVC dia: 2.00in fm: 0.0' to: 7.75'
Drilling Method: 4 1/4" ID Hollow Stem Auger, Direct Push		Screens: type: Slotted size: 0.010in dia: 2.00in fm: 7.75' to: 17.75'
Well Construction Materials:: type: Bentonite Grout fm: 0.00' to: 3.75'; type: Bentonite Pellets fm: 3.75' to: 5.75'; type: Sand Pack (generic) fm: 5.75' to: 18.00'		SOUTH CAVALCADE SUPERFUND SITE HOUSTON, TEXAS

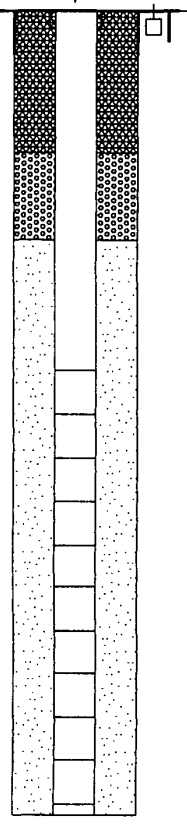
Elevation (ft-msl)	Depth (ft-bgs)	Recovery	Sample No.	Blow Count	USCS Code	PID (ppm)	Graphic Log	Material Description	Well Construction (MP. EL. 51.72)
50								Hand Auger	
			DP-01		SM	0 ppm		Mottled, light gray (10YR 7/1) and yellowish brown (10YR 5/8); f. SAND and SILT; dry to moist.	
			DP-02		SM/SP	0 ppm		Same as above to 9.7 ft-bgs; light gray (10YR 7/1); f. SAND; moist to wet (9.7 ft-bgs. to 12 ft-bgs.).	
40	10		DP-03		SP	0 ppm		Light gray (10YR 7/1); f. SAND; saturated.	
			DP-04		SP/CL	0 ppm		Same as above to 17.5 ft-bgs; mottled, strong brown (7.5YR 4/6) light greenish gray (1 Gley 7/10Y); CLAY; moist.	
30	20								

KEY ENVIRONMENTAL INCORPORATED	Site ID: MW-26	Location: Houston, TX
	Contractor: Fugro Geosciences	Ground Surface Elevation (ft-msl): 48.44'
	Consulting Firm: Key Environmental	Datum: Mean Sea Level
	Logged By: J. Hale	Date(s): 04/11/00 - 04/15/00
Type: Monitoring Well, Shallow		Riser Casing: type: PVC dia: 2.00in fm: 0.0' to: 8.25'
Drilling Method: 4 1/4" ID Hollow Stem Auger, Direct Push		Screens: type: Slotted size: 0.010in dia: 2.00in fm: 8.25' to: 18.25'
Well Construction Materials:: type: Bentonite Grout fm: 0.00' to: 3.25'; type: Bentonite Pellets fm: 3.25' to: 5.25'; type: Sand Pack (generic) fm: 5.25' to: 18.50'		SOUTH CAVALCADE SUPERFUND SITE HOUSTON, TEXAS

Elevation (ft-msl)	Depth (ft-bgs)	Recovery	Sample No.	Blow Count	USCS Code	PID (ppm)	Graphic Log	Material Description
			DP-01					No Recovery
			DP-02		ML	0 ppm		Light Gray (10YR 7/1); clayey SILT; moist
40			DP-03		ML	0 ppm		Light Gray (10YR 7/1); clayey SILT; moist
	10		DP-04		ML/SM	0 ppm		Light Gray (10YR 7/1); clayey SILT; moist grading to silty SAND and f. SAND w/ depth; moist to wet.
30	20		DP-05		ML/CL	0 ppm		Light yellowish brown (10YR 6/4) light gray (10YR 7/2); clayey SILT grading to CLAY @ 18.4 ft-bgs.

Well Construction

MP. EL. 48.35



APPENDIX C
ANALYTICAL LABORATORY REPORTS

Savannah Laboratories
Division of Severn Trent Laboratories, Inc.
5102 LaRoche Avenue · Savannah, GA 31404 · (912) 354-7858 · Fax (912) 352-0165 · www.stlsavlab.com

LOG NO: S9-18204A
Received: 07 DEC 99
Reported: 31 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 152700131

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204A-1	DPN-TN3-1012	12-06-99/15:45	SCB05
18204A-2	DPN-TN3-1618	12-06-99/16:00	SCB05
18204A-3	DPN-TS3-1820	12-06-99/16:45	SCB05
18204A-4	DPN-TS3-1012	12-06-99/16:30	SCB05

PARAMETER	18204A-1	18204A-2	18204A-3	18204A-4
Organic Carbon (WALKLEY-BLACK), mg/kg dw	110U	100J	98J	120U
Dilution Factor	1.0	1.0	1.0	1.0
Prep Date	01.24.00	01.24.00	01.24.00	01.24.00
Analysis Date	01.24.00	01.24.00	01.24.00	01.24.00
Batch ID	0124X	0124X	0124X	0124X
Percent Solids	88	85	88	85

Angie Weimerskirk

Angie Weimerskirk, Project Manager

Savannah Laboratories
Division of Severn Trent Laboratories, Inc.
5102 LaRoche Avenue · Savannah, GA 31404 · (912) 354-7858 · Fax (912) 352-0165 · www.stlsavlab.com

LOG NO: S9-18204
Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-1	DPN-TN3-1012	12-06-99/15:45	SCB01
18204-2	DPN-TN3-1618	12-06-99/16:00	SCB01
18204-3	DPN-TS3-1820	12-06-99/16:45	SCB01
18204-4	DPN-TS3-1012	12-06-99/16:30	SCB01

PARAMETER	18204-1	18204-2	18204-3	18204-4
Total Organic Carbon (9060), mg/kg dw	100U	100U	100U	100U
Dilution Factor	1.0	1.0	1.0	1.0
Prep Date	12.23.99	12.23.99	12.23.99	12.23.99
Analysis Date	12.23.99	12.23.99	12.23.99	12.23.99
Batch ID	1223X	1223X	1223X	1223X

Savannah Laboratories
Division of Severn Trent Laboratories, Inc.
5102 LaRoche Avenue · Savannah, GA 31404 · (912) 354-7858 · Fax (912) 352-0165 · www.stlsavlab.com

LOG NO: S9-18204
Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-5	DPN-L1-120699	12-06-99/14:00	SCB01
18204-5-DL	DPN-L1-120699	12-06-99/14:00	SCB01
18204-6	DPN-L2-120699	12-06-99/15:00	SCB01
18204-6-DL	DPN-L2-120699	12-06-99/15:00	SCB01

PARAMETER	18204-5	18204-5-DL	18204-6	18204-6-DL
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/l	10	---	30	---
Ethylbenzene, ug/l	12	---	34	---
Toluene, ug/l	16	---	51	---
o-Xylene, ug/l	18	---	48	---
m&p-Xylene, ug/l	28.9	---	84	---
Surrogate - a,a,a-Trifluorotoluene	97 %	---	97 %	---
Dilution Factor	2.0	---	2.0	---
Analysis Date	12.10.99	---	12.10.99	---
Batch ID	1D1210	---	1D1210	---
Total Organic Carbon (415.1), mg/l	39		48	
Dilution Factor	1.0	---	1.0	---
Prep Date	12.17.99	---	12.17.99	---
Analysis Date	12.17.99	---	12.17.99	---
Batch ID	1217A	---	1217A	---
Chloride (325.2), mg/l	15		14	
Dilution Factor	1	---	1	---
Prep Date	12.09.99	---	12.09.99	---
Analysis Date	12.09.99	---	12.09.99	---
Batch ID	1209B	---	1209B	---

Savannah Laboratories
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LOG NO: S9-18204
Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-5	DPN-L1-120699	12-06-99/14:00	SCB01
18204-5-DL	DPN-L1-120699	12-06-99/14:00	SCB01
18204-6	DPN-L2-120699	12-06-99/15:00	SCB01
18204-6-DL	DPN-L2-120699	12-06-99/15:00	SCB01

PARAMETER	18204-5	18204-5-DL	18204-6	18204-6-DL
Nitrate-N (353.2), mg/l	0.050U		0.050U	
Dilution Factor	1	---	1	---
Prep Date	12.07.99	---	12.07.99	---
Analysis Date	12.07.99	---	12.07.99	---
Batch ID	1213A	---	1213A	---
Sulfate as SO4 (375.4), mg/l	5.0U		5.0U	
Dilution Factor	1.0	---	1.0	---
Prep Date	12.14.99	---	12.14.99	---
Analysis Date	12.14.99	---	12.14.99	---
Batch ID	1214A	---	1214A	---
Dissolved Gases				
Methane, ug/l	1200	1600D	1100	990D
Carbon Dioxide, ug/l	39000E	43000D	40000E	38000D
Dilution Factor	1.0	2.0	1.0	2.0
Analysis Date	12.20.99	12.20.99	12.20.99	12.20.99
Batch ID	2C1220	2C1220	2C1220	2C1220

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LOG NO: S9-18204
Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-5	DPN-L1-120699	12-06-99/14:00	SCB01
18204-5-DL	DPN-L1-120699	12-06-99/14:00	SCB01
18204-6	DPN-L2-120699	12-06-99/15:00	SCB01
18204-6-DL	DPN-L2-120699	12-06-99/15:00	SCB01

PARAMETER	18204-5	18204-5-DL	18204-6	18204-6-DL
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	21		22	
Dilution Factor		---		---
Prep Date	12.07.99	---	12.07.99	---
Analysis Date	12.07.99	---	12.07.99	---
Batch ID	1207A	---	1207A	---
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	360		340	
Dilution Factor	1.0	---	1.0	---
Prep Date	12.07.99	---	12.07.99	---
Analysis Date	12.07.99	---	12.07.99	---
Batch ID	1207A	---	1207A	---
Ammonia (as N) (350.1), mg/l	0.17		0.39	
Dilution Factor	1	---	1	---
Prep Date	12.09.99	---	12.09.99	---
Analysis Date	12.09.99	---	12.09.99	---
Batch ID	1209A	---	1209A	---

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Sampled By: Client
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-5	DPN-L1-120699	12-06-99/14:00	SCB01
18204-5-DL	DPN-L1-120699	12-06-99/14:00	SCB01
18204-6	DPN-L2-120699	12-06-99/15:00	SCB01
18204-6-DL	DPN-L2-120699	12-06-99/15:00	SCB01

PARAMETER	18204-5	18204-5-DL	18204-6	18204-6-DL
Manganese (Dissolved) (6010)				
Manganese (Dissolved), ug/l	6000	---	9100	---
Dilution Factor	1.0	---	1.0	---
Prep Date	12.31.99	---	12.31.99	---
Analysis Date	01.03.00	---	01.03.00	---
Batch ID	1231I	---	1231I	---
Iron (Dissolved) (6010)				
Iron (Dissolved), ug/l	8700	---	22000	---
Dilution Factor	1.0	---	1.0	---
Prep Date	12.31.99	---	12.31.99	---
Analysis Date	01.03.00	---	01.03.00	---
Batch ID	1231I	---	1231I	---
Ortho-Phosphate-P (365.2), mg/l	0.093		0.10	
Dilution Factor	1.0	---	1.0	---
Prep Date	12.08.99	---	12.08.99	---
Analysis Date	12.08.99	---	12.08.99	---
Batch ID	1208A	---	1208A	---

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Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-5	DPN-L1-120699	12-06-99/14:00	SCB01
18204-5-DL	DPN-L1-120699	12-06-99/14:00	SCB01
18204-6	DPN-L2-120699	12-06-99/15:00	SCB01
18204-6-DL	DPN-L2-120699	12-06-99/15:00	SCB01

PARAMETER	18204-5	18204-5-DL	18204-6	18204-6-DL
Chemical Oxygen Demand (410.1), mg/l	83		110	
Dilution Factor	1.0	---	1.0	---
Prep Date	12.10.99	---	12.10.99	---
Analysis Date	12.13.99	---	12.13.99	---
Batch ID	1210A	---	1210A	---

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Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18204-7	Trip Blank	12-06-99	SCB01

PARAMETER	18204-7
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	103 %
Dilution Factor	1.0
Analysis Date	12.10.99
Batch ID	2D1209

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-1	DPN-TN2-120799	12-07-99/08:25	SCB01
18252-1-DL	DPN-TN2-120799	12-07-99/08:25	SCB01
18252-2	DPN-TN3-120799	12-07-99/09:10	SCB01
18252-2-DL	DPN-TN3-120799	12-07-99/09:10	SCB01
18252-3	DPN-DUP-120799	12-07-99/00:00	SCB01

PARAMETER	18252-1	18252-1-DL	18252-2	18252-2-DL	18252-3
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	11	---	2.0	---	12
Ethylbenzene, ug/l	22	---	0.74J	---	25
Toluene, ug/l	4.3	---	0.89J	---	4.6
o-Xylene, ug/l	18	---	3.3	---	18
m&p-Xylene, ug/l	27	---	3.1	---	31
Surrogate - a,a,a-Trifluorotoluene	93 %	---	97 %	---	93 %
Dilution Factor	2.0	---	1.0	---	2.0
Analysis Date	12.10.99	---	12.10.99	---	12.10.99
Batch ID	1D1210	---	1D1210	---	1D1210

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-1	DPN-TN2-120799	12-07-99/08:25	SCB01
18252-1-DL	DPN-TN2-120799	12-07-99/08:25	SCB01
18252-2	DPN-TN3-120799	12-07-99/09:10	SCB01
18252-2-DL	DPN-TN3-120799	12-07-99/09:10	SCB01
18252-3	DPN-DUP-120799	12-07-99/00:00	SCB01

PARAMETER	18252-1	18252-1-DL	18252-2	18252-2-DL	18252-3
Semivolatile Organics (8270)					
Naphthalene, ug/l	1300E	3900D	480E	800D	1300E
Acenaphthylene, ug/l	10U	200U	10U	40U	10U
Acenaphthene, ug/l	160	170JD	120	160D	170
Fluorene, ug/l	77	76JD	65	78D	75
Phenanthrene, ug/l	28	29JD	1.8J	40U	26
Anthracene, ug/l	3.6J	200U	1.4J	40U	3.2J
Fluoranthene, ug/l	1.1J	200U	0.36J	40U	0.89J
Pyrene, ug/l	1.0J	200U	10U	40U	0.68J
Chrysene, ug/l	1.1J	200U	0.72J	40U	10U
Benzo(a)anthracene, ug/l	1.2J	200U	1.1J	40U	0.72J
Benzo(b)fluoranthene, ug/l	2.5J	200U	3.3J	40U	3.0J
Benzo(k)fluoranthene, ug/l	3.2J	200U	5.2J	40U	4.2J
Benzo(a)pyrene, ug/l	2.9J	200U	4.2J	40U	3.3J
Indeno(1,2,3-cd)pyrene, ug/l	1.0J	200U	1.6J	40U	1.3J
Dibenzo(a,h)anthracene, ug/l	10U	200U	1.4J	40U	1.1J
Benzo(g,h,i)perylene, ug/l	1.5J	200U	1.7J	40U	10U
2-Methylnaphthalene, ug/l	160	160JD	19	21JD	170
Surrogate-2FBP	48 %	X	58 %	X	50 %

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Received: 08 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 171700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-1	DPN-TN2-120799	12-07-99/08:25	SCB01
18252-1-DL	DPN-TN2-120799	12-07-99/08:25	SCB01
18252-2	DPN-TN3-120799	12-07-99/09:10	SCB01
18252-2-DL	DPN-TN3-120799	12-07-99/09:10	SCB01
18252-3	DPN-DUP-120799	12-07-99/00:00	SCB01

PARAMETER	18252-1	18252-1-DL	18252-2	18252-2-DL	18252-3
Surrogate-NBZ	54 %	X	58 %	X	58 %
Surrogate-TPH	30 %	X	14 %	X	24 %
Dilution Factor	1.0	20.0	1.0	4.0	1.0
Prep Date	12.10.99	12.10.99	12.10.99	12.10.99	12.10.99
Analysis Date	12.15.99	12.16.99	12.15.99	12.16.99	12.15.99
Batch ID	1210A	1210A	1210A	1210A	1210A

X = Because the sample was diluted prior to analysis, the surrogate recoveries are not reported.

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-3-DL	DPN-DUP-120799	12-07-99/00:00	SCB01
18252-4	DPN-TN1-120799	12-07-99/13:40	SCB01
18252-4-DL	DPN-TN1-120799	12-07-99/13:40	SCB01
18252-5	DPN-T0-120799	12-07-99/14:10	SCB01
18252-5-DL	DPN-T0-120799	12-07-99/14:10	SCB01

PARAMETER	18252-3-DL	18252-4	18252-4-DL	18252-5	18252-5-DL
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	---	24	---	15	---
Ethylbenzene (8021), ug/l	---	30	---	16	---
Toluene (8021), ug/l	---	25	---	9.1	---
o-Xylene, ug/l	---	36	---	21	---
m&p-Xylene, ug/l	---	62	---	33	---
Surrogate - a,a,a-Trifluorotoluene	---	87 %	---	87 %	---
Dilution Factor	---	2.0	---	2.0	---
Analysis Date	---	12.10.99	---	12.10.99	---
Batch ID	---	1D1210	---	1D1210	---

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18252-3-DL	DPN-DUP-120799	12-07-99/00:00	SCB01
18252-4	DPN-TN1-120799	12-07-99/13:40	SCB01
18252-4-DL	DPN-TN1-120799	12-07-99/13:40	SCB01
18252-5	DPN-T0-120799	12-07-99/14:10	SCB01
18252-5-DL	DPN-T0-120799	12-07-99/14:10	SCB01

PARAMETER	18252-3-DL	18252-4	18252-4-DL	18252-5	18252-5-DL
Semivolatile Organics (8270)					
Naphthalene, ug/l	4400D	1400E	6100D	1300E	4300D
Acenaphthylene, ug/l	200U	10U	200U	10U	200U
Acenaphthene, ug/l	190JD	160	180JD	170	170JD
Fluorene, ug/l	78JD	62	65JD	60	56JD
Phenanthrene, ug/l	29JD	24	24JD	33	33JD
Anthracene, ug/l	200U	4.3J	200U	3.7J	200U
Fluoranthene, ug/l	200U	10U	200U	1.6J	200U
Pyrene, ug/l	200U	10U	200U	0.96J	200U
Chrysene, ug/l	200U	10U	200U	10U	200U
Benzo(a)anthracene, ug/l	200U	10U	200U	10U	200U
Benzo(b)fluoranthene, ug/l	200U	2.4J	200U	1.9J	200U
Benzo(k)fluoranthene, ug/l	200U	2.6J	200U	2.5J	200U
Benzo(a)pyrene, ug/l	200U	2.6J	200U	2.2J	200U
Indeno(1,2,3-cd)pyrene, ug/l	200U	0.82J	200U	0.79J	200U
Dibenzo(a,h)anthracene, ug/l	200U	10U	200U	10U	200U
Benzo(g,h,i)perylene, ug/l	200U	10U	200U	0.83J	200U
2-Methylnaphthalene, ug/l	180JD	200	280D	200	220D
Surrogate-2FBP	X	66 %	X	70 %	X

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-3-DL	DPN-DUP-120799	12-07-99/00:00	SCB01
18252-4	DPN-TN1-120799	12-07-99/13:40	SCB01
18252-4-DL	DPN-TN1-120799	12-07-99/13:40	SCB01
18252-5	DPN-T0-120799	12-07-99/14:10	SCB01
18252-5-DL	DPN-T0-120799	12-07-99/14:10	SCB01

PARAMETER	18252-3-DL	18252-4	18252-4-DL	18252-5	18252-5-DL
Surrogate-NBZ	X	60 %	X	72 %	X
Surrogate-TPH	X	24 %	X	19 %	X
Dilution Factor	20.0	1.0	20.0	1.0	20.0
Prep Date	12.10.99	12.10.99	12.10.99	12.10.99	12.10.99
Analysis Date	12.16.99	12.15.99	12.16.99	12.15.99	12.16.99
Batch ID	1210A	1210A	1210A	1210A	1210A

X = Because the sample was diluted prior to analysis, the surrogate recoveries are not reported.

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LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-6	DPN-TS1-120799	12-07-99/14:30	SCB01
18252-6-DL	DPN-TS1-120799	12-07-99/14:30	SCB01
18252-7	DPN-TS2-120799	12-07-99/14:55	SCB01
18252-7-DL	DPN-TS2-120799	12-07-99/14:55	SCB01
18252-8	DPN-TS3-120799	12-07-99/15:55	SCB01

PARAMETER	18252-6	18252-6-DL	18252-7	18252-7-DL	18252-8
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	13	---	16	---	7.6
Ethylbenzene, ug/l	20	---	26	---	17
Toluene, ug/l	20	---	31	---	9.0
o-Xylene, ug/l	28	---	35	---	24
m&p-Xylene, ug/l	43	---	57	---	35
Surrogate - a,a,a-Trifluorotoluene	87 %	---	80 %	---	83 %
Dilution Factor	2.0	---	2.0	---	2.0
Analysis Date	12.10.99	---	12.10.99	---	12.10.99
Batch ID	1D1210	---	1D1210	---	1D1210

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-6	DPN-TS1-120799	12-07-99/14:30	SCB01
18252-6-DL	DPN-TS1-120799	12-07-99/14:30	SCB01
18252-7	DPN-TS2-120799	12-07-99/14:55	SCB01
18252-7-DL	DPN-TS2-120799	12-07-99/14:55	SCB01
18252-8	DPN-TS3-120799	12-07-99/15:55	SCB01

PARAMETER	18252-6	18252-6-DL	18252-7	18252-7-DL	18252-8
Semivolatile Organics (8270)					
Naphthalene, ug/l	1800E	7400D	1100E	4900D	1300E
Acenaphthylene, ug/l	10U	250U	10U	200U	10U
Acenaphthene, ug/l	180	210JD	160	170JD	160
Fluorene, ug/l	65	69JD	69	71JD	62
Phenanthrene, ug/l	22	25JD	10	12JD	15
Anthracene, ug/l	10U	250U	4.6J	200U	5.2J
Fluoranthene, ug/l	1.7J	250U	1.4J	200U	2.4J
Pyrene, ug/l	10U	250U	10U	200U	1.4J
Chrysene, ug/l	10U	250U	10U	200U	10U
Benzo(a)anthracene, ug/l	10U	250U	10U	200U	10U
Benzo(b)fluoranthene, ug/l	2.5J	250U	3.0J	200U	2.1J
Benzo(k)fluoranthene, ug/l	2.6J	250U	4.8J	200U	3.5J
Benzo(a)pyrene, ug/l	2.9J	250U	4.1J	200U	2.7J
Indeno(1,2,3-cd)pyrene, ug/l	1.4J	250U	1.7J	200U	1.4J
Dibenzo(a,h)anthracene, ug/l	1.5J	250U	1.6J	200U	1.4J
Benzo(g,h,i)perylene, ug/l	1.7J	250U	2.1J	200U	1.4J
2-Methylnaphthalene, ug/l	290	370D	140	210D	180
Surrogate-2FBP	70 %	X	64 %	X	78 %

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LOG NO: S9-18252
Received: 08 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 171700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-6	DPN-TS1-120799	12-07-99/14:30	SCB01
18252-6-DL	DPN-TS1-120799	12-07-99/14:30	SCB01
18252-7	DPN-TS2-120799	12-07-99/14:55	SCB01
18252-7-DL	DPN-TS2-120799	12-07-99/14:55	SCB01
18252-8	DPN-TS3-120799	12-07-99/15:55	SCB01

PARAMETER	18252-6	18252-6-DL	18252-7	18252-7-DL	18252-8
Surrogate-NBZ	80 %	X	58 %	X	80 %
Surrogate-TPH	19 %	X	28 %	X	32 %
Dilution Factor	1.0	25.0	1.0	20.0	1.0
Prep Date	12.10.99	12.10.99	12.10.99	12.10.99	12.10.99
Analysis Date	12.15.99	12.16.99	12.15.99	12.17.99	12.15.99
Batch ID	1210A	1210A	1210A	1210A	1210A

X = Because the sample was diluted prior to analysis, the surrogate recoveries are not reported.

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LOG NO: S9-18252
Received: 08 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-8-DL	DPN-TS3-120799	12-07-99/15:55	SCB01
18252-9	DPN-L3-120799	12-07-99/16:58	SCB01
18252-9-DL	DPN-L3-120799	12-07-99/16:58	SCB01
18252-10	DPN-L4-120799	12-07-99/17:15	SCB01
18252-10-D	DPN-L4-120799	12-07-99/17:15	SCB01

PARAMETER	18252-8-DL	18252-9	18252-9-DL	18252-10	18252-10-DL
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	---	20	---	14	---
Ethylbenzene (8021), ug/l	---	30	---	26	---
Toluene (8021), ug/l	---	52	---	28	---
o-Xylene, ug/l	---	45	---	46	---
m&p-Xylene, ug/l	---	77	---	68	---
Surrogate - a,a,a-Trifluorotoluene	---	80 %	---	80 %	---
Dilution Factor	---	2.0	---	2.0	---
Analysis Date	---	12.10.99	---	12.10.99	---
Batch ID	---	1D1210	---	1D1210	---

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-8-DL	DPN-TS3-120799	12-07-99/15:55	SCB01
18252-9	DPN-L3-120799	12-07-99/16:58	SCB01
18252-9-DL	DPN-L3-120799	12-07-99/16:58	SCB01
18252-10	DPN-L4-120799	12-07-99/17:15	SCB01
18252-10-D	DPN-L4-120799	12-07-99/17:15	SCB01

PARAMETER	18252-8-DL	18252-9	18252-9-DL	18252-10	18252-10-DL
Semivolatile Organics (8270)					
Naphthalene, ug/l	4600D	1300E	6400D	1800E	6900D
Acenaphthylene, ug/l	200U	10U	200U	10U	250U
Acenaphthene, ug/l	160JD	190	260D	150	150JD
Fluorene, ug/l	56JD	80	100JD	58	55JD
Phenanthrene, ug/l	13JD	51	60JD	23	22JD
Anthracene, ug/l	200U	8.4J	200U	5.6J	250U
Fluoranthene, ug/l	200U	2.6J	200U	10U	250U
Pyrene, ug/l	200U	10U	200U	10U	250U
Chrysene, ug/l	200U	10U	200U	10U	250U
Benzo(a)anthracene, ug/l	200U	10U	200U	10U	250U
Benzo(b)fluoranthene, ug/l	200U	1.8J	200U	2.0J	250U
Benzo(k)fluoranthene, ug/l	200U	3.1J	200U	3.5J	250U
Benzo(a)pyrene, ug/l	200U	2.4J	200U	2.9J	250U
Indeno(1,2,3-cd)pyrene, ug/l	200U	1.3J	200U	2.3J	250U
Dibenzo(a,h)anthracene, ug/l	200U	1.6J	200U	2.0J	250U
Benzo(g,h,i)perylene, ug/l	200U	1.6J	200U	10U	250U
2-Methylnaphthalene, ug/l	200D	260	440D	250	340D
Surrogate-2FBP	X	52 %	X	70 %	X

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Received: 08 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 171700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-8-DL	DPN-TS3-120799	12-07-99/15:55	SCB01
18252-9	DPN-L3-120799	12-07-99/16:58	SCB01
18252-9-DL	DPN-L3-120799	12-07-99/16:58	SCB01
18252-10	DPN-L4-120799	12-07-99/17:15	SCB01
18252-10-D	DPN-L4-120799	12-07-99/17:15	SCB01

PARAMETER	18252-8-DL	18252-9	18252-9-DL	18252-10	18252-10-DL
Surrogate-NBZ	X	44 %	X	64 %	X
Surrogate-TPH	X	17 %	X	28 %	X
Dilution Factor	20.0	1.0	20.0	1.0	25.0
Prep Date	12.10.99	12.10.99	12.10.99	12.10.99	12.10.99
Analysis Date	12.17.99	12.15.99	12.17.99	12.15.99	12.17.99
Batch ID	1210A	1210A	1210A	1210A	1210A

X = Because the sample was diluted prior to analysis, the surrogate recoveries are not reported.

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Reported: 18 JAN 00

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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-11	DPN-L2-120799	12-07-99/17:38	SCB01
18252-11-D	DPN-L2-120799	12-07-99/17:38	SCB01
18252-12	DPN-L1-120799	12-07-99/17:48	SCB01
18252-12-D	DPN-L1-120799	12-07-99/17:48	SCB01

PARAMETER	18252-11	18252-11-DL	18252-12	18252-12-DL
Semivolatile Organics (8270)				
Naphthalene, ug/l	1600E	6300D	1500E	5700D
Acenaphthylene, ug/l	10U	250U	10U	250U
Acenaphthene, ug/l	120	130JD	150	160JD
Fluorene, ug/l	52	47JD	53	53JD
Phenanthrene, ug/l	20	19JD	29	29JD
Anthracene, ug/l	7.5J	250U	4.3J	250U
Fluoranthene, ug/l	10U	250U	1.0J	250U
Pyrene, ug/l	10U	250U	10U	250U
Chrysene, ug/l	10U	250U	10U	250U
Benzo(a)anthracene, ug/l	10U	250U	10U	250U
Benzo(b)fluoranthene, ug/l	1.6J	250U	1.6J	250U
Benzo(k)fluoranthene, ug/l	2.0J	250U	1.5J	250U
Benzo(a)pyrene, ug/l	1.9J	250U	1.8J	250U
Indeno(1,2,3-cd)pyrene, ug/l	2.1J	250U	2.2J	250U
Dibenzo(a,h)anthracene, ug/l	2.2J	250U	2.1J	250U
Benzo(g,h,i)perylene, ug/l	2.1J	250U	2.3J	250U
2-Methylnaphthalene, ug/l	220	240JD	210	270D
Surrogate-2FBP	50 %	X	56 %	X
Surrogate-NBZ	58 %	X	56 %	X
Surrogate-TPH	32 %	X	19 %	X
Dilution Factor	1.0	25.0	1.0	25.0
Prep Date	12.10.99	12.10.99	12.10.99	12.10.99
Analysis Date	12.15.99	12.17.99	12.15.99	12.17.99
Batch ID	1210A	1210A	1210A	1210A

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LOG NO: S9-18252
Received: 08 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
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200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-11	DPN-L2-120799	12-07-99/17:38	SCB01
18252-11-D	DPN-L2-120799	12-07-99/17:38	SCB01
18252-12	DPN-L1-120799	12-07-99/17:48	SCB01
18252-12-D	DPN-L1-120799	12-07-99/17:48	SCB01

PARAMETER	18252-11	18252-11-DL	18252-12	18252-12-DL

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18252-13	Trip Blank	12-07-99	SCB01

PARAMETER	18252-13
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	103 %
Dilution Factor	1.0
Analysis Date	12.10.99
Batch ID	2D1209

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18307A
Received: 09 DEC 99
Reported: 31 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 152700131

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307A-1	DPS-TN3-1214	12-08-99/08:15	SCB05
18307A-2	DPS-TN3-1618	12-08-99/08:25	SCB05
18307A-3	DPS-TS3-1012	12-08-99/09:05	SCB05
18307A-4	DPS-TS3-1820	12-08-99/09:30	SCB05

PARAMETER	18307A-1	18307A-2	18307A-3	18307A-4
Organic Carbon (WALKLEY-BLACK), mg/kg dw	120U	120U	91J	120U
Dilution Factor	1.0	1.0	1.0	1.0
Prep Date	01.24.00	01.24.00	01.24.00	01.24.00
Analysis Date	01.24.00	01.24.00	01.24.00	01.24.00
Batch ID	0124X	0124X	0124X	0124X
Percent Solids	83	82	83	85

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-SCB05
Received: 19 JAN 00
Reported: 31 JAN 00

Mr. Jeff Hale
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200 Arch Street
Pittsburgh, PA 15106

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 152700131

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
SCB05-1	Method Blank		SCB05
SCB05-2	Lab Control Standard % Recovery		SCB05

PARAMETER	SCB05-1	SCB05-2
Organic Carbon (WALKLEY-BLACK), mg/kg dw	100U	93 %
Dilution Factor	1.0	1.0
Prep Date	01.24.00	01.24.00
Analysis Date	01.24.00	01.24.00
Batch ID	0124X	0124X

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18307
Received: 09 DEC 99
Reported: 19 JAN 00
QC*S9SCB02 S918345
Client PO. No.: 00552-03215 0

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 14210027

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-1	DPS-TN3-1214	12-08-99/08:15	SCB02
18307-2	DPS-TN3-1618	12-08-99/08:25	SCB02
18307-3	DPS-TS3-1012	12-08-99/09:05	SCB02
18307-4	DPS-TS3-1820	12-08-99/09:30	SCB02

PARAMETER	18307-1	18307-2	18307-3	18307-4
Total Organic Carbon (9060), mg/kg dw	100U	100U	100U	100U
Dilution Factor	1.0	1.0	1.0	1.0
Prep Date	12.23.99	12.23.99	12.23.99	12.23.99
Analysis Date	12.23.99	12.23.99	12.23.99	12.23.99
Batch ID	1223X	1223X	1223X	1223X

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18307
Received: 09 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
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200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-5	DPS-T0-120899	12-08-99/14:15	SCB02

PARAMETER	18307-5
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	6.9
Ethylbenzene, ug/l	1.5
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.7
Surrogate - a,a,a-Trifluorotoluene	103 %
Dilution Factor	1.0
Analysis Date	12.13.99
Batch ID	2D1213

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Received: 09 DEC 99
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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-5	DPS-T0-120899	12-08-99/14:15	SCB02

PARAMETER	18307-5
Semivolatile Organics (8270)	
Naphthalene, ug/l	270
Acenaphthylene, ug/l	10U
Acenaphthene, ug/l	49
Fluorene, ug/l	14
Phenanthrene, ug/l	4.2J
Anthracene, ug/l	0.92J
Fluoranthene, ug/l	0.93J
Pyrene, ug/l	1.4J
Chrysene, ug/l	10U
Benzo(a)anthracene, ug/l	10U
Benzo(b)fluoranthene, ug/l	10U
Benzo(k)fluoranthene, ug/l	10U
Benzo(a)pyrene, ug/l	10U
Indeno(1,2,3-cd)pyrene, ug/l	10U
Dibenzo(a,h)anthracene, ug/l	10U
Benzo(g,h,i)perylene, ug/l	10U
2-Methylnaphthalene, ug/l	20
Surrogate-2FBP	74 %
Surrogate-NBZ	88 %
Surrogate-TPH	24 %
Dilution Factor	1.0
Prep Date	12.15.99
Analysis Date	12.21.99
Batch ID	1215G

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Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-5	DPS-T0-120899	12-08-99/14:15	SCB02

PARAMETER	18307-5
Total Organic Carbon (415.1), mg/l	4.2
Dilution Factor	1.0
Prep Date	12.20.99
Analysis Date	12.20.99
Batch ID	1220A
Chloride (325.2), mg/l	4.3
Dilution Factor	1
Prep Date	12.15.99
Analysis Date	12.15.99
Batch ID	1215A
Nitrate-N (353.2), mg/l	0.050U
Dilution Factor	1
Prep Date	12.09.99
Analysis Date	12.09.99
Batch ID	1213C
Sulfate as SO4 (375.4), mg/l	5.0U
Dilution Factor	1.0
Prep Date	12.14.99
Analysis Date	12.14.99
Batch ID	1214A

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Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-5	DPS-T0-120899	12-08-99/14:15	SCB02

PARAMETER	18307-5
Dissolved Gases	
Methane, ug/l	12J
Carbon Dioxide, ug/l	9700
Dilution Factor	1.0
Analysis Date	12.21.99
Batch ID	2C1220
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	12
Dilution Factor	1.0
Prep Date	12.09.99
Analysis Date	12.09.99
Batch ID	1209A
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	220
Dilution Factor	1.0
Prep Date	12.10.99
Analysis Date	12.10.99
Batch ID	1210A
Ammonia (as N) (350.1), mg/l	0.030U
Dilution Factor	1
Prep Date	12.15.99
Analysis Date	12.15.99
Batch ID	1215A

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-5	DPS-T0-120899	12-08-99/14:15	SCB02

PARAMETER	18307-5
Manganese (Dissolved) (6010)	
Manganese (Dissolved), ug/l	510
Dilution Factor	1.0
Prep Date	12.13.99
Analysis Date	12.14.99
Batch ID	1213I
Iron (Dissolved) (6010)	
Iron (Dissolved), ug/l	840
Dilution Factor	1.0
Prep Date	12.13.99
Analysis Date	12.14.99
Batch ID	1213I
Ortho-Phosphate-P (365.2), mg/l	0.12
Dilution Factor	1.0
Prep Date	12.09.99
Analysis Date	12.09.99
Batch ID	1209A
Chemical Oxygen Demand (410.1), mg/l	34
Dilution Factor	1.0
Prep Date	12.10.99
Analysis Date	12.13.99
Batch ID	1210B

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LOG NO: S9-18307
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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-6	DPS-TN3-120899	12-08-99/15:40	SCB02
18307-7	DPS-TS3-120899	12-08-99/10:00	SCB02
18307-8	DPS-TS2-120899	12-08-99/11:15	SCB02
18307-8-RE	DPS-TS2-120899	12-08-99/11:15	SCB02
18307-9	DPS-TS1-120899	12-08-99/14:00	SCB02

PARAMETER	18307-6	18307-7	18307-8	18307-8-RE	18307-9
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	1.0U	1.0U	---	5.2
Ethylbenzene, ug/l	1.0U	1.0U	1.0U	---	8.6
Toluene, ug/l	1.0U	1.0U	1.0U	---	1.0U
o-Xylene, ug/l	1.0U	1.0U	1.0U	---	1.7
m&p-Xylene, ug/l	1.0U	1.0U	1.0U	---	6.6
Surrogate - a,a,a-Trifluorotoluene	100 %	103 %	100 %	---	100 %
Dilution Factor	1.0	1.0	1.0	---	1.0
Analysis Date	12.13.99	12.13.99	12.13.99	---	12.14.99
Batch ID	2D1213	2D1213	2D1213	---	1D1214

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LOG NO: S9-18307
Received: 09 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-6	DPS-TN3-120899	12-08-99/15:40	SCB02
18307-7	DPS-TS3-120899	12-08-99/10:00	SCB02
18307-8	DPS-TS2-120899	12-08-99/11:15	SCB02
18307-8-RE	DPS-TS2-120899	12-08-99/11:15	SCB02
18307-9	DPS-TS1-120899	12-08-99/14:00	SCB02

PARAMETER	18307-6	18307-7	18307-8	18307-8-RE	18307-9
Semivolatile Organics (8270)					
Naphthalene, ug/l	69	190	17	10U	800E
Acenaphthylene, ug/l	10U	10U	10U	10U	10U
Acenaphthene, ug/l	39	34	27	1.8J	57
Fluorene, ug/l	28	15	16	10U	23
Phenanthrene, ug/l	16	3.0J	4.1J	10U	9.2J
Anthracene, ug/l	1.6J	0.75J	0.74J	10U	1.3J
Fluoranthene, ug/l	1.9J	1.2J	0.66J	10U	0.65J
Pyrene, ug/l	1.8J	1.3J	10U	1.8J	0.78J
Chrysene, ug/l	10U	10U	10U	10U	10U
Benzo(a)anthracene, ug/l	0.35J	10U	10U	10U	10U
Benzo(b)fluoranthene, ug/l	10U	10U	10U	0.68J	10U
Benzo(k)fluoranthene, ug/l	10U	10U	10U	0.40J	10U
Benzo(a)pyrene, ug/l	10U	0.71J	10U	0.74J	10U
Indeno(1,2,3-cd)pyrene, ug/l	0.71J	1.0J	10U	0.71J	10U
Dibenzo(a,h)anthracene, ug/l	10U	1.0J	10U	0.58J	10U
Benzo(g,h,i)perylene, ug/l	1.0J	1.1J	10U	0.99J	10U
2-Methylnaphthalene, ug/l	2.4J	5.2J	1.8J	10U	74
Surrogate-2FBP	50 %	58 %	58 %	52 %	54 %

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Received: 09 DEC 99
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Key Environmental, Inc.
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-6	DPS-TN3-120899	12-08-99/15:40	SCB02
18307-7	DPS-TS3-120899	12-08-99/10:00	SCB02
18307-8	DPS-TS2-120899	12-08-99/11:15	SCB02
18307-8-RE	DPS-TS2-120899	12-08-99/11:15	SCB02
18307-9	DPS-TS1-120899	12-08-99/14:00	SCB02

PARAMETER	18307-6	18307-7	18307-8	18307-8-RE	18307-9
Surrogate-NBZ	54 %	70 %	72 %	28 %	66 %
Surrogate-TPH	20 %	18 %	9 %	30 %	17 %
Dilution Factor	1.0	1.0	1.0	1.0	1.0
Prep Date	12.15.99	12.15.99	12.15.99	12.23.99	12.15.99
Analysis Date	12.19.99	12.19.99	12.21.99	12.29.99	12.19.99
Batch ID	1215G	1215G	1215G	1223A	1215G

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-9-DL	DPS-TS1-120899	12-08-99/14:00	SCB02
18307-10	DPS-TN1-120899	12-08-99/15:05	SCB02
18307-10-D	DPS-TN1-120899	12-08-99/15:05	SCB02
18307-11	DPS-TN2-120899	12-08-99/11:58	SCB02

PARAMETER	18307-9-DL	18307-10	18307-10-DL	18307-11
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/l	---	210E	290D	1.0U
Ethylbenzene (8021), ug/l	---	64	82D	1.0U
Toluene (8021), ug/l	---	2.0U	10U	1.0U
o-Xylene, ug/l	---	2.9	5.3JD	1.0U
m&p-Xylene, ug/l	---	61	77D	1.0U
Surrogate - a,a,a-Trifluorotoluene	---	87 %	103 %	103 %
Dilution Factor	---	2.0	10.0	1.0
Analysis Date	---	12.13.99	12.14.99	12.14.99
Batch ID	---	2D1213	1D1214	1D1214

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-9-DL	DPS-TS1-120899	12-08-99/14:00	SCB02
18307-10	DPS-TN1-120899	12-08-99/15:05	SCB02
18307-10-D	DPS-TN1-120899	12-08-99/15:05	SCB02
18307-11	DPS-TN2-120899	12-08-99/11:58	SCB02

PARAMETER	18307-9-DL	18307-10	18307-10-DL	18307-11
Semivolatile Organics (8270)				
Naphthalene, ug/l	1000	14000	---	31
Acenaphthylene, ug/l	100U	5000U	---	10U
Acenaphthene, ug/l	82J	5000U	---	62
Fluorene, ug/l	30J	5000U	---	42
Phenanthrene, ug/l	13J	5000U	---	11
Anthracene, ug/l	100U	5000U	---	1.6J
Fluoranthene, ug/l	100U	5000U	---	1.9J
Pyrene, ug/l	100U	5000U	---	1.5J
Chrysene, ug/l	100U	5000U	---	10U
Benzo(a)anthracene, ug/l	100U	5000U	---	10U
Benzo(b)fluoranthene, ug/l	100U	5000U	---	10U
Benzo(k)fluoranthene, ug/l	100U	5000U	---	10U
Benzo(a)pyrene, ug/l	100U	5000U	---	10U
Indeno(1,2,3-cd)pyrene, ug/l	100U	5000U	---	10U
Dibenzo(a,h)anthracene, ug/l	100U	5000U	---	10U
Benzo(g,h,i)perylene, ug/l	100U	5000U	---	10U
2-Methylnaphthalene, ug/l	98J	690J	---	3.0J
Surrogate-2FBP	X	X	---	72 %
Surrogate-NBZ	X	X	---	82 %
Surrogate-TPH	X	X	---	26 %
Dilution Factor	10.0	500.0	---	1.0
Prep Date	12.15.99	12.15.99	---	12.15.99
Analysis Date	12.21.99	12.21.99	---	12.19.99
Batch ID	1215G	1215G	---	1215G

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-9-DL	DPS-TS1-120899	12-08-99/14:00	SCB02
18307-10	DPS-TN1-120899	12-08-99/15:05	SCB02
18307-10-D	DPS-TN1-120899	12-08-99/15:05	SCB02
18307-11	DPS-TN2-120899	12-08-99/11:58	SCB02

PARAMETER	18307-9-DL	18307-10	18307-10-DL	18307-11

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-12	DPS-L1-120899	12-08-99/17:15	SCB02

PARAMETER	18307-12
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	8.9
Dilution Factor	1.0
Prep Date	12.09.99
Analysis Date	12.09.99
Batch ID	1209A
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	320
Dilution Factor	1.0
Prep Date	12.10.99
Analysis Date	12.10.99
Batch ID	1210A
Chemical Oxygen Demand (410.1), mg/l	140
Dilution Factor	1.0
Prep Date	12.10.99
Analysis Date	12.13.99
Batch ID	1210B
Ammonia (as N) (350.1), mg/l	0.071
Dilution Factor	1
Prep Date	12.15.99
Analysis Date	12.15.99
Batch ID	1215A

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LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-12	DPS-L1-120899	12-08-99/17:15	SCB02

PARAMETER	18307-12
Manganese (Dissolved) (6010)	
Manganese (Dissolved), ug/l	1300
Dilution Factor	1.0
Prep Date	12.13.99
Analysis Date	12.14.99
Batch ID	1213I
Iron (Dissolved) (6010)	
Iron (Dissolved), ug/l	2100
Dilution Factor	1.0
Prep Date	12.13.99
Analysis Date	12.14.99
Batch ID	1213I
Chloride (325.2), mg/l	16
Dilution Factor	1
Prep Date	12.15.99
Analysis Date	12.15.99
Batch ID	1215A
Nitrate-N (353.2), mg/l	0.37
Dilution Factor	1.0
Prep Date	12.09.99
Analysis Date	12.09.99
Batch ID	1213C

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Sampled By: Client
Code: 101000119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-12	DPS-L1-120899	12-08-99/17:15	SCB02

PARAMETER	18307-12
Ortho-Phosphate-P (365.2), mg/l	0.14
Dilution Factor	1.0
Prep Date	12.09.99
Analysis Date	12.09.99
Batch ID	1209A
Sulfate as SO4 (375.4), mg/l	5.0U
Dilution Factor	1.0
Prep Date	12.14.99
Analysis Date	12.14.99
Batch ID	1214A
Total Organic Carbon (415.1), mg/l	11
Dilution Factor	1.0
Prep Date	12.20.99
Analysis Date	12.20.99
Batch ID	1220A

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18307-13	Trip Blank	12-08-99	SCB02

PARAMETER	18307-13
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	103 %
Dilution Factor	1.0
Analysis Date	12.13.99
Batch ID	2D1213

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

X = Because the sample was diluted prior to analysis, surrogate recoveries were not reported.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18345
Received: 10 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101200119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-1	PSG-2-120999	12-09-99/08:40	SCB02
18345-1-DL	PSG-2-120999	12-09-99/08:40	SCB02
18345-2	PSG-3-120999	12-09-99/09:25	SCB02
18345-3	PSG-6-120999	12-09-99/11:35	SCB02
18345-4	PSG-5-120999	12-09-99/15:30	SCB02

PARAMETER	18345-1	18345-1-DL	18345-2	18345-3	18345-4
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	7.6	8.6D	1.0U	1.0U	1.0U
Ethylbenzene, ug/l	53	57D	1.0U	1.0U	1.0U
Toluene, ug/l	24	28D	1.0U	1.0U	1.0U
o-Xylene, ug/l	54	61D	1.0U	1.0U	1.0U
m&p-Xylene, ug/l	130E	140D	1.0U	1.0U	1.0U
Surrogate - a,a,a-Trifluorotoluene	150 %Y	93 %	83 %	107 %	103 %
Dilution Factor	2.0	5.0	1.0	1.0	1.0
Analysis Date	12.14.99	12.15.99	12.14.99	12.14.99	12.14.99
Batch ID	1D1214	1D1215	1D1214	2D1213	2D1213

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-1	PSG-2-120999	12-09-99/08:40	SCB02
18345-1-DL	PSG-2-120999	12-09-99/08:40	SCB02
18345-2	PSG-3-120999	12-09-99/09:25	SCB02
18345-3	PSG-6-120999	12-09-99/11:35	SCB02
18345-4	PSG-5-120999	12-09-99/15:30	SCB02

PARAMETER	18345-1	18345-1-DL	18345-2	18345-3	18345-4
Semivolatile Organics (8270)					
Naphthalene, ug/l	19000	---	8.1J	2.1J	1.1J
Acenaphthylene, ug/l	5000U	---	10U	10U	10U
Acenaphthene, ug/l	790J	---	1.4J	10U	0.59J
Fluorene, ug/l	420J	---	0.88J	10U	10U
Phenanthrene, ug/l	660J	---	1.3J	0.46J	0.51J
Anthracene, ug/l	5000U	---	0.51J	10U	0.53J
Fluoranthene, ug/l	5000U	---	10U	10U	0.37J
Pyrene, ug/l	5000U	---	10U	10U	10U
Chrysene, ug/l	5000U	---	10U	10U	10U
Benzo(a)anthracene, ug/l	5000U	---	10U	10U	10U
Benzo(b)fluoranthene, ug/l	5000U	---	10U	10U	10U
Benzo(k)fluoranthene, ug/l	5000U	---	10U	10U	10U
Benzo(a)pyrene, ug/l	5000U	---	10U	10U	10U
Indeno(1,2,3-cd)pyrene, ug/l	5000U	---	10U	10U	10U
Dibenzo(a,h)anthracene, ug/l	5000U	---	10U	10U	10U
Benzo(g,h,i)perylene, ug/l	5000U	---	0.67J	10U	10U
2-Methylnaphthalene, ug/l	1300J	---	1.2J	0.60J	10U
Surrogate-2FBP	X	---	72 %	64 %	68 %

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-1	PSG-2-120999	12-09-99/08:40	SCB02
18345-1-DL	PSG-2-120999	12-09-99/08:40	SCB02
18345-2	PSG-3-120999	12-09-99/09:25	SCB02
18345-3	PSG-6-120999	12-09-99/11:35	SCB02
18345-4	PSG-5-120999	12-09-99/15:30	SCB02

PARAMETER	18345-1	18345-1-DL	18345-2	18345-3	18345-4
Surrogate-NBZ	X	---	82 %	78 %	82 %
Surrogate-TPH	X	---	16 %	20 %	20 %
Dilution Factor	500.0	---	1.0	1.0	1.0
Prep Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Analysis Date	12.21.99	---	12.19.99	12.19.99	12.19.99
Batch ID	1215G	---	1215G	1215G	1215G

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-5	PSG-1-120999	12-09-99/14:27	SCB02
18345-5-RE	PSG-1-120999	12-09-99/14:27	SCB02
18345-6	PSG-4-120999	12-09-99/14:40	SCB02

PARAMETER	18345-5	18345-5-RE	18345-6
Halogenated and Aromatic Volatiles (8021)			
Benzene, ug/l	1.0U	---	1.0U
Ethylbenzene, ug/l	1.0U	---	1.0U
Toluene, ug/l	1.0U	---	1.0U
o-Xylene, ug/l	1.0U	---	1.0U
m&p-Xylene, ug/l	1.0U	---	1.0U
Surrogate - a,a,a-Trifluorotoluene	107 %	---	107 %
Dilution Factor	1.0	---	1.0
Analysis Date	12.14.99	---	12.14.99
Batch ID	2D1213	---	2D1213

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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101200119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-5	PSG-1-120999	12-09-99/14:27	SCB02
18345-5-RE	PSG-1-120999	12-09-99/14:27	SCB02
18345-6	PSG-4-120999	12-09-99/14:40	SCB02

PARAMETER	18345-5	18345-5-RE	18345-6
Semivolatile Organics (8270)			
Naphthalene, ug/l	1.7J	10U	2.5J
Acenaphthylene, ug/l	10U	10U	10U
Acenaphthene, ug/l	9.9J	23	10U
Fluorene, ug/l	4.6J	8.6J	10U
Phenanthrene, ug/l	0.84J	1.5J	10U
Anthracene, ug/l	10U	0.37J	10U
Fluoranthene, ug/l	1.1J	2.5J	10U
Pyrene, ug/l	10U	1.6J	10U
Chrysene, ug/l	10U	10U	10U
Benzo(a)anthracene, ug/l	10U	10U	10U
Benzo(b)fluoranthene, ug/l	10U	0.54J	10U
Benzo(k)fluoranthene, ug/l	10U	10U	10U
Benzo(a)pyrene, ug/l	10U	0.64J	10U
Indeno(1,2,3-cd)pyrene, ug/l	10U	10U	10U
Dibenzo(a,h)anthracene, ug/l	10U	10U	10U
Benzo(g,h,i)perylene, ug/l	10U	0.74J	10U
2-Methylnaphthalene, ug/l	0.74J	10U	10U
Surrogate-2FBP	42 %	60 %	64 %
Surrogate-NBZ	48 %	54 %	72 %
Surrogate-TPH	10 %	24 %	14 %
Dilution Factor	1.0	1.0	1.0
Prep Date	12.15.99	12.23.99	12.15.99
Analysis Date	12.21.99	12.29.99	12.19.99
Batch ID	1215G	1223A	1215G

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LOG NO: S9-18345
Received: 10 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 101200119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-7	DPS-L1-120999	12-09-99/07:50	SCB02

PARAMETER	18345-7
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	10
Ethylbenzene, ug/l	26
Toluene, ug/l	5.4
o-Xylene, ug/l	26
m&p-Xylene, ug/l	60
Surrogate - a,a,a-Trifluorotoluene	87 %
Dilution Factor	2.0
Analysis Date	12.14.99
Batch ID	2D1213

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-7	DPS-L1-120999	12-09-99/07:50	SCB02

PARAMETER	18345-7
Semivolatile Organics (8270)	
Naphthalene, ug/l	4000
Acenaphthylene, ug/l	1000U
Acenaphthene, ug/l	320J
Fluorene, ug/l	100J
Phenanthrene, ug/l	46J
Anthracene, ug/l	1000U
Fluoranthene, ug/l	1000U
Pyrene, ug/l	1000U
Chrysene, ug/l	1000U
Benzo(a)anthracene, ug/l	1000U
Benzo(b)fluoranthene, ug/l	1000U
Benzo(k)fluoranthene, ug/l	1000U
Benzo(a)pyrene, ug/l	1000U
Indeno(1,2,3-cd)pyrene, ug/l	1000U
Dibenzo(a,h)anthracene, ug/l	1000U
Benzo(g,h,i)perylene, ug/l	1000U
2-Methylnaphthalene, ug/l	270J
Surrogate-2FBP	X
Surrogate-NBZ	X
Surrogate-TPH	X
Dilution Factor	100.0
Prep Date	12.15.99
Analysis Date	12.21.99
Batch ID	1215G

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Code: 101200119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18345-7	DPS-L1-120999	12-09-99/07:50	SCB02

PARAMETER	18345-7
Dissolved Gases	
Methane, ug/l	35J
Carbon Dioxide, ug/l	8200
Dilution Factor	1.0
Analysis Date	12.21.99
Batch ID	2C1220

Methods: EPA SW-846, Update III.

X = Surrogate recovery was outside established limits due to acoeluting matrix interference in the sample.

Y = Surrogate recovery was outside established limits due to coeluting matrix interference in the sample.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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Received: 14 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-1	OWI0-121399	12-13-99/13:50	SCB03
18430-1-DL	OWI0-121399	12-13-99/13:50	SCB03
18430-2	MW03-121399	12-13-99/16:20	SCB03
18430-3	OW07-121399	12-13-99/17:00	SCB03

PARAMETER	18430-1	18430-1-DL	18430-2	18430-3
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/l	650	---	1.0U	1.0U
Ethylbenzene, ug/l	260	---	1.0U	1.0U
Toluene, ug/l	660	---	1.0U	1.0U
o-Xylene, ug/l	300	---	1.0U	1.0U
m&p-Xylene, ug/l	650	---	1.0U	1.0U
Surrogate - a,a,a-Trifluorotoluene	100 %	---	103 %	107 %
Dilution Factor	25.0	---	1.0	1.0
Analysis Date	12.16.99	---	12.16.99	12.16.99
Batch ID	1D1216	---	2D1215	2D1215

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-1	OWI0-121399	12-13-99/13:50	SCB03
18430-1-DL	OWI0-121399	12-13-99/13:50	SCB03
18430-2	MW03-121399	12-13-99/16:20	SCB03
18430-3	OW07-121399	12-13-99/17:00	SCB03

PARAMETER	18430-1	18430-1-DL	18430-2	18430-3
Semivolatile Organics (8270)				
Naphthalene, ug/l	26000E	24000D	20	6.9J
Acenaphthylene, ug/l	32J	1000U	10U	10U
Acenaphthene, ug/l	700	1000D	1.6J	0.77J
Fluorene, ug/l	470	620JD	1.0J	10U
Phenanthrene, ug/l	900	1300D	1.9J	0.66J
Anthracene, ug/l	130	150JD	1.9J	10U
Fluoranthene, ug/l	320	400JD	10U	10U
Pyrene, ug/l	190	260JD	10U	10U
Chrysene, ug/l	48J	80JD	10U	10U
Benzo(a)anthracene, ug/l	44J	52JD	0.34J	10U
Benzo(b)fluoranthene, ug/l	20J	1000U	0.91J	10U
Benzo(k)fluoranthene, ug/l	15J	390JD	1.0J	10U
Benzo(a)pyrene, ug/l	20J	1000U	1.4J	10U
Indeno(1,2,3-cd)pyrene, ug/l	16J	1000U	2.7J	0.96J
Dibenzo(a,h)anthracene, ug/l	13J	1000U	2.2J	10U
Benzo(g,h,i)perylene, ug/l	23J	1000U	2.5J	1.2J
2-Methylnaphthalene, ug/l	1200	1800D	1.4J	10U
Surrogate-2FBP	76 %	X	68 %	80 %
Surrogate-NBZ	80 %	X	78 %	92 %
Surrogate-TPH	15 %	X	38 %	38 %
Dilution Factor	10.0	100.0	1.0	1.0
Prep Date	12.16.99	12.16.99	12.16.99	12.16.99
Analysis Date	12.23.99	01.06.00	12.20.99	12.20.99
Batch ID	1216C	1216C	1216C	1216C

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Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-1	OWI0-121399	12-13-99/13:50	SCB03
18430-1-DL	OWI0-121399	12-13-99/13:50	SCB03
18430-2	MW03-121399	12-13-99/16:20	SCB03
18430-3	OW07-121399	12-13-99/17:00	SCB03

PARAMETER	18430-1	18430-1-DL	18430-2	18430-3
Total Organic Carbon (415.1), mg/l	42		5.6	2.3
Dilution Factor	1.0	---	1.0	1.0
Prep Date	12.20.99	---	12.20.99	12.20.99
Analysis Date	12.20.99	---	12.20.99	12.20.99
Batch ID	1220C	---	1220C	1220C
Chloride (325.2), mg/l	49		29	130
Dilution Factor	1	---	1	2
Prep Date	12.15.99	---	12.15.99	12.16.99
Analysis Date	12.15.99	---	12.15.99	12.16.99
Batch ID	1215C	---	1215C	1216A
Nitrate-N (353.2), mg/l	0.050U		0.050U	14
Dilution Factor	1	---	1	20
Prep Date	12.14.99	---	12.14.99	12.14.99
Analysis Date	12.14.99	---	12.14.99	12.14.99
Batch ID	1215A	---	1215A	1215A
Sulfate as SO4 (375.4), mg/l	5.0U		36	140
Dilution Factor	1.0	---	1.0	5.0
Prep Date	12.20.99	---	12.20.99	12.20.99
Analysis Date	12.20.99	---	12.20.99	12.20.99
Batch ID	1220A	---	1220A	1220A

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-1	OWI0-121399	12-13-99/13:50	SCB03
18430-1-DL	OWI0-121399	12-13-99/13:50	SCB03
18430-2	MW03-121399	12-13-99/16:20	SCB03
18430-3	OW07-121399	12-13-99/17:00	SCB03

PARAMETER	18430-1	18430-1-DL	18430-2	18430-3
Dissolved Gases				
Methane, ug/l	170	---	47U	47U
Carbon Dioxide, ug/l	17000	---	12000	12000
Dilution Factor	1.0	---	1.0	1.0
Analysis Date	12.21.99	---	12.21.99	12.21.99
Batch ID	2C1220	---	2C1220	2C1220
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	45		8.1	8.6
Dilution Factor		---		
Prep Date	12.14.99	---	12.14.99	12.14.99
Analysis Date	12.14.99	---	12.14.99	12.14.99
Batch ID	1214A	---	1214A	1214A
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	410		470	230
Dilution Factor	1.0	---	1.0	1.0
Prep Date	12.14.99	---	12.14.99	12.14.99
Analysis Date	12.14.99	---	12.14.99	12.14.99
Batch ID	1214A	---	1214A	1214A

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-1	OWI0-121399	12-13-99/13:50	SCB03
18430-1-DL	OWI0-121399	12-13-99/13:50	SCB03
18430-2	MW03-121399	12-13-99/16:20	SCB03
18430-3	OW07-121399	12-13-99/17:00	SCB03

PARAMETER	18430-1	18430-1-DL	18430-2	18430-3
Ammonia (as N) (350.1), mg/l	0.040		0.050	0.030U
Dilution Factor	1	---	1	1
Prep Date	12.22.99	---	12.22.99	12.22.99
Analysis Date	12.22.99	---	12.22.99	12.22.99
Batch ID	1222A	---	1222A	1222A
Manganese (Dissolved) (6010)				
Manganese (Dissolved), ug/l	1100	---	300	22
Dilution Factor	1.0	---	1.0	1.0
Prep Date	12.20.99	---	12.20.99	12.20.99
Analysis Date	12.21.99	---	12.21.99	12.21.99
Batch ID	1220I	---	1220I	1220I
Iron (Dissolved) (6010)				
Iron (Dissolved), ug/l	1300	---	13B	50U
Dilution Factor	1.0	---	1.0	1.0
Prep Date	12.20.99	---	12.20.99	12.20.99
Analysis Date	12.21.99	---	12.21.99	12.21.99
Batch ID	1220I	---	1220I	1220I

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-1	OWI0-121399	12-13-99/13:50	SCB03
18430-1-DL	OWI0-121399	12-13-99/13:50	SCB03
18430-2	MW03-121399	12-13-99/16:20	SCB03
18430-3	OW07-121399	12-13-99/17:00	SCB03

PARAMETER	18430-1	18430-1-DL	18430-2	18430-3
Ortho-Phosphate-P (365.2), mg/l	0.18		0.16	0.074
Dilution Factor	1.0	---	1.0	1.0
Prep Date	12.14.99	---	12.14.99	12.14.99
Analysis Date	12.14.99	---	12.14.99	12.14.99
Batch ID	1214A	---	1214A	1214A
Chemical Oxygen Demand (410.1), mg/l	160		20U	20U
Dilution Factor	1.0	---	1.0	1.0
Prep Date	12.17.99	---	12.17.99	12.17.99
Analysis Date	12.20.99	---	12.20.99	12.20.99
Batch ID	1217A	---	1217A	1217A

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-4	DUP01-121399	12-13-99	SCB03
18430-4-DL	DUP01-121399	12-13-99	SCB03
18430-5	FB-121399	12-13-99/17:55	SCB03

PARAMETER	18430-4	18430-4-DL	18430-5
Halogenated and Aromatic Volatiles (8021)			
Benzene, ug/l	530	---	1.0U
Ethylbenzene, ug/l	210	---	1.0U
Toluene, ug/l	540	---	1.0U
o-Xylene, ug/l	240	---	1.0U
m&p-Xylene, ug/l	520	---	1.0U
Surrogate - a,a,a-Trifluorotoluene	97 %	---	107 %
Dilution Factor	25.0	---	1.0
Analysis Date	12.16.99	---	12.16.99
Batch ID	1D1216	---	2D1215

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Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-4	DUP01-121399	12-13-99	SCB03
18430-4-DL	DUP01-121399	12-13-99	SCB03
18430-5	FB-121399	12-13-99/17:55	SCB03

PARAMETER	18430-4	18430-4-DL	18430-5
Semivolatile Organics (8270)			
Naphthalene, ug/l	23000E	16000D	11
Acenaphthylene, ug/l	28J	1000U	10U
Acenaphthene, ug/l	560	540JD	0.82J
Fluorene, ug/l	340	290JD	10U
Phenanthrene, ug/l	490	470JD	0.67J
Anthracene, ug/l	69J	64JD	10U
Fluoranthene, ug/l	130	100JD	10U
Pyrene, ug/l	74J	59JD	10U
Chrysene, ug/l	15J	1000U	10U
Benzo(a)anthracene, ug/l	16J	1000U	10U
Benzo(b)fluoranthene, ug/l	100U	1000U	10U
Benzo(k)fluoranthene, ug/l	100U	1000U	10U
Benzo(a)pyrene, ug/l	7.1J	1000U	10U
Indeno(1,2,3-cd)pyrene, ug/l	100U	1000U	10U
Dibenzo(a,h)anthracene, ug/l	100U	1000U	10U
Benzo(g,h,i)perylene, ug/l	100U	1000U	10U
2-Methylnaphthalene, ug/l	1100	940JD	10U
Surrogate-2FBP	84 %	X	76 %
Surrogate-NBZ	96 %	X	84 %
Surrogate-TPH	20 %	X	68 %
Dilution Factor	10.0	100.0	1.0
Prep Date	12.16.99	12.16.99	12.16.99
Analysis Date	12.23.99	12.23.99	12.20.99
Batch ID	1216C	1216C	1216C

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-4	DUP01-121399	12-13-99	SCB03
18430-4-DL	DUP01-121399	12-13-99	SCB03
18430-5	FB-121399	12-13-99/17:55	SCB03

PARAMETER	18430-4	18430-4-DL	18430-5

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 121400119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18430-6	TB-121399	12-13-99	SCB03

PARAMETER	18430-6
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	107 %
Dilution Factor	1.0
Analysis Date	12.16.99
Batch ID	2D1215

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.
X = Because the sample was diluted prior to analysis, surrogate recoveries

Angie Weimerskirk
Angie Weimerskirk, Project Manager

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Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	16	---	1.0U	1.0U	1.8
Ethylbenzene, ug/l	35	---	1.0U	1.0U	2.4
Toluene, ug/l	49	---	1.0U	1.0U	1.0U
o-Xylene, ug/l	45	---	1.0U	1.0U	2.1
m&p-Xylene, ug/l	82	---	1.0U	1.0U	4.6
Surrogate - a,a,a-Trifluorotoluene	97 %	---	100 %	100 %	93 %
Dilution Factor	5.0	---	1.0	1.0	1.0
Analysis Date	12.22.99	---	12.21.99	12.21.99	12.21.99
Batch ID	2D1221	---	1D1221	1D1221	1D1221

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LOG NO: S9-18475
Received: 17 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Semivolatile Organics (8270)					
Naphthalene, ug/l	760E	11000D	0.72J	7.3J	400E
Acenaphthylene, ug/l	13	19JD	10U	10U	0.70J
Acenaphthene, ug/l	280	560D	10U	0.31J	28
Fluorene, ug/l	130	260JD	10U	10U	12
Phenanthrene, ug/l	190	360JD	10U	0.61J	3.4J
Anthracene, ug/l	32	46JD	0.34J	10U	0.82J
Fluoranthene, ug/l	56	68JD	10U	10U	1.3J
Pyrene, ug/l	35	48JD	10U	10U	0.72J
Chrysene, ug/l	6.4J	400U	10U	10U	10U
Benzo(a)anthracene, ug/l	6.8J	400U	10U	10U	10U
Benzo(b)fluoranthene, ug/l	5.0J	400U	0.89J	10U	10U
Benzo(k)fluoranthene, ug/l	4.1J	400U	0.78J	10U	10U
Benzo(a)pyrene, ug/l	4.9J	400U	1.2J	10U	10U
Indeno(1,2,3-cd)pyrene, ug/l	5.5J	30JD	4.1J	2.9J	2.5J
Dibenzo(a,h)anthracene, ug/l	4.9J	400U	4.2J	2.9J	2.4J
Benzo(g,h,i)perylene, ug/l	5.6J	33JD	4.6J	3.3J	2.8J
2-Methylnaphthalene, ug/l	210	840D	10U	0.51J	26
Surrogate-2FBP	46 %	68 %	66 %	64 %	78 %

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Surrogate-NBZ	36 %	78 %	70 %	70 %	86 %
Surrogate-TPH	12 %Y	18 %	38 %	24 %	44 %
Dilution Factor	1.0	40.0	1.0	1.0	1.0
Prep Date	12.21.99	12.21.99	12.21.99	12.21.99	12.21.99
Analysis Date	12.27.99	12.29.99	12.27.99	12.27.99	12.27.99
Batch ID	1221C	1221C	1221C	1221C	1221C
Total Organic Carbon (415.1), mg/l	49		8.3	2.8	4.5
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	12.21.99	---	12.21.99	12.21.99	12.21.99
Analysis Date	12.21.99	---	12.21.99	12.21.99	12.21.99
Batch ID	1221C	---	1221C	1221C	1221C
Chloride (325.2), mg/l	14		5.5	8.5	11
Dilution Factor	1	---	1	1	1
Prep Date	12.21.99	---	12.21.99	12.21.99	12.21.99
Analysis Date	12.21.99	---	12.21.99	12.21.99	12.21.99
Batch ID	1221A	---	1221A	1221A	1221A

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Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Nitrate-N (353.2), mg/l	0.050U		0.050U	0.050U	0.34
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Analysis Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Batch ID	1216B	---	1216B	1216B	1216B
Sulfate as SO4 (375.4), mg/l	24		61	15	17
Dilution Factor	1	---	2	1	1
Prep Date	12.28.99	---	12.28.99	12.28.99	12.28.99
Analysis Date	12.28.99	---	12.28.99	12.28.99	12.28.99
Batch ID	1228A	---	1228A	1228A	1228A
Dissolved Gases					
Methane, ug/l	1400	1400	47U	47U	320
Carbon Dioxide, ug/l	100000E	110000	9700	5400	18000
Dilution Factor	1.0	10.0	1.0	1.0	1.0
Analysis Date	12.23.99	12.23.99	12.23.99	12.23.99	12.23.99
Batch ID	1C1223	1C1223	1C1223	1C1223	1C1223

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Sampled By: Client
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	32		2.0U	2.0U	2.0U
Prep Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Analysis Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Batch ID	1215A	---	1215A	1215A	1215A
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	410		250	390	360
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	12.16.99	---	12.16.99	12.16.99	12.16.99
Analysis Date	12.16.99	---	12.16.99	12.16.99	12.16.99
Batch ID	1216A	---	1216A	1216A	1216A
Ammonia (as N) (350.1), mg/l	0.19		0.11	0.031	0.067
Dilution Factor	1	---	1	1	1
Prep Date	12.22.99	---	12.22.99	12.22.99	12.22.99
Analysis Date	12.22.99	---	12.22.99	12.22.99	12.22.99
Batch ID	1222D	---	1222D	1222D	1222D

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Manganese (Dissolved) (6010)					
Manganese (Dissolved), ug/l	4500	---	3200	560	1100
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	01.04.99	---	01.04.99	01.04.99	01.04.99
Analysis Date	01.05.00	---	01.05.00	01.05.00	01.05.00
Batch ID	0104G	---	0104G	0104G	0104G
Iron (Dissolved) (6010)					
Iron (Dissolved), ug/l	5000	---	700	33B	770
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	01.04.99	---	01.04.99	01.04.99	01.04.99
Analysis Date	01.05.00	---	01.05.00	01.05.00	01.05.00
Batch ID	0104G	---	0104G	0104G	0104G
Ortho-Phosphate-P (365.2), mg/l	0.17		0.10	0.14	0.18
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Analysis Date	12.15.99	---	12.15.99	12.15.99	12.15.99
Batch ID	1215A	---	1215A	1215A	1215A

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-1	OW02-121499	12-14-99/09:20	SCB03
18475-1-DL	OW02-121499	12-14-99/09:20	SCB03
18475-2	MW07-121499	12-14-99/11:35	SCB03
18475-3	MW08-121499	12-14-99/14:10	SCB03
18475-4	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-1	18475-1-DL	18475-2	18475-3	18475-4
Chemical Oxygen Demand (410.1), mg/l	120		20U	20U	20U
Dilution Factor	1.0	---	1.0	1.0	1.0
Prep Date	12.21.99	---	12.17.99	12.17.99	12.17.99
Analysis Date	12.21.99	---	12.20.99	12.20.99	12.20.99
Batch ID	1221A	---	1217B	1217B	1217B

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-4-DL	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-4-DL
Halogenated and Aromatic Volatiles (8021)	

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-4-DL	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-4-DL
Semivolatile Organics (8270)	
Naphthalene, ug/l	630D
Acenaphthylene, ug/l	50U
Acenaphthene, ug/l	31JD
Fluorene, ug/l	12JD
Phenanthrene, ug/l	3.7JD
Anthracene, ug/l	50U
Fluoranthene, ug/l	50U
Pyrene, ug/l	50U
Chrysene, ug/l	50U
Benzo(a)anthracene, ug/l	50U
Benzo(b)fluoranthene, ug/l	50U
Benzo(k)fluoranthene, ug/l	50U
Benzo(a)pyrene, ug/l	50U
Indeno(1,2,3-cd)pyrene, ug/l	50U
Dibenzo(a,h)anthracene, ug/l	50U
Benzo(g,h,i)perylene, ug/l	50U
2-Methylnaphthalene, ug/l	29JD
Surrogate-2FBP	84 %
Surrogate-NBZ	76 %
Surrogate-TPH	38 %
Dilution Factor	5.0
Prep Date	12.21.99
Analysis Date	12.29.99
Batch ID	1221C

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LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-4-DL	MW24-121499	12-14-99/16:40	SCB03

PARAMETER	18475-4-DL
Total Organic Carbon (415.1)	
Chloride (325.2)	
Nitrate-N (353.2), mg/l	
Sulfate as SO4 (375.4), mg/l	
Dissolved Gases	
Biochemical Oxygen Demand (5 Day) (405.1/5210B)	
Alkalinity (to pH 4.5) as CaCO3 (310.1)	
Ammonia (as N) (350.1)	
Manganese (Dissolved) (6010)	
Iron (Dissolved) (6010)	
Ortho-Phosphate-P (365.2)	
Chemical Oxygen Demand (410.1)	

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-5	DUP02-121499	12-14-99	SCB03
18475-5-DL	DUP02-121499	12-14-99	SCB03
18475-6	FB-121499	12-14-99/11:30	SCB03

PARAMETER	18475-5	18475-5-DL	18475-6
Halogenated and Aromatic Volatiles (8021)			
Benzene, ug/l	14	---	1.0U
Ethylbenzene, ug/l	36	---	1.0U
Toluene, ug/l	46	---	1.0U
o-Xylene, ug/l	51	---	1.0U
m&p-Xylene, ug/l	97	---	1.0U
Surrogate - a,a,a-Trifluorotoluene	93 %	---	103 %
Dilution Factor	5.0	---	1.0
Analysis Date	12.22.99	---	12.21.99
Batch ID	2D1221	---	1D1221

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18475-5-DL	DUP02-121499	12-14-99	SCB03
18475-6	FB-121499	12-14-99/11:30	SCB03

PARAMETER	18475-5	18475-5-DL	18475-6
Semivolatile Organics (8270)			
Naphthalene, ug/l	1600E	9700D	10U
Acenaphthylene, ug/l	14	16JD	10U
Acenaphthene, ug/l	280	500D	10U
Fluorene, ug/l	140	240JD	10U
Phenanthrene, ug/l	200	320JD	10U
Anthracene, ug/l	32	42JD	10U
Fluoranthene, ug/l	56	63JD	10U
Pyrene, ug/l	33	39JD	10U
Chrysene, ug/l	6.3J	7.6JD	10U
Benzo(a)anthracene, ug/l	6.7J	11JD	10U
Benzo(b)fluoranthene, ug/l	5.2J	5.9JD	10U
Benzo(k)fluoranthene, ug/l	5.3J	5.6JD	10U
Benzo(a)pyrene, ug/l	3.1J	3.9JD	0.43J
Indeno(1,2,3-cd)pyrene, ug/l	2.0J	15JD	2.0J
Dibenzo(a,h)anthracene, ug/l	1.6J	17JD	2.2J
Benzo(g,h,i)perylene, ug/l	2.5J	20JD	2.4J
2-Methylnaphthalene, ug/l	440E	780D	10U
Surrogate-2FBP	50 %	68 %	80 %
Surrogate-NBZ	80 %	76 %	92 %
Surrogate-TPH	14 %	14 %	100 %
Dilution Factor	1.0	40.0	1.0
Prep Date	12.21.99	12.21.99	12.21.99
Analysis Date	12.27.99	12.29.99	12.27.99
Batch ID	1221C	1221C	1221C

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18475-5	DUP02-121499	12-14-99	SCB03
18475-5-DL	DUP02-121499	12-14-99	SCB03
18475-6	FB-121499	12-14-99/11:30	SCB03

PARAMETER	18475-5	18475-5-DL	18475-6

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
18475-7	TB-121499		SCB03

PARAMETER	18475-7
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	103 %
Dilution Factor	1.0
Analysis Date	12.21.99
Batch ID	1D1221

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

Y = Surrogate recovery outside accuracy limits.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18503A
Received: 16 DEC 99

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 14480027

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , OIL SAMPLES	DATE/ TIME SAMPLED	SDG#
18503A-1	RWS1-121599	12-15-99/10:00	SCB06
18503A-2	RWS2-121599	12-15-99/11:30	SCB06
18503A-3	RWS5-121599	12-15-99/12:30	SCB06
18503A-4	RWN4-121599	12-15-99/13:00	SCB06

PARAMETER	18503A-1	18503A-2	18503A-3	18503A-4
Semivolatile Organics (8270)				
Naphthalene, ug/kg dw	200000000	140000000	110000000	120000000
Acenaphthylene, ug/kg dw	9900000U	9600000U	9900000U	9800000U
Acenaphthene, ug/kg dw	40000000	28000000	42000000	26000000
Fluorene, ug/kg dw	27000000	23000000	24000000	17000000
Phenanthrene, ug/kg dw	88000000	68000000	70000000	61000000
Anthracene, ug/kg dw	12000000	9900000	9300000J	9700000J
Fluoranthene, ug/kg dw	38000000	30000000	44000000	33000000
Pyrene, ug/kg dw	23000000	16000000	28000000	20000000
Chrysene, ug/kg dw	4800000J	4200000J	6900000J	4400000J
Benzo(a)anthracene, ug/kg dw	5000000J	4300000J	8200000J	4800000J
Benzo(b)fluoranthene, ug/kg dw	2000000J	1500000J	2700000J	1800000J
Benzo(k)fluoranthene, ug/kg dw	2700000J	2100000J	3900000J	2000000J
Benzo(a)pyrene, ug/kg dw	3000000J	2000000J	3400000J	2100000J
Indeno(1,2,3-cd)pyrene, ug/kg dw	9900000U	9600000U	9900000U	9800000U
Dibenzo(a,h)anthracene, ug/kg dw	9900000U	1700000J	9900000U	9800000U
Benzo(g,h,i)perylene, ug/kg dw	2400000J	2200000J	1300000J	1200000J
2-Methylnaphthalene, ug/kg dw	40000000	30000000	27000000	24000000
Surrogate-2FBP	X	X	X	X
Surrogate-NBZ	X	X	X	X
Surrogate-TPH	X	X	X	X
Dilution Factor	100.0	100.0	100.0	100.0
Prep Date	12.28.99	12.28.99	12.28.99	12.28.99
Analysis Date	02.03.00	02.04.00	02.04.00	02.04.00
Batch ID	1228E	1228E	1228E	1228E

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LOG NO: S9-18503
Received: 16 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 14390027

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , OIL SAMPLES	DATE/ TIME SAMPLED	SDG#
18503-1	RWS1-121599	12-15-99/10:00	SCB04
18503-2	RWS2-121599	12-15-99/11:30	SCB04
18503-3	RWS5-121599	12-15-99/12:30	SCB04
18503-4	RWN4-121599	12-15-99/13:00	SCB04

PARAMETER	18503-1	18503-2	18503-3	18503-4
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/kg	220000	89000	8600J	13000
Ethylbenzene, ug/kg	460000	230000	190000	120000
Toluene, ug/kg	730000	280000	37000	75000
o-Xylene, ug/kg	210000	76000	7400J	170000
m&p-Xylene, ug/kg	1200000	570000	280000	320000
Surrogate - a,a,a-Trifluorotoluene	137 %	73 %	53 %	90 %
Dilution Factor	4000	2000	2000	2000
Analysis Date	12.28.99	12.28.99	12.28.99	12.28.99
Batch ID	1A1227	1A1228	1A1228	1A1228

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LOG NO: S9-18503A
Received: 16 DEC 99

Mr. Jeff Hale
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 14480027

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , OIL SAMPLES	DATE/ TIME SAMPLED	SDG#
18503A-1	RWS1-121599	12-15-99/10:00	SCB06
18503A-2	RWS2-121599	12-15-99/11:30	SCB06
18503A-3	RWS5-121599	12-15-99/12:30	SCB06
18503A-4	RWN4-121599	12-15-99/13:00	SCB06

PARAMETER	18503A-1	18503A-2	18503A-3	18503A-4

X = Because sample was diluted prior to analysis, surrogate recoveries are not reported.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-02343
Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-1	MW-01	04-11-00/16:15	SCB07
02343-1-DL	MW-01	04-11-00/16:15	SCB07

PARAMETER	02343-1	02343-1-DL
Halogenated and Aromatic Volatiles (8021)		
Benzene, ug/l	4.1	---
Ethylbenzene, ug/l	8.0	---
Toluene, ug/l	5.7	---
o-Xylene, ug/l	6.9	---
m&p-Xylene, ug/l	14	---
Surrogate - a,a,a-Trifluorotoluene	103 %	---
Dilution Factor	1	---
Analysis Date	04.14.00	---
Batch ID	1B0414	---

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LOG NO: S0-02343
Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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1200 Arch Street - Suite 200
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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-1	MW-01	04-11-00/16:15	SCB07
02343-1-DL	MW-01	04-11-00/16:15	SCB07

PARAMETER	02343-1	02343-1-DL
Semivolatile Organics (8270)		
Naphthalene, ug/l	340	---
Acenaphthylene, ug/l	0.66JB	---
Acenaphthene, ug/l	14	---
Fluorene, ug/l	4.7J	---
Phenanthrene, ug/l	2.8JB	---
Anthracene, ug/l	0.76J	---
Fluoranthene, ug/l	0.58J	---
Pyrene, ug/l	10U	---
Chrysene, ug/l	10U	---
Benzo(a)anthracene, ug/l	10U	---
Benzo(b)fluoranthene, ug/l	0.71JB	---
Benzo(k)fluoranthene, ug/l	10U	---
Benzo(a)pyrene, ug/l	0.88JB	---
Indeno(1,2,3-cd)pyrene, ug/l	1.2JB	---
Dibenzo(a,h)anthracene, ug/l	10U	---
Benzo(g,h,i)perylene, ug/l	1.3JB	---
2-Methylnaphthalene, ug/l	15	---
Surrogate-2FBP	88 %	---
Surrogate-NBZ	82 %	---
Surrogate-TPH	98 %	---
Dilution Factor	1	---
Prep Date	04.14.00	---
Analysis Date	04.17.00	---
Batch ID	0414B	---

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LOG NO: S0-02343
Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-1	MW-01	04-11-00/16:15	SCB07
02343-1-DL	MW-01	04-11-00/16:15	SCB07

PARAMETER	02343-1	02343-1-DL
Total Organic Carbon (415.1), mg/l	6.0	
Dilution Factor	1	---
Prep Date	04.14.00	---
Analysis Date	04.14.00	---
Batch ID	0414A	---
Chloride (325.2), mg/l	68	
Dilution Factor	1	---
Prep Date	04.18.00	---
Analysis Date	04.18.00	---
Batch ID	0418C	---
Nitrate-N (353.2), mg/l	0.050U	
Dilution Factor	1	---
Prep Date	04.12.00	---
Analysis Date	04.12.00	---
Batch ID	0416B	---
Sulfate as SO4 (375.4), mg/l	5.0U	
Dilution Factor	1	---
Prep Date	04.20.00	---
Analysis Date	04.20.00	---
Batch ID	0420A	---

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Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-1	MW-01	04-11-00/16:15	SCB07
02343-1-DL	MW-01	04-11-00/16:15	SCB07

PARAMETER	02343-1	02343-1-DL
Dissolved Gases (SOP AR30)		
Methane, ug/l	1100	---
Carbon Dioxide, ug/l	61000EB	59000DB
Dilution Factor	1	3
Analysis Date	04.18.00	04.20.00
Batch ID	1C0417	1C0420
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U	
Dilution Factor		---
Prep Date	04.12.00	---
Analysis Date	04.12.00	---
Batch ID	0412A	---
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	460	
Dilution Factor	1	---
Prep Date	04.13.00	---
Analysis Date	04.13.00	---
Batch ID	0413B	---
Ammonia (as N) (350.1), mg/l	0.030U	
Dilution Factor	1	---
Prep Date	04.14.00	---
Analysis Date	04.14.00	---
Batch ID	0414B	---

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Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-1	MW-01	04-11-00/16:15	SCB07
02343-1-DL	MW-01	04-11-00/16:15	SCB07

PARAMETER	02343-1	02343-1-DL
Manganese (Dissolved) (6010)		
Manganese (Dissolved), mg/l	0.48	---
Dilution Factor	1	---
Prep Date	04.19.00	---
Analysis Date	04.20.00	---
Batch ID	0419I	---
Iron (Dissolved) (6010)		
Iron (Dissolved), mg/l	2.8	---
Dilution Factor	1	---
Prep Date	04.19.00	---
Analysis Date	04.20.00	---
Batch ID	0419I	---
Ortho-Phosphate-P (365.2), mg/l	0.23	
Dilution Factor	1	---
Prep Date	04.12.00	---
Analysis Date	04.12.00	---
Batch ID	0412A	---
Chemical Oxygen Demand (410.1), mg/l	20U	
Dilution Factor	1	---
Prep Date	04.19.00	---
Analysis Date	04.19.00	---
Batch ID	0419A	---

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Received: 12 APR 00
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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-2	FB-01-041100	04-11-00/17:30	SCB07

PARAMETER	02343-2
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	0.19J
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	100 %
Dilution Factor	1
Analysis Date	04.14.00
Batch ID	1B0414

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LOG NO: S0-02343
Received: 12 APR 00
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Mr. Jeff Hale
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1200 Arch Street - Suite 200
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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-2	FB-01-041100	04-11-00/17:30	SCB07

PARAMETER	02343-2
Semivolatile Organics (8270)	
Naphthalene, ug/l	10U
Acenaphthylene, ug/l	10U
Acenaphthene, ug/l	10U
Fluorene, ug/l	10U
Phenanthrene, ug/l	0.42JB
Anthracene, ug/l	10U
Fluoranthene, ug/l	10U
Pyrene, ug/l	10U
Chrysene, ug/l	10U
Benzo(a)anthracene, ug/l	10U
Benzo(b)fluoranthene, ug/l	10U
Benzo(k)fluoranthene, ug/l	10U
Benzo(a)pyrene, ug/l	0.55JB
Indeno(1,2,3-cd)pyrene, ug/l	10U
Dibenzo(a,h)anthracene, ug/l	10U
Benzo(g,h,i)perylene, ug/l	0.69JB
2-Methylnaphthalene, ug/l	10U
Surrogate-2FBP	98 %
Surrogate-NBZ	92 %
Surrogate-TPH	100 %
Dilution Factor	1
Prep Date	04.14.00
Analysis Date	04.18.00
Batch ID	0414B

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LOG NO: S0-02343
Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155200511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02343-3	Trip Blank	04-11-00	SCB07

PARAMETER	02343-3
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	103 %
Dilution Factor	1
Analysis Date	04.14.00
Batch ID	1B0414

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-02457
Received: 17 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155900511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02457-1	MW-12R	04-13-00/09:20	SCB07
02457-1-DL	MW-12R	04-13-00/09:20	SCB07
02457-2	FB-02-041300	04-13-00/14:40	SCB07
02457-3	P-02R	04-14-00/09:00	SCB07
02457-3-DL	P-02R	04-14-00/09:00	SCB07

PARAMETER	02457-1	02457-1-DL	02457-2	02457-3	02457-3-DL
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	---	1.0U	8.4	---
Ethylbenzene, ug/l	9.3	---	1.0U	26	---
Toluene, ug/l	10	---	1.0U	12	---
o-Xylene, ug/l	13B	---	1.0U	19B	---
m&p-Xylene, ug/l	13	---	1.0U	14	---
Surrogate - a,a,a-Trifluorotoluene	87 %	---	90 %	77 %	---
Dilution Factor	1	---	1	1	---
Analysis Date	04.24.00	---	04.24.00	04.24.00	---
Batch ID	1D0424	---	1D0424	1D0424	---

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LOG NO: S0-02457
Received: 17 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155900511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02457-1	MW-12R	04-13-00/09:20	SCB07
02457-1-DL	MW-12R	04-13-00/09:20	SCB07
02457-2	FB-02-041300	04-13-00/14:40	SCB07
02457-3	P-02R	04-14-00/09:00	SCB07
02457-3-DL	P-02R	04-14-00/09:00	SCB07

PARAMETER	02457-1	02457-1-DL	02457-2	02457-3	02457-3-DL
Semivolatile Organics (8270)					
Naphthalene, ug/l	820E	1700D	10U	880E	1400D
Acenaphthylene, ug/l	2.3J	2.8DJ	10U	7.2J	7.1DJ
Acenaphthene, ug/l	250	300D	0.34J	270	320D
Fluorene, ug/l	84	88D	10U	61	58D
Phenanthrene, ug/l	110	120D	10U	77	82D
Anthracene, ug/l	13	16DJ	10U	17	18DJ
Fluoranthene, ug/l	11	11DJ	10U	30	28DJ
Pyrene, ug/l	6.5J	7.3DJ	10U	18	17DJ
Chrysene, ug/l	10U	50U	10U	0.80J	50U
Benzo(a)anthracene, ug/l	0.40J	50U	10U	0.78J	50U
Benzo(b)fluoranthene, ug/l	10U	50U	10U	10U	50U
Benzo(k)fluoranthene, ug/l	10U	50U	10U	10U	50U
Benzo(a)pyrene, ug/l	0.56J	2.9DJ	10U	10U	50U
Indeno(1,2,3-cd)pyrene, ug/l	1.1J	6.8DJ	0.81J	0.77J	4.4DJ
Dibenzo(a,h)anthracene, ug/l	0.91J	4.7DJ	10U	10U	50U
Benzo(g,h,i)perylene, ug/l	1.2J	8.2DJ	1.1J	0.92J	4.6DJ
2-Methylnaphthalene, ug/l	230	230D	10U	120	110D
Surrogate-2FBP	74 %	0D %	80 %	72 %	0D %

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LOG NO: S0-02457
Received: 17 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155900511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02457-1	MW-12R	04-13-00/09:20	SCB07
02457-1-DL	MW-12R	04-13-00/09:20	SCB07
02457-2	FB-02-041300	04-13-00/14:40	SCB07
02457-3	P-02R	04-14-00/09:00	SCB07
02457-3-DL	P-02R	04-14-00/09:00	SCB07

PARAMETER	02457-1	02457-1-DL	02457-2	02457-3	02457-3-DL
Surrogate-NBZ	80 %	0D %	80 %	80 %	0D %
Surrogate-TPH	60 %	0D %	88 %	72 %	0D %
Dilution Factor	1	5	1	1	5
Prep Date	04.18.00	04.18.00	04.18.00	04.18.00	04.18.00
Analysis Date	04.20.00	04.20.00	04.20.00	04.20.00	04.20.00
Batch ID	0418C	0418C	0418C	0418C	0418C

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Mr. Jeff Hale
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155900511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02457-4	FB-03-041400	04-14-00/18:15	SCB07

PARAMETER	02457-4
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	0.36JB
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	90 %
Dilution Factor	1
Analysis Date	04.24.00
Batch ID	1D0424

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LOG NO: S0-02457
Received: 17 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155900511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02457-4	FB-03-041400	04-14-00/18:15	SCB07

PARAMETER	02457-4
Semivolatile Organics (8270)	
Naphthalene, ug/l	10U
Acenaphthylene, ug/l	10U
Acenaphthene, ug/l	0.40J
Fluorene, ug/l	10U
Phenanthrene, ug/l	10U
Anthracene, ug/l	10U
Fluoranthene, ug/l	10U
Pyrene, ug/l	10U
Chrysene, ug/l	0.87J
Benzo(a)anthracene, ug/l	0.68J
Benzo(b)fluoranthene, ug/l	1.4J
Benzo(k)fluoranthene, ug/l	1.4J
Benzo(a)pyrene, ug/l	1.6J
Indeno(1,2,3-cd)pyrene, ug/l	1.5J
Dibenzo(a,h)anthracene, ug/l	1.2J
Benzo(g,h,i)perylene, ug/l	1.4J
2-Methylnaphthalene, ug/l	10U
Surrogate-2FBP	76 %
Surrogate-NBZ	76 %
Surrogate-TPH	82 %
Dilution Factor	1
Prep Date	04.18.00
Analysis Date	04.20.00
Batch ID	0418C

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LOG NO: S0-02457
Received: 17 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155900511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02457-5	Trip Blank	04-14-00	SCB07

PARAMETER	02457-5
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	87 %
Dilution Factor	1
Analysis Date	04.19.00
Batch ID	1D0419

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

Angie Weimerskirk, Project Manager

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LOG NO: S0-02509
Received: 19 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-0920030

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02509-1	P-03R	04-17-00/16:30	SCB07
02509-2	MW-25	04-17-00/17:45	SCB07
02509-3	MW-14R	04-17-00/19:25	SCB07
02509-3-DL	MW-14R	04-17-00/19:25	SCB07
02509-4	DUP-01-041700	04-17-00/00:00	SCB07

PARAMETER	02509-1	02509-2	02509-3	02509-3-DL	02509-4
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	2.9	2.6	0.25J	---	320
Ethylbenzene, ug/l	0.32J	0.14J	1.0U	---	170
Toluene, ug/l	1.2	1.1	0.15J	---	42J
o-Xylene, ug/l	0.30J	0.16JB	0.13JB	---	170
m&p-Xylene, ug/l	0.63J	0.33J	1.0U	---	210
Surrogate - a,a,a-Trifluorotoluene	80 %	83 %	83 %	---	83 %
Dilution Factor	1	1	1	---	50
Analysis Date	04.25.00	04.24.00	04.24.00	---	04.25.00
Batch ID	1D0425	1D0424	1D0424	---	1D0425

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Received: 19 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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Client PO. No.: 00552-0920030

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02509-1	P-03R	04-17-00/16:30	SCB07
02509-2	MW-25	04-17-00/17:45	SCB07
02509-3	MW-14R	04-17-00/19:25	SCB07
02509-3-DL	MW-14R	04-17-00/19:25	SCB07
02509-4	DUP-01-041700	04-17-00/00:00	SCB07

PARAMETER	02509-1	02509-2	02509-3	02509-3-DL	02509-4
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	10U	4500E	12000D	3800E
Acenaphthylene, ug/l	0.34J	10U	9.0J	400U	7.8J
Acenaphthene, ug/l	1.0J	0.62J	350E	520D	310
Fluorene, ug/l	0.62J	10U	210	270DJ	180
Phenanthrene, ug/l	0.97J	10U	200	290DJ	180
Anthracene, ug/l	0.96J	10U	29	37DJ	26
Fluoranthene, ug/l	5.2J	10U	20	27DJ	16
Pyrene, ug/l	2.7J	10U	11	400U	8.6J
Chrysene, ug/l	10U	10U	10U	400U	10U
Benzo(a)anthracene, ug/l	10U	10U	0.72J	400U	10U
Benzo(b)fluoranthene, ug/l	10U	10U	10U	400U	10U
Benzo(k)fluoranthene, ug/l	10U	10U	10U	400U	10U
Benzo(a)pyrene, ug/l	10U	10U	0.51J	400U	10U
Indeno(1,2,3-cd)pyrene, ug/l	10U	10U	10U	400U	10U
Dibenzo(a,h)anthracene, ug/l	10U	10U	10U	400U	10U
Benzo(g,h,i)perylene, ug/l	10U	10U	10U	400U	10U
2-Methylnaphthalene, ug/l	10U	10U	880E	900D	720E
Surrogate-2FBP	60 %	76 %	72 %	0D %	70 %

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Received: 19 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-0920030

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02509-1	P-03R	04-17-00/16:30	SCB07
02509-2	MW-25	04-17-00/17:45	SCB07
02509-3	MW-14R	04-17-00/19:25	SCB07
02509-3-DL	MW-14R	04-17-00/19:25	SCB07
02509-4	DUP-01-041700	04-17-00/00:00	SCB07

PARAMETER	02509-1	02509-2	02509-3	02509-3-DL	02509-4
Surrogate-NBZ	60 %	80 %	134 %	0D %	106 %
Surrogate-TPH	50 %	72 %	80 %	0D %	70 %
Dilution Factor	1	1	1	40	1
Prep Date	04.20.00	04.20.00	04.20.00	04.20.00	04.20.00
Analysis Date	05.02.00	05.02.00	05.03.00	05.03.00	05.03.00
Batch ID	0420D	0420D	0420D	0420D	0420D

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LOG NO: S0-02509
Received: 19 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-0920030

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02509-4-DL	DUP-01-041700	04-17-00/00:00	SCB07
02509-5	FB-04-041700	04-17-00/20:10	SCB07
02509-6	MW-26	04-17-00/13:30	SCB07
02509-6-DL	MW-26	04-17-00/13:30	SCB07

PARAMETER	02509-4-DL	02509-5	02509-6	02509-6-DL
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/l	---	1.0U	500U	---
Ethylbenzene (8021), ug/l	---	1.0U	500U	---
Toluene (8021), ug/l	---	0.16J	500U	---
o-Xylene, ug/l	---	0.35JB	500U	---
m&p-Xylene, ug/l	---	1.0U	500U	---
Surrogate - a,a,a-Trifluorotoluene	---	87 %	87 %	---
Dilution Factor	---	1	500	---
Analysis Date	---	04.24.00	04.26.00	---
Batch ID	---	1D0420	1D0426	---

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Received: 19 APR 00
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Pittsburgh, PA 15106

Client PO. No.: 00552-0920030

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02509-4-DL	DUP-01-041700	04-17-00/00:00	SCB07
02509-5	FB-04-041700	04-17-00/20:10	SCB07
02509-6	MW-26	04-17-00/13:30	SCB07
02509-6-DL	MW-26	04-17-00/13:30	SCB07

PARAMETER	02509-4-DL	02509-5	02509-6	02509-6-DL
Semivolatile Organics (8270)				
Naphthalene, ug/l	12000D	0.74J	2100E	4300D
Acenaphthylene, ug/l	400U	10U	1.9J	250U
Acenaphthene, ug/l	460D	10U	320	340D
Fluorene, ug/l	230DJ	10U	220	220DJ
Phenanthrene, ug/l	250DJ	10U	330	360D
Anthracene, ug/l	30DJ	10U	28	25DJ
Fluoranthene, ug/l	21DJ	10U	42	42DJ
Pyrene, ug/l	400U	10U	26	21DJ
Chrysene, ug/l	400U	10U	2.3J	250U
Benzo(a)anthracene, ug/l	400U	10U	1.9J	250U
Benzo(b)fluoranthene, ug/l	400U	10U	0.73J	250U
Benzo(k)fluoranthene, ug/l	400U	10U	10U	250U
Benzo(a)pyrene, ug/l	400U	10U	0.66J	250U
Indeno(1,2,3-cd)pyrene, ug/l	400U	10U	10U	250U
Dibenzo(a,h)anthracene, ug/l	400U	10U	10U	250U
Benzo(g,h,i)perylene, ug/l	400U	10U	10U	250U
2-Methylnaphthalene, ug/l	780D	10U	250	230DJ
Surrogate-2FBP	0D %	92 %	92 %	0D %
Surrogate-NBZ	0D %	92 %	104 %	0D %
Surrogate-TPH	0D %	104 %	80 %	0D %
Dilution Factor	40	1	1	25
Prep Date	04.20.00	04.20.00	04.20.00	04.20.00
Analysis Date	05.03.00	05.02.00	05.02.00	05.03.00
Batch ID	0420D	0420D	0420D	0420D

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LOG NO: S0-02509
Received: 19 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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Pittsburgh, PA 15106

Client PO. No.: 00552-0920030

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
02509-7	Trip Blank	04-18-00	SCB07

PARAMETER	02509-7
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	0.80J
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	100 %
Dilution Factor	1
Analysis Date	04.24.00
Batch ID	1D0420

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-04432
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432-1	MW-26	07-05-00/15:30	SCB08
04432-1-DL	MW-26	07-05-00/15:30	SCB08

PARAMETER	04432-1	04432-1-DL
Halogenated and Aromatic Volatiles (8021)		
Benzene, ug/l	1.0U	---
Ethylbenzene, ug/l	4.4	---
Toluene, ug/l	0.45J	---
o-Xylene, ug/l	1.4	---
m&p-Xylene, ug/l	6.6	---
Surrogate - a,a,a-Trifluorotoluene	90 %	---
Dilution Factor	1	---
Analysis Date	07.08.00	---
Batch ID	1D0708	---

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LOG NO: S0-04432
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432-1	MW-26	07-05-00/15:30	SCB08
04432-1-DL	MW-26	07-05-00/15:30	SCB08

PARAMETER	04432-1	04432-1-DL
Semivolatile Organics (8270)		
Naphthalene, ug/l	890E	1800D
Acenaphthylene, ug/l	1.2J	100U
Acenaphthene, ug/l	250	220D
Fluorene, ug/l	150	140D
Phenanthrene, ug/l	270	240D
Anthracene, ug/l	22	21DJ
Fluoranthene, ug/l	29	23DJ
Pyrene, ug/l	15	12DJ
Chrysene, ug/l	1.2J	100U
Benzo(a)anthracene, ug/l	1.3J	100U
Benzo(b)fluoranthene, ug/l	10U	100U
Benzo(k)fluoranthene, ug/l	10U	100U
Benzo(a)pyrene, ug/l	10U	100U
Indeno(1,2,3-cd)pyrene, ug/l	10U	100U
Dibenzo(a,h)anthracene, ug/l	10U	100U
Benzo(g,h,i)perylene, ug/l	10U	100U
2-Methylnaphthalene, ug/l	110	100D
Surrogate-2FBP	74 %	0D %
Surrogate-NBZ	68 %	0D %
Surrogate-TPH	46 %	0D %
Dilution Factor	1	10
Prep Date	07.07.00	07.07.00
Analysis Date	07.11.00	07.11.00
Batch ID	0707A	0707A

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LOG NO: S0-04432
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432-1	MW-26	07-05-00/15:30	SCB08
04432-1-DL	MW-26	07-05-00/15:30	SCB08

PARAMETER	04432-1	04432-1-DL
Total Organic Carbon (415.1), mg/l	5.8	
Dilution Factor	1	---
Prep Date	07.07.00	---
Analysis Date	07.07.00	---
Batch ID	0707B	---
Chloride (325.2), mg/l	37	
Dilution Factor	1	---
Prep Date	07.13.00	---
Analysis Date	07.13.00	---
Batch ID	0713A	---
Nitrate-N (353.2), mg/l	0.050U	
Dilution Factor	1	---
Prep Date	07.06.00	---
Analysis Date	07.06.00	---
Batch ID	0707C	---
Sulfate as SO4 (375.4), mg/l	38	
Dilution Factor	1	---
Prep Date	07.13.00	---
Analysis Date	07.13.00	---
Batch ID	0713A	---

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LOG NO: S0-04432
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
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Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432-1	MW-26	07-05-00/15:30	SCB08
04432-1-DL	MW-26	07-05-00/15:30	SCB08

PARAMETER	04432-1	04432-1-DL
Dissolved Gases (SOP AR30)		
Methane, ug/l	22	---
Carbon Dioxide, ug/l	34000	---
Dilution Factor	1	---
Analysis Date	07.06.00	---
Batch ID	1C0706	---
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.8	
Dilution Factor	1	---
Prep Date	07.06.00	---
Analysis Date	07.06.00	---
Batch ID	0706A	---
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	450	
Dilution Factor	1	---
Prep Date	07.13.00	---
Analysis Date	07.13.00	---
Batch ID	0713A	---
Ammonia (as N) (350.1), mg/l	0.030U	
Dilution Factor	1	---
Prep Date	07.10.00	---
Analysis Date	07.10.00	---
Batch ID	0710A	---

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LOG NO: S0-04432
Received: 06 JUL 00
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Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432-1	MW-26	07-05-00/15:30	SCB08
04432-1-DL	MW-26	07-05-00/15:30	SCB08

PARAMETER	04432-1	04432-1-DL
Manganese (Dissolved) (6010)		
Manganese (Dissolved), mg/l	0.58	---
Dilution Factor	1	---
Prep Date	07.10.00	---
Analysis Date	07.13.00	---
Batch ID	0710J	---
Iron (Dissolved) (6010)		
Iron (Dissolved), mg/l	1.5	---
Dilution Factor	1	---
Prep Date	07.10.00	---
Analysis Date	07.13.00	---
Batch ID	0710J	---
Ortho-Phosphate-P (365.2), mg/l	0.086	
Dilution Factor	1	---
Prep Date	07.06.00	---
Analysis Date	07.06.00	---
Batch ID	0706A	---
Chemical Oxygen Demand (410.1), mg/l	20U	
Dilution Factor	1	---
Prep Date	07.11.00	---
Analysis Date	07.12.00	---
Batch ID	0711A	---

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LOG NO: S0-04432
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432-1	MW-26	07-05-00/15:30	SCB08
04432-1-DL	MW-26	07-05-00/15:30	SCB08

PARAMETER	04432-1	04432-1-DL

Code of Federal Regulations, Title 40, Part 136; Washington DC, July 1, 1997.
SW-846, Test Methods for Evaluating Solid Waste, Third Edition, September 1986, and Updates I, II, IIA, IIB, and III.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-04432A
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
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1200 Arch Street - Suite 200
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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-1	MW-25	07-05-00/13:15	SCB08

PARAMETER	04432A-1
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	1.0U
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	90 %
Dilution Factor	1
Analysis Date	07.07.00
Batch ID	1D0707

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LOG NO: S0-04432A
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-1	MW-25	07-05-00/13:15	SCB08

PARAMETER	04432A-1
Semivolatile Organics (8270)	
Naphthalene, ug/l	10U
Acenaphthylene, ug/l	10U
Acenaphthene, ug/l	2.4J
Fluorene, ug/l	10U
Phenanthrene, ug/l	10U
Anthracene, ug/l	10U
Fluoranthene, ug/l	10U
Pyrene, ug/l	10U
Chrysene, ug/l	10U
Benzo(a)anthracene, ug/l	10U
Benzo(b)fluoranthene, ug/l	10U
Benzo(k)fluoranthene, ug/l	10U
Benzo(a)pyrene, ug/l	10U
Indeno(1,2,3-cd)pyrene, ug/l	10U
Dibenzo(a,h)anthracene, ug/l	10U
Benzo(g,h,i)perylene, ug/l	10U
2-Methylnaphthalene, ug/l	10U
Surrogate-2FBP	88 %
Surrogate-NBZ	76 %
Surrogate-TPH	68 %
Dilution Factor	1
Prep Date	07.07.00
Analysis Date	07.11.00
Batch ID	0707A

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Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-1	MW-25	07-05-00/13:15	SCB08

PARAMETER	04432A-1
Total Organic Carbon (415.1), mg/l	2.8
Dilution Factor	1
Prep Date	07.07.00
Analysis Date	07.07.00
Batch ID	0707B
hloride (325.2), mg/l	56
Dilution Factor	1
Prep Date	07.13.00
Analysis Date	07.13.00
Batch ID	0713A
Nitrate-N (353.2), mg/l	0.13
Dilution Factor	1
Prep Date	07.06.00
Analysis Date	07.06.00
Batch ID	0707C
Sulfate as SO4 (375.4), mg/l	72
Dilution Factor	5
Prep Date	07.13.00
Analysis Date	07.13.00
Batch ID	0713A

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Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-1	MW-25	07-05-00/13:15	SCB08

PARAMETER	04432A-1
Dissolved Gases (SOP AR30)	
Methane, ug/l	20
Carbon Dioxide, ug/l	40000
Dilution Factor	1
Analysis Date	07.06.00
Batch ID	1C0706
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U
Dilution Factor	1
Prep Date	07.06.00
Analysis Date	07.06.00
Batch ID	0706A
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	300
Dilution Factor	1
Prep Date	07.13.00
Analysis Date	07.13.00
Batch ID	0713A
Ammonia (as N) (350.1), mg/l	0.030U
Dilution Factor	1
Prep Date	07.10.00
Analysis Date	07.10.00
Batch ID	0710A

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Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-1	MW-25	07-05-00/13:15	SCB08

PARAMETER	04432A-1
Manganese (Dissolved) (6010)	
Manganese (Dissolved), mg/l	0.39
Dilution Factor	1
Prep Date	07.10.00
Analysis Date	07.13.00
Batch ID	0710J
Iron (Dissolved) (6010)	
Iron (Dissolved), mg/l	0.27
Dilution Factor	1
Prep Date	07.10.00
Analysis Date	07.13.00
Batch ID	0710J
Ortho-Phosphate-P (365.2), mg/l	0.071
Dilution Factor	1
Prep Date	07.06.00
Analysis Date	07.06.00
Batch ID	0706A
Chemical Oxygen Demand (410.1), mg/l	20U
Dilution Factor	1
Prep Date	07.11.00
Analysis Date	07.12.00
Batch ID	0711A

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Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-2	FB-01-070500	07-05-00/17:00	SCB08
04432A-3	DUP-01-070500	07-05-00	SCB08
04432A-3-D	DUP-01-070500	07-05-00	SCB08

PARAMETER	04432A-2	04432A-3	04432A-3-DL
Halogenated and Aromatic Volatiles (8021)			
Benzene, ug/l	0.17J	1.0U	---
Ethylbenzene, ug/l	0.16J	4.5	---
Toluene, ug/l	0.16J	0.39J	---
o-Xylene, ug/l	0.48J	1.1	---
m&p-Xylene, ug/l	0.27J	6.7	---
Surrogate - a,a,a-Trifluorotoluene	93 %	87 %	---
Dilution Factor	1	1	---
Analysis Date	07.07.00	07.07.00	---
Batch ID	1D0707	1D0707	---

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Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-2	FB-01-070500	07-05-00/17:00	SCB08
04432A-3	DUP-01-070500	07-05-00	SCB08
04432A-3-D	DUP-01-070500	07-05-00	SCB08

PARAMETER	04432A-2	04432A-3	04432A-3-DL
Semivolatile Organics (8270)			
Naphthalene, ug/l	5.4J	940E	2000D
Acenaphthylene, ug/l	10U	1.2J	100U
Acenaphthene, ug/l	0.62J	250	240D
Fluorene, ug/l	10U	160	150D
Phenanthrene, ug/l	1.2J	280	260D
Anthracene, ug/l	10U	25	19DJ
Fluoranthene, ug/l	10U	31	24DJ
Pyrene, ug/l	10U	16	13DJ
Chrysene, ug/l	10U	1.0J	100U
Benzo(a)anthracene, ug/l	10U	1.1J	100U
Benzo(b)fluoranthene, ug/l	10U	10U	100U
Benzo(k)fluoranthene, ug/l	10U	10U	100U
Benzo(a)pyrene, ug/l	10U	10U	100U
Indeno(1,2,3-cd)pyrene, ug/l	10U	10U	100U
Dibenzo(a,h)anthracene, ug/l	10U	10U	100U
Benzo(g,h,i)perylene, ug/l	10U	10U	100U
2-Methylnaphthalene, ug/l	10U	120	100D
Surrogate-2FBP	86 %	72 %	0D %
Surrogate-NBZ	76 %	60 %	0D %
Surrogate-TPH	74 %	68 %	0D %
Dilution Factor	1	1	10
Prep Date	07.07.00	07.07.00	07.07.00
Analysis Date	07.11.00	07.11.00	07.11.00
Batch ID	0707A	0707A	0707A

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Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-2	FB-01-070500	07-05-00/17:00	SCB08
04432A-3	DUP-01-070500	07-05-00	SCB08
04432A-3-D	DUP-01-070500	07-05-00	SCB08

PARAMETER	04432A-2	04432A-3	04432A-3-DL

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Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145000713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
04432A-4	Trip Blank	07-05-00	SCB08

PARAMETER	04432A-4
Halogenated and Aromatic Volatiles (8021)	
Benzene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Toluene, ug/l	1.0U
o-Xylene, ug/l	0.78J
m&p-Xylene, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene	93 %
Dilution Factor	1
Analysis Date	07.07.00
Batch ID	1D0707

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-SCB08
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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	---	100 %	---	48-152 %
Ethylbenzene, ug/l	1.0U	---	95 %	---	54-125 %
Toluene, ug/l	1.0U	---	100 %	---	62-133 %
o-Xylene, ug/l	1.0U	---	95 %	---	54-128 %
m&p-Xylene, ug/l	1.0U	---	90 %	---	54-125 %
Surrogate - a,a,a-Trifluorotoluene	93 %	---	90 %	---	70-130 %
Dilution Factor	1	---	1	---	---
Analysis Date	07.07.00	---	07.07.00	---	---
Batch ID	1D0707	---	1D0707	---	---

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Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	10U	75 %	79 %	41-130 %
Acenaphthylene, ug/l	10U	10U	86 %	91 %	41-121 %
Acenaphthene, ug/l	10U	10U	84 %	88 %	36-121 %
Fluorene, ug/l	10U	10U	85 %	88 %	50-124 %
Phenanthrene, ug/l	10U	10U	84 %	92 %	50-121 %
Anthracene, ug/l	10U	10U	81 %	88 %	45-126 %
Fluoranthene, ug/l	10U	0.33J	86 %	92 %	41-129 %
Pyrene, ug/l	10U	10U	85 %	95 %	31-139 %
Chrysene, ug/l	10U	1.1J	89 %	98 %	44-128 %
Benzo(a)anthracene, ug/l	10U	1.0J	85 %	86 %	33-136 %
Benzo(b)fluoranthene, ug/l	10U	0.90J	84 %	76 %	33-132 %
Benzo(k)fluoranthene, ug/l	10U	10U	90 %	100 %	33-150 %
Benzo(a)pyrene, ug/l	10U	0.61J	85 %	85 %	45-120 %
Indeno(1,2,3-cd)pyrene, ug/l	10U	10U	83 %	94 %	37-140 %
Dibenzo(a,h)anthracene, ug/l	10U	10U	83 %	94 %	33-143 %
Benzo(g,h,i)perylene, ug/l	10U	10U	86 %	92 %	28-146 %
2-Methylnaphthalene, ug/l	10U	10U	78 %	82 %	43-130 %
Surrogate-2FBP	88 %	94 %	84 %	92 %	36-124 %

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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Surrogate-NBZ	78 %	80 %	76 %	78 %	34-130 %
Surrogate-TPH	78 %	84 %	78 %	90 %	14-148 %
Dilution Factor	1	1	1	1	---
Prep Date	07.07.00	07.12.00	07.07.00	07.12.00	---
Analysis Date	07.11.00	07.13.00	07.11.00	07.13.00	---
Batch ID	0707A	0712A	0707A	0712A	---
Dissolved Gases (SOP AR30)					
Methane, ug/l	0.19U	---	95 %	---	75-125 %
Carbon Dioxide, ug/l	2600U	---	116 %	---	75-125 %
Dilution Factor	1	---	1	---	1
Analysis Date	07.06.00	---	07.06.00	---	07.06.00
Batch ID	1C0706	---	1C0706	---	1C0706
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U		105 %		85-115 %
Prep Date	07.06.00	---	07.06.00	---	---
Analysis Date	07.06.00	---	07.06.00	---	---
Batch ID	0706A	---	0706A	---	---

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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	1.0U		96 %		80-120 %
Dilution Factor	1	---	1	---	---
Prep Date	07.13.00	---	07.13.00	---	---
Analysis Date	07.13.00	---	07.13.00	---	---
Batch ID	0713A	---	0713A	---	---
Chemical Oxygen Demand (410.1), mg/l	20U		94 %		60-140 %
Dilution Factor	1	---	1	---	---
Prep Date	07.11.00	---	07.11.00	---	---
Analysis Date	07.12.00	---	07.12.00	---	---
Batch ID	0711A	---	0711A	---	---
Ammonia (as N) (350.1), mg/l	0.030U		100 %		85-115 %
Dilution Factor	1	---	1	---	---
Prep Date	07.10.00	---	07.10.00	---	---
Analysis Date	07.10.00	---	07.10.00	---	---
Batch ID	0710A	---	0710A	---	---

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Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Manganese (Dissolved) (6010)					
Manganese (Dissolved), mg/l	0.010U	---	103 %	---	75-125 %
Dilution Factor	1	---	1	---	---
Prep Date	07.10.00	---	07.10.00	---	---
Analysis Date	07.13.00	---	07.13.00	---	---
Batch ID	0710J	---	0710J	---	---
Iron (Dissolved) (6010)					
Iron (Dissolved), mg/l	0.050U	---	101 %	---	75-125 %
Dilution Factor	1	---	1	---	---
Prep Date	07.10.00	---	07.10.00	---	---
Analysis Date	07.13.00	---	07.13.00	---	---
Batch ID	0710J	---	0710J	---	---
Chloride (325.2), mg/l	1.0U		109 %		85-115 %
Dilution Factor	1	---	1	---	---
Prep Date	07.13.00	---	07.13.00	---	---
Analysis Date	07.13.00	---	07.13.00	---	---
Batch ID	0713A	---	0713A	---	---

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Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Nitrate-N (353.2), mg/l	0.050U		89 %		80-120 %
Dilution Factor	1	---	1	---	---
Prep Date	07.06.00	---	07.06.00	---	---
Analysis Date	07.06.00	---	07.06.00	---	---
Batch ID	0707C	---	0707C	---	---
Ortho-Phosphate-P (365.2), mg/l	0.050U		96 %		90-110 %
Dilution Factor	1	---	1	---	---
Prep Date	07.06.00	---	07.06.00	---	---
Analysis Date	07.06.00	---	07.06.00	---	---
Batch ID	0706A	---	0706A	---	---
Sulfate as SO4 (375.4), mg/l	5.0U		113 %		80-120 %
Dilution Factor	1	---	1	---	---
Prep Date	07.13.00	---	07.13.00	---	---
Analysis Date	07.13.00	---	07.13.00	---	---
Batch ID	0713A	---	0713A	---	---

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LOG NO: S0-SCB08
Received: 06 JUL 00
Reported: 13 JUL 00

Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-1	Method Blank		SCB08
SCB08-8	Method Blank		SCB08
SCB08-2	Lab Control Standard % Recovery		SCB08
SCB08-9	Lab Control Standard % Recovery		SCB08
SCB08-3	LCS Accuracy Control Limit (%R)		SCB08

PARAMETER	SCB08-1	SCB08-8	SCB08-2	SCB08-9	SCB08-3
Total Organic Carbon (415.1), mg/l	1.0U		95 %		80-120 %
Dilution Factor	1	---	1	---	---
Prep Date	07.07.00	---	07.07.00	---	---
Analysis Date	07.07.00	---	07.07.00	---	---
Batch ID	0707B	---	0707B	---	---

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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LOG NO: S0-SCB08
Received: 06 JUL 00
Reported: 13 JUL 00

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Key Environmental, Inc.
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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-6	Method Blank		SCB08
SCB08-7	Lab Control Standard % Recovery		SCB08

PARAMETER	SCB08-6	SCB08-7
Halogenated and Aromatic Volatiles (8021)		
Benzene, ug/l	1.0U	105 %
Ethylbenzene, ug/l	1.0U	100 %
Toluene, ug/l	1.0U	100 %
o-Xylene, ug/l	1.0U	95 %
m&p-Xylene, ug/l	1.0U	95 %
Surrogate - a,a,a-Trifluorotoluene	93 %	93 %
Dilution Factor	1	1
Analysis Date	07.08.00	07.08.00
Batch ID	1D0708	1D0708

Semivolatile Organics (8270)

Dissolved Gases (SOP AR30)

Biochemical Oxygen Demand (5 Day) (405.1/5210B)

Alkalinity (to pH 4.5) as CaCO3 (310.1)

Chemical Oxygen Demand (410.1)

Ammonia (as N) (350.1)

Manganese (Dissolved) (6010)

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Pittsburgh, PA 15106

Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-6	Method Blank		SCB08
SCB08-7	Lab Control Standard % Recovery		SCB08

PARAMETER	SCB08-6	SCB08-7
Iron (Dissolved) (6010)		
Chloride (325.2), mg/l		
Nitrate-N (353.2), mg/l		
Ortho-Phosphate-P (365.2)		
Sulfate as SO4 (375.4), mg/l		
Total Organic Carbon (415.1)		

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713
Page 10

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-4	Matrix Spike % Recovery (MW-25)		SCB08
SCB08-5	Matrix Spike Duplicate % Recovery (MW-25)		SCB08

PARAMETER	SCB08-4	SCB08-5
Halogenated and Aromatic Volatiles (8021)		
Benzene, %	105 %	110 %
Ethylbenzene, %	105 %	105 %
Toluene, %	105 %	105 %
o-Xylene, %	100 %	100 %
m&p-Xylene, %	100 %	98 %
Surrogate - a,a,a-Trifluorotoluene	90 %	90 %
Dilution Factor	1	1
Analysis Date	07.07.00	07.07.00
Batch ID	1D0707	1D0707

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Client PO. No.: HARP#00522-0920-0600

Requisition: HARP#00552-0920-0600

Project: SCB08/BEAZER SOUTH CALVALCADE
Sampled By: Client
Code: 145600713

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB08-4	Matrix Spike % Recovery (MW-25)		SCB08
SCB08-5	Matrix Spike Duplicate % Recovery (MW-25)		SCB08

PARAMETER	SCB08-4	SCB08-5
Semivolatile Organics (8270)		
Naphthalene, ug/l	76 %	74 %
Acenaphthylene, ug/l	87 %	86 %
Acenaphthene, ug/l	85 %	84 %
Fluorene, ug/l	86 %	85 %
Phenanthrene, ug/l	87 %	86 %
Anthracene, ug/l	86 %	84 %
Fluoranthene, ug/l	85 %	84 %
Pyrene, ug/l	85 %	86 %
Chrysene, ug/l	85 %	87 %
Benzo(a)anthracene, ug/l	81 %	82 %
Benzo(b)fluoranthene, ug/l	71 %	75 %
Benzo(k)fluoranthene, ug/l	90 %	93 %
Benzo(a)pyrene, ug/l	75 %	77 %
Indeno(1,2,3-cd)pyrene, ug/l	89 %	91 %
Dibenzo(a,h)anthracene, ug/l	84 %	87 %
Benzo(g,h,i)perylene, ug/l	84 %	87 %
2-Methylnaphthalene, ug/l	80 %	77 %
Surrogate-2FBP	86 %	86 %
Surrogate-NBZ	74 %	74 %
Surrogate-TPH	60 %	60 %
Dilution Factor	1	1
Prep Date	07.12.00	07.12.00
Analysis Date	07.13.00	07.13.00
Batch ID	0712A	0712A

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-SCB01
Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
SCB01-1	Method Blank		SCB01
SCB01-2	Lab Control Standard % Recovery		SCB01
SCB01-3	LCS Accuracy Control Limit (%R)		SCB01

PARAMETER	SCB01-1	SCB01-2	SCB01-3
Total Organic Carbon (9060), mg/kg dw	100U	90 %	60-140 %
Dilution Factor	1.0	1.0	---
Prep Date	12.23.99	12.23.99	---
Analysis Date	12.23.99	12.23.99	---
Batch ID	1223X	1223X	---

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	105 %	48-152 %	1.0U	105 %
Ethylbenzene, ug/l	1.0U	95 %	54-125 %	1.0U	100 %
Toluene, ug/l	1.0U	105 %	62-133 %	1.0U	105 %
o-Xylene, ug/l	1.0U	110 %	54-128 %	1.0U	110 %
m&p-Xylene, ug/l	1.0U	115 %	54-125 %	1.0U	113 %
Surrogate - a,a,a-Trifluorotoluene	107 %	107 %	70-130 %	87 %	90 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Analysis Date	12.09.99	12.10.99	---	12.10.99	12.10.99
Batch ID	2D1209	2D1209	---	1D1210	1D1210

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Key Environmental, Inc.
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Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	74 %	41-130 %	---	---
Acenaphthylene, ug/l	10U	81 %	41-121 %	---	---
Acenaphthene, ug/l	10U	77 %	36-121 %	---	---
Fluorene, ug/l	10U	79 %	50-124 %	---	---
Phenanthrene, ug/l	10U	83 %	50-121 %	---	---
Anthracene, ug/l	10U	81 %	45-126 %	---	---
Fluoranthene, ug/l	10U	85 %	41-129 %	---	---
Pyrene, ug/l	10U	88 %	31-139 %	---	---
Chrysene, ug/l	10U	87 %	44-128 %	---	---
Benzo(a)anthracene, ug/l	10U	83 %	33-136 %	---	---
Benzo(b)fluoranthene, ug/l	10U	71 %	33-132 %	---	---
Benzo(k)fluoranthene, ug/l	10U	79 %	33-150 %	---	---
Benzo(a)pyrene, ug/l	10U	71 %	45-120 %	---	---
Indeno(1,2,3-cd)pyrene, ug/l	10U	78 %	37-140 %	---	---
Dibenzo(a,h)anthracene, ug/l	10U	78 %	33-143 %	---	---
Benzo(g,h,i)perylene, ug/l	10U	82 %	28-146 %	---	---
2-Methylnaphthalene, ug/l	10U	77 %	43-130 %	---	---
Surrogate-2FBP	84 %	86 %	36-124 %	---	---

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Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Surrogate-NBZ	80 %	82 %	34-130 %	---	---
Surrogate-TPH	94 %	84 %	14-148 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.10.99	12.10.99	---	---	---
Analysis Date	12.15.99	12.15.99	---	---	---
Batch ID	1210A	1210A	---	---	---
Total Organic Carbon (415.1), mg/l	1.0U	99 %	80-120 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.17.99	12.17.99	---	---	---
Analysis Date	12.17.99	12.17.99	---	---	---
Batch ID	1217A	1217A	---	---	---
Chloride (325.2), mg/l	1.0U	111 %	85-115 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.09.99	12.09.99	---	---	---
Analysis Date	12.09.99	12.09.99	---	---	---
Batch ID	1209B	1209B	---	---	---

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Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Nitrate-N (353.2), mg/l	0.050U	91 %	80-120 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.07.99	12.07.99	---	---	---
Analysis Date	12.07.99	12.07.99	---	---	---
Batch ID	1213A	1213A	---	---	---
Sulfate as SO4 (375.4), mg/l	5.0U	80 %	75-125 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.14.99	12.14.99	---	---	---
Analysis Date	12.14.99	12.14.99	---	---	---
Batch ID	1214A	1214A	---	---	---
Dissolved Gases					
Methane, ug/l	47U	113 %	75-125 %	---	---
Carbon Dioxide, ug/l	2600U	84 %	75-125 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Analysis Date	12.20.99	12.20.99	---	---	---
Batch ID	2C1220	2C1220	---	---	---

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Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	1.0U	97 %	80-120 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.07.99	12.07.99	---	---	---
Analysis Date	12.07.99	12.07.99	---	---	---
Batch ID	1207A	1207A	---	---	---
Chemical Oxygen Demand (410.1), mg/l	20U	78 %	60-140 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.10.99	12.10.99	---	---	---
Analysis Date	12.13.99	12.13.99	---	---	---
Batch ID	1210A	1210A	---	---	---
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U	95 %	85-115 %		
Prep Date	12.07.99	12.07.99	---	---	---
Analysis Date	12.07.99	12.07.99	---	---	---
Batch ID	1207A	1207A	---	---	---

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200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Ammonia (as N) (350.1), mg/l	0.030U	101 %	85-115 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.09.99	12.09.99	---	---	---
Analysis Date	12.09.99	12.09.99	---	---	---
Batch ID	1209A	1209A	---	---	---
Manganese (Dissolved) (6010)					
Manganese (Dissolved), ug/l	10U	125 %	75-125 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.31.99	12.31.99	---	---	---
Analysis Date	01.03.00	01.03.00	---	---	---
Batch ID	1231I	1231I	---	---	---
Iron (Dissolved) (6010)					
Iron (Dissolved), ug/l	50U	123 %	75-125 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.31.99	12.31.99	---	---	---
Analysis Date	01.03.00	01.03.00	---	---	---
Batch ID	1231I	1231I	---	---	---

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Mr. Jeff Hale
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-4	Method Blank		SCB01
SCB01-5	Lab Control Standard % Recovery		SCB01
SCB01-6	LCS Accuracy Control Limit (%R)		SCB01
SCB01-9	Method Blank		SCB01
SCB01-10	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-4	SCB01-5	SCB01-6	SCB01-9	SCB01-10
Ortho-Phosphate-P (365.2), mg/l	0.050U	103 %	90-110 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.08.99	12.08.99	---	---	---
Analysis Date	12.08.99	12.08.99	---	---	---
Batch ID	1208A	1208A	---	---	---

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-11	Method Blank		SCB01
SCB01-12	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-11	SCB01-12
Halogenated and Aromatic Volatiles (8021)		
Benzene, ug/l	1.0U	100 %
Ethylbenzene, ug/l	1.0U	95 %
Toluene, ug/l	1.0U	100 %
o-Xylene, ug/l	1.0U	110 %
m&p-Xylene, ug/l	1.0U	110 %
Surrogate - a,a,a-Trifluorotoluene	93 %	97 %
Dilution Factor	1.0	1.0
Analysis Date	12.13.99	12.13.99
Batch ID	1D1213A	1D1213A
Semivolatile Organics (8270)		
Total Organic Carbon (415.1), mg/l		
Chloride (325.2), mg/l		
Nitrate-N (353.2), mg/l		
Sulfate as SO4 (375.4), mg/l		
Dissolved Gases		
Alkalinity (to pH 4.5) as CaCO3 (310.1)		

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LOG NO: S9-SCB01
Received: 07 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-11	Method Blank		SCB01
SCB01-12	Lab Control Standard % Recovery		SCB01

PARAMETER	SCB01-11	SCB01-12
Chemical Oxygen Demand (410.1)		
Biochemical Oxygen Demand (5 Day) (405.1/5210B)		
Ammonia (as N) (350.1), mg/l		
Manganese (Dissolved) (6010)		
Iron (Dissolved) (6010)		
Ortho-Phosphate-P (365.2), mg/l		

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Received: 07 DEC 99
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Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-7	Matrix Spike % Recovery (DPN-TN2-120799)		SCB01
SCB01-8	Matrix Spike Duplicate % Recovery (DPN-TN2-120799)		SCB01

PARAMETER	SCB01-7	SCB01-8
Halogenated and Aromatic Volatiles (8021)		
Benzene, %	102 %	100 %
Ethylbenzene, %	110 %	100 %
Toluene, %	102 %	99 %
o-Xylene, %	115 %	115 %
m&p-Xylene, %	121 %	112 %
Surrogate - a,a,a-Trifluorotoluene	87 %	87 %
Dilution Factor	2.0	2.0
Analysis Date	12.13.99	12.13.99
Batch ID	1D1213A	1D1213A

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Reported: 18 JAN 00

Mr. Jeff Hale
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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-7	Matrix Spike % Recovery (DPN-TN2-120799)		SCB01
SCB01-8	Matrix Spike Duplicate % Recovery (DPN-TN2-120799)		SCB01

PARAMETER	SCB01-7	SCB01-8
Semivolatile Organics (8270)		
Naphthalene, ug/l	0 %Y	%Y
Acenaphthylene, ug/l	65 %	64 %
Acenaphthene, ug/l	40 %	100 %
Fluorene, ug/l	23 %Y	63 %
Phenanthrene, ug/l	18 %Y	46 %Y
Anthracene, ug/l	36 %Y	40 %Y
Fluoranthene, ug/l	34 %Y	41 %
Pyrene, ug/l	32 %Y	40 %
Chrysene, ug/l	29 %Y	35 %Y
Benzo(a)anthracene, ug/l	29 %Y	36 %
Benzo(b)fluoranthene, ug/l	26 %Y	30 %Y
Benzo(k)fluoranthene, ug/l	21 %Y	27 %Y
Benzo(a)pyrene, ug/l	23 %Y	27 %Y
Indeno(1,2,3-cd)pyrene, ug/l	29 %Y	27 %Y
Dibenzo(a,h)anthracene, ug/l	28 %Y	28 %Y
Benzo(g,h,i)perylene, ug/l	26 %Y	28 %Y
2-Methylnaphthalene, ug/l	20 %Y	150 %Y
Surrogate-2FBP	74 %	74 %
Surrogate-NBZ	60 %	88 %
Surrogate-TPH	22 %	16 %
Dilution Factor	1.0	1.0
Prep Date	12.10.99	12.10.99
Analysis Date	12.15.99	12.15.99
Batch ID	1210A	1210A

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 155700118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB01-7	Matrix Spike % Recovery (DPN-TN2-120799)		SCB01
SCB01-8	Matrix Spike Duplicate % Recovery (DPN-TN2-120799)		SCB01

PARAMETER	SCB01-7	SCB01-8

Angie Weimerskirk, Project Manager

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LOG NO: S9-SCB02
Received: 09 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
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Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
SCB02-1	Method Blank		SCB02
SCB02-2	Lab Control Standard % Recovery		SCB02
SCB02-3	LCS Accuracy Control Limit (%R)		SCB02

PARAMETER	SCB02-1	SCB02-2	SCB02-3
Total Organic Carbon (9060), mg/kg dw	100U	90 %	60-140 %
Dilution Factor	1.0	1.0	---
Prep Date	12.23.99	12.23.99	---
Analysis Date	12.23.99	12.23.99	---
Batch ID	1223X	1223X	---

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Received: 09 DEC 99
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Mr. Jeff Hale
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200 Arch Street
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	100 %	48-152 %	1.0U	105 %
Ethylbenzene, ug/l	1.0U	100 %	54-125 %	1.0U	100 %
Toluene, ug/l	1.0U	105 %	62-133 %	1.0U	105 %
o-Xylene, ug/l	1.0U	110 %	54-128 %	1.0U	110 %
m&p-Xylene, ug/l	1.0U	113 %	54-125 %	1.0U	113 %
Surrogate - a,a,a-Trifluorotoluene	100 %	100 %	70-130 %	107 %	103 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Analysis Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Batch ID	1D1214	1D1214	---	1D1215	1D1215

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	72 %	41-130 %	10U	76 %
Acenaphthylene, ug/l	10U	87 %	41-121 %	10U	95 %
Acenaphthene, ug/l	10U	81 %	36-121 %	10U	91 %
Fluorene, ug/l	10U	83 %	50-124 %	10U	91 %
Phenanthrene, ug/l	10U	83 %	50-121 %	10U	92 %
Anthracene, ug/l	10U	83 %	45-126 %	10U	92 %
Fluoranthene, ug/l	10U	86 %	41-129 %	10U	100 %
Pyrene, ug/l	10U	88 %	31-139 %	10U	86 %
Chrysene, ug/l	10U	86 %	44-128 %	2.9J	86 %
Benzo(a)anthracene, ug/l	10U	88 %	33-136 %	2.3J	85 %
Benzo(b)fluoranthene, ug/l	10U	86 %	33-132 %	4.5J	94 %
Benzo(k)fluoranthene, ug/l	10U	78 %	33-150 %	2.1J	90 %
Benzo(a)pyrene, ug/l	10U	83 %	45-120 %	3.5J	90 %
Indeno(1,2,3-cd)pyrene, ug/l	10U	83 %	37-140 %	3.4J	88 %
Dibenzo(a,h)anthracene, ug/l	10U	80 %	33-143 %	3.1J	93 %
Benzo(g,h,i)perylene, ug/l	10U	81 %	28-146 %	4.6J	105 %
2-Methylnaphthalene, ug/l	10U	78 %	43-130 %	10U	87 %
Surrogate-2FBP	92 %	90 %	36-124 %	92 %	94 %

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Surrogate-NBZ	100 %	82 %	34-130 %	74 %	70 %
Surrogate-TPH	80 %	76 %	14-148 %	80 %	78 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.15.99	12.15.99	---	12.23.99	12.23.99
Analysis Date	12.19.99	12.19.99	---	12.29.99	12.29.99
Batch ID	1215G	1215G	---	1223A	1223A
Dissolved Gases					
Methane, ug/l	47U	113 %	75-125 %	---	---
Carbon Dioxide, ug/l	2600U	84 %	75-125 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Analysis Date	12.20.99	12.20.99	---	---	---
Batch ID	2C1220	2C1220	---	---	---
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U	108 %	85-115 %		
Prep Date	12.09.99	12.09.99	---	---	---
Analysis Date	12.09.99	12.09.99	---	---	---
Batch ID	1209A	1209A	---	---	---

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LOG NO: S9-SCB02
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	1.0U	94 %	80-120 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.10.99	12.10.99	---	---	---
Analysis Date	12.10.99	12.10.99	---	---	---
Batch ID	1210A	1210A	---	---	---
Chemical Oxygen Demand (410.1), mg/l	20U	92 %	60-140 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.10.99	12.10.99	---	---	---
Analysis Date	12.13.99	12.13.99	---	---	---
Batch ID	1210B	1210B	---	---	---
Ammonia (as N) (350.1), mg/l	0.030U	104 %	85-115 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.15.99	12.15.99	---	---	---
Analysis Date	12.15.99	12.15.99	---	---	---
Batch ID	1215A	1215A	---	---	---

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Mr. Jeff Hale
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200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Manganese (Dissolved) (6010)					
Manganese (Dissolved), ug/l	0.47B	107 %	75-125 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.13.99	12.13.99	---	---	---
Analysis Date	12.14.99	12.14.99	---	---	---
Batch ID	1213I	1213I	---	---	---
Iron (Dissolved) (6010)					
Iron (Dissolved), ug/l	16B	105 %	75-125 %	---	---
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.13.99	12.13.99	---	---	---
Analysis Date	12.14.99	12.14.99	---	---	---
Batch ID	1213I	1213I	---	---	---
Chloride (325.2), mg/l	1.0U	107 %	85-115 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.15.99	12.15.99	---	---	---
Analysis Date	12.15.99	12.15.99	---	---	---
Batch ID	1215A	1215A	---	---	---

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Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Nitrate-N (353.2), mg/l	0.050U	82 %	80-120 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.09.99	12.09.99	---	---	---
Analysis Date	12.09.99	12.09.99	---	---	---
Batch ID	1213C	1213C	---	---	---
Ortho-Phosphate-P (365.2), mg/l	0.050U	97 %	90-110%		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.09.99	12.09.99	---	---	---
Analysis Date	12.09.99	12.09.99	---	---	---
Batch ID	1209A	1209A	---	---	---
Sulfate as SO4 (375.4), mg/l	5.0U	80 %	75-125 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.14.99	12.14.99	---	---	---
Analysis Date	12.14.99	12.14.99	---	---	---
Batch ID	1214A	1214A	---	---	---

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LOG NO: S9-SCB02
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Reported: 18 JAN 00

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-4	Method Blank		SCB02
SCB02-5	Lab Control Standard % Recovery		SCB02
SCB02-6	LCS Accuracy Control Limit (%R)		SCB02
SCB02-7	Method Blank		SCB02
SCB02-8	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-4	SCB02-5	SCB02-6	SCB02-7	SCB02-8
Total Organic Carbon (415.1), mg/l	1.0U	98 %	80-120 %		
Dilution Factor	1.0	1.0	---	---	---
Prep Date	12.20.99	12.20.99	---	---	---
Analysis Date	12.20.99	12.20.99	---	---	---
Batch ID	1220A	1220A	---	---	---

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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LOG NO: S9-SCB02
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-9	Method Blank		SCB02
SCB02-10	Method Blank		SCB02
SCB02-11	Lab Control Standard % Recovery		SCB02
SCB02-12	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-9	SCB02-10	SCB02-11	SCB02-12
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/l	1.0U	1.0U	100 %	110 %
Ethylbenzene, ug/l	1.0U	1.0U	95 %	105 %
Toluene, ug/l	1.0U	1.0U	105 %	110 %
o-Xylene, ug/l	1.0U	1.0U	110 %	120 %
m&p-Xylene, ug/l	1.0U	1.0U	113 %	120 %
Surrogate - a,a,a-Trifluorotoluene	103 %	103 %	107 %	107 %
Dilution Factor	1.0	1.0	1.0	1.0
Analysis Date	12.13.99	12.15.99	12.13.99	12.15.99
Batch ID	2D1213	2D1215	2D1213	2D1215

Semivolatile Organics (8270)

Dissolved Gases

Biochemical Oxygen Demand (5 Day) (405.1/5210B)

Alkalinity (to pH 4.5) as CaCO3 (310.1)

Chemical Oxygen Demand (410.1)

Ammonia (as N) (350.1), mg/l

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Reported: 18 JAN 00

Mr. Jeff Hale
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 174000118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB02-9	Method Blank		SCB02
SCB02-10	Method Blank		SCB02
SCB02-11	Lab Control Standard % Recovery		SCB02
SCB02-12	Lab Control Standard % Recovery		SCB02

PARAMETER	SCB02-9	SCB02-10	SCB02-11	SCB02-12
Manganese (Dissolved) (6010)				
Iron (Dissolved) (6010)				
Chloride (325.2), mg/l				
Nitrate-N (353.2), mg/l				
Ortho-Phosphate-P (365.2), mg/l				
Sulfate as SO4 (375.4)				
Total Organic Carbon (415.1)				

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

Angie Weimerskirk, Project Manager

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LOG NO: S9-SCB03
Received: 14 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	110 %	48-152 %	1.0U	105 %
Ethylbenzene, ug/l	1.0U	105 %	54-125 %	1.0U	100 %
Toluene, ug/l	1.0U	110 %	62-133 %	1.0U	105 %
o-Xylene, ug/l	1.0U	120 %	54-128 %	1.0U	115 %
m&p-Xylene, ug/l	1.0U	120 %	54-125 %	1.0U	115 %
Surrogate - a,a,a-Trifluorotoluene	103 %	107 %	70-130 %	103 %	103 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Analysis Date	12.15.99	12.15.99	---	12.16.99	12.16.99
Batch ID	2D1215	2D1215	---	1D1216	1D1216

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LOG NO: S9-SCB03
Received: 14 DEC 99
Reported: 18 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	79 %	41-130 %	10U	69 %
Acenaphthylene, ug/l	10U	94 %	41-121 %	10U	75 %
Acenaphthene, ug/l	10U	89 %	36-121 %	10U	72 %
Fluorene, ug/l	10U	90 %	50-124 %	10U	75 %
Phenanthrene, ug/l	10U	87 %	50-121 %	10U	73 %
Anthracene, ug/l	10U	89 %	45-126 %	10U	71 %
Fluoranthene, ug/l	10U	90 %	41-129 %	10U	74 %
Pyrene, ug/l	10U	86 %	31-139 %	10U	88 %
Chrysene, ug/l	10U	88 %	44-128 %	10U	75 %
Benzo(a)anthracene, ug/l	10U	86 %	33-136 %	10U	76 %
Benzo(b)fluoranthene, ug/l	10U	76 %	33-132 %	10U	68 %
Benzo(k)fluoranthene, ug/l	10U	100 %	33-150 %	10U	68 %
Benzo(a)pyrene, ug/l	10U	87 %	45-120 %	10U	67 %
Indeno(1,2,3-cd)pyrene, ug/l	10U	78 %	37-140 %	10U	69 %
Dibenzo(a,h)anthracene, ug/l	10U	82 %	33-143 %	10U	72 %
Benzo(g,h,i)perylene, ug/l	10U	81 %	28-146 %	10U	76 %
2-Methylnaphthalene, ug/l	10U	85 %	43-130 %	10U	71 %
Surrogate-2FBP	72 %	90 %	36-124 %	76 %	78 %

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Surrogate-NBZ	74 %	88 %	34-130 %	86 %	80 %
Surrogate-TPH	68 %	74 %	14-148 %	86 %	80 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.16.99	12.16.99	---	12.21.99	12.21.99
Analysis Date	12.19.99	12.19.99	---	12.27.99	12.27.99
Batch ID	1216C	1216C	---	1221C	1221C
Dissolved Gases					
Methane, ug/l	47U	113 %	75-125 %	47U	104 %
Carbon Dioxide, ug/l	2600U	84 %	75-125 %	2600U	68 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Analysis Date	12.20.99	12.21.99	---	12.23.99	12.23.99
Batch ID	2C1220	1C1220	---	1C1223	1C1223
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U	108 %	85-115 %	2.0U	107 %
Prep Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Analysis Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Batch ID	1214A	1214A	---	1215A	1215A

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	1.0U	101 %	80-120 %	1.0U	101 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.14.99	12.14.99	---	12.16.99	12.16.99
Analysis Date	12.14.99	12.14.99	---	12.16.99	12.16.99
Batch ID	1214A	1214A	---	1216A	1216A
Chemical Oxygen Demand (410.1), mg/l	20U	90 %	60-140 %	20U	84 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.21.99	12.21.99	---	12.17.99	12.17.99
Analysis Date	12.21.99	12.21.99	---	12.20.99	12.20.99
Batch ID	1221A	1221A	---	1217B	1217B
Ammonia (as N) (350.1), mg/l	0.030U	101 %	85-115 %	0.030U	103 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.22.99	12.22.99	---	12.22.99	12.22.99
Analysis Date	12.22.99	12.22.99	---	12.22.99	12.22.99
Batch ID	1222A	1222A	---	1222D	1222D

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Key Environmental, Inc.
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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Manganese (Dissolved) (6010)					
Manganese (Dissolved), ug/l	10U	105 %	75-125 %	10U	101 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.20.99	12.20.99	---	01.04.99	01.04.99
Analysis Date	12.21.99	12.21.99	---	01.05.00	01.05.00
Batch ID	1220I	1220I	---	0104G	0104G
Iron (Dissolved) (6010)					
Iron (Dissolved), ug/l	50U	104 %	75-125 %	50U	98 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.20.99	12.20.99	---	01.04.99	01.04.99
Analysis Date	12.21.99	12.21.99	---	01.05.00	01.05.00
Batch ID	1220I	1220I	---	0104G	0104G
Chloride (325.2), mg/l	1.0U	109 %	85-115 %	1.0U	107 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.15.99	12.15.99	---	12.16.99	12.16.99
Analysis Date	12.15.99	12.15.99	---	12.16.99	12.16.99
Batch ID	1215C	1215C	---	1216A	1216A

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Nitrate-N (353.2), mg/l	0.050U	91 %	80-120 %	0.050U	90 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Analysis Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Batch ID	1215A	1215A	---	1216B	1216B
Ortho-Phosphate-P (365.2), mg/l	0.050U	104 %	90-110 %	0.050U	94 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Analysis Date	12.14.99	12.14.99	---	12.15.99	12.15.99
Batch ID	1214A	1214A	---	1215A	1215A
Sulfate as SO4 (375.4), mg/l	5.0U	96 %	75-125 %	5.0U	79 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.20.99	12.20.99	---	12.28.99	12.28.99
Analysis Date	12.20.99	12.20.99	---	12.28.99	12.28.99
Batch ID	1220A	1220A	---	1228A	1228A

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Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-1	Method Blank		SCB03
SCB03-2	Lab Control Standard % Recovery		SCB03
SCB03-3	LCS Accuracy Control Limit (%R)		SCB03
SCB03-8	Method Blank		SCB03
SCB03-9	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-1	SCB03-2	SCB03-3	SCB03-8	SCB03-9
Total Organic Carbon (415.1), mg/l	1.0U	100 %	80-120 %	1.0U	100 %
Dilution Factor	1.0	1.0	---	1.0	1.0
Prep Date	12.20.99	12.20.99	---	12.21.99	12.21.99
Analysis Date	12.20.99	12.20.99	---	12.21.99	12.21.99
Batch ID	1220C	1220C	---	1221C	1221C

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-10	Method Blank		SCB03
SCB03-11	Lab Control Standard % Recovery		SCB03
SCB03-12	Method Blank		SCB03
SCB03-13	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-10	SCB03-11	SCB03-12	SCB03-13
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/l	1.0U	100 %	1.0U	105 %
Ethylbenzene, ug/l	1.0U	100 %	1.0U	100 %
Toluene, ug/l	1.0U	105 %	1.0U	110 %
o-Xylene, ug/l	1.0U	115 %	1.0U	120 %
m&p-Xylene, ug/l	1.0U	118 %	1.0U	123 %
Surrogate - a,a,a-Trifluorotoluene	107 %	107 %	103 %	110 %
Dilution Factor	1.0	1.0	1.0	1.0
Analysis Date	12.21.99	12.21.99	12.21.99	12.21.99
Batch ID	1D1221	1D1221	2D1221	2D1221

Semivolatile Organics (8270)

Dissolved Gases

Biochemical Oxygen Demand (5 Day) (405.1/5210B)

Alkalinity (to pH 4.5) as CaCO3 (310.1)

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Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-10	Method Blank		SCB03
SCB03-11	Lab Control Standard % Recovery		SCB03
SCB03-12	Method Blank		SCB03
SCB03-13	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-10	SCB03-11	SCB03-12	SCB03-13
Chemical Oxygen Demand (410.1), mg/l	20U	88 %		
Dilution Factor	1.0	1.0	---	---
Prep Date	12.17.99	12.17.99	---	---
Analysis Date	12.20.99	12.20.99	---	---
Batch ID	1217A	1217A	---	---
Ammonia (as N) (350.1), mg/l				
Manganese (Dissolved) (6010)				
Iron (Dissolved) (6010)				
Chloride (325.2), mg/l	1.0U	107 %		
Dilution Factor	1.0	1.0	---	---
Prep Date	12.21.99	12.21.99	---	---
Analysis Date	12.21.99	12.21.99	---	---
Batch ID	1221A	1221A	---	---
Nitrate-N (353.2), mg/l				
Ortho-Phosphate-P (365.2)				
Sulfate as SO4 (375.4)				

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Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-10	Method Blank		SCB03
SCB03-11	Lab Control Standard % Recovery		SCB03
SCB03-12	Method Blank		SCB03
SCB03-13	Lab Control Standard % Recovery		SCB03

PARAMETER	SCB03-10	SCB03-11	SCB03-12	SCB03-13
Total Organic Carbon (415.1)				

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-4	Matrix Spike % Recovery (OW10-121399)		SCB03
SCB03-5	Matrix Spike Duplicate % Recovery (OW10-121399)		SCB03

PARAMETER	SCB03-4	SCB03-5
Halogenated and Aromatic Volatiles (8021)		
Benzene, %	90 %	90 %
Ethylbenzene, %	90 %	90 %
Toluene, %	88 %	88 %
o-Xylene, %	110 %	106 %
m&p-Xylene, %	106 %	106 %
Surrogate - a,a,a-Trifluorotoluene	100 %	100 %
Dilution Factor	25	25
Analysis Date	12.16.99	12.16.99
Batch ID	1D1216	1D1216

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Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-4	Matrix Spike % Recovery (OW10-121399)		SCB03
SCB03-5	Matrix Spike Duplicate % Recovery (OW10-121399)		SCB03

PARAMETER	SCB03-4	SCB03-5
Semivolatile Organics (8270)		
Naphthalene	X	X
Acenaphthylene	88 %	X
Acenaphthene	X	60 %
Fluorene	X	70 %
Phenanthrene	X	X
Anthracene	X	80 %
Fluoranthene	X	X
Pyrene	X	70 %
Chrysene	X	92 %
Benzo(a)anthracene	46 %	86 %
Benzo(b)fluoranthene	64 %	90 %
Benzo(k)fluoranthene	51 %	74 %
Benzo(a)pyrene	51 %	90 %
Indeno(1,2,3-cd)pyrene	53 %	72 %
Dibenzo(a,h)anthracene	49 %	74 %
Benzo(g,h,i)perylene	50 %	75 %
2-Methylnaphthalene	X	100 %
Surrogate-2FBP	90 %	82 %
Surrogate-NBZ	98 %	102 %
Surrogate-TPH	30 %	32 %
Dilution Factor	10.0	10.0
Prep Date	12.16.99	12.16.99
Analysis Date	12.23.99	12.23.99
Batch ID	1216C	1216C

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 131600118

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-6	Matrix Spike % Recovery (OW02-121499)		SCB03
SCB03-7	Matrix Spike Duplicate % Recovery (OW02-121499)		SCB03

PARAMETER	SCB03-6	SCB03-7
Halogenated and Aromatic Volatiles (8021)		
Benzene, %	94 %	94 %
Ethylbenzene, %	85 %	95 %
Toluene, %	91 %	91 %
o-Xylene, %	115 %	105 %
m&p-Xylene, %	119 %	114 %
Surrogate - a,a,a-Trifluorotoluene	100 %	100 %
Dilution Factor	5	1.0
Analysis Date	12.21.99	12.21.99
Batch ID	2D1221	2D1221

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB03-6	Matrix Spike % Recovery (OW02-121499)		SCB03
SCB03-7	Matrix Spike Duplicate % Recovery (OW02-121499)		SCB03

PARAMETER	SCB03-6	SCB03-7
Semivolatile Organics (8270)		
Naphthalene	X	60 %
Acenaphthylene	63 %	58 %
Acenaphthene	60 %	X
Fluorene	60 %	X
Phenanthrene	50 %	X
Anthracene	57 %	56 %
Fluoranthene	64 %	54 %
Pyrene	59 %	53 %
Chrysene	64 %	64 %
Benzo(a)anthracene	65 %	65 %
Benzo(b)fluoranthene	54 %	55 %
Benzo(k)fluoranthene	60 %	63 %
Benzo(a)pyrene	55 %	58 %
Indeno(1,2,3-cd)pyrene	56 %	64 %
Dibenzo(a,h)anthracene	55 %	61 %
Benzo(g,h,i)perylene	57 %	63 %
2-Methylnaphthalene	X	X
Surrogate-2FBP	58 %	52 %
Surrogate-NBZ	38 %	36 %
Surrogate-TPH	24 %	24 %
Dilution Factor	1.0	1.0
Prep Date	12.21.99	12.21.99
Analysis Date	12.27.99	12.27.99
Batch ID	1221C	1221C

X = MS/MSD % recovery outside advisory limits.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18503A
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Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 15490024

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
18503A-5	Method Blank		SCB06

PARAMETER	18503A-5
Semivolatile Organics (8270)	

Methods: EPA SW-846, Update III.

X = Because the sample was diluted prior to analysis, surrogate recoveries are not reported.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S9-18503
Received: 16 DEC 99
Reported: 19 JAN 00

Mr. Jeff Hale
Key Environmental, Inc.
200 Arch Street
Pittsburgh, PA 15106

Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 151600119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
18503-5	Method Blank		SCB04
18503-6	Lab Control Standard % Recovery		SCB04
18503-7	Method Blank		SCB04
18503-8	Lab Control Standard % Recovery		SCB04

PARAMETER	18503-5	18503-6	18503-7	18503-8
Halogenated and Aromatic Volatiles (8021)				
Benzene, ug/kg	200U	98 %	200U	100 %
Ethylbenzene, ug/kg	200U	90 %	200U	95 %
Toluene, ug/kg	200U	90 %	200U	95 %
o-Xylene, ug/kg	200U	115 %	200U	125 %
m&p-Xylene, ug/kg	200U	99 %	200U	108 %
Surrogate - a,a,a-Trifluorotoluene	115 %	105 %	105 %	110 %
Dilution Factor	1.0	1.0	1.0	1.0
Analysis Date	12.27.99	12.28.99	12.28.99	12.27.99
Batch ID	1A1227	1A1228	1A1228	1A1227

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Reported: 19 JAN 00

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Client PO. No.: 00552-03215 0

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 151600119

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
18503-5	Method Blank		SCB04
18503-6	Lab Control Standard % Recovery		SCB04
18503-7	Method Blank		SCB04
18503-8	Lab Control Standard % Recovery		SCB04

PARAMETER	18503-5	18503-6	18503-7	18503-8
Semivolatile Organics (8270)				
Naphthalene, ug/kg	99000U	*	---	---
Acenaphthylene, ug/kg	99000U	---	---	---
Acenaphthene, ug/kg	99000U	---	---	---
Fluorene, ug/kg	99000U	---	---	---
Phenanthrene, ug/kg	99000U	---	---	---
Anthracene, ug/kg	99000U	---	---	---
Fluoranthene, ug/kg	99000U	---	---	---
Pyrene, ug/kg	99000U	---	---	---
Chrysene, ug/kg	99000U	---	---	---
Benzo(a)anthracene, ug/kg	99000U	---	---	---
Benzo(b)fluoranthene, ug/kg	99000U	---	---	---
Benzo(k)fluoranthene, ug/kg	99000U	---	---	---
Benzo(a)pyrene, ug/kg	99000U	---	---	---
Indeno(1,2,3-cd)pyrene, ug/kg	99000U	---	---	---
Dibenzo(a,h)anthracene, ug/kg	99000U	---	---	---
Benzo(g,h,i)perylene, ug/kg	99000U	---	---	---
2-Methylnaphthalene, ug/kg	99000U	---	---	---
Surrogate-2FBP	X	---	---	---
Surrogate-NBZ	X	---	---	---
Surrogate-TPH	X	---	---	---
Dilution Factor	1.0	---	---	---
Prep Date	12.28.99	---	---	---
Analysis Date	01.07.00	---	---	---
Batch ID	1228E	---	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED	SDG#
18503-5	Method Blank		SCB04
18503-6	Lab Control Standard % Recovery		SCB04
18503-7	Method Blank		SCB04
18503-8	Lab Control Standard % Recovery		SCB04

PARAMETER	18503-5	18503-6	18503-7	18503-8

Methods: EPA SW-846, Update III.

X = Because the sample was diluted prior to analysis, surrogate recoveriesare not reported.

Angie Weimerskirk

Angie Weimerskirk, Project Manager

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LOG NO: S0-SCB07
Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
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1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	110 %	48-152 %	1.0U	100 %
Ethylbenzene, ug/l	1.0U	110 %	54-125 %	1.0U	95 %
Toluene, ug/l	1.0U	110 %	62-133 %	1.0U	100 %
o-Xylene, ug/l	1.0U	100 %	54-128 %	0.38J	78 %
m&p-Xylene, ug/l	1.0U	110 %	54-125 %	1.0U	92 %
Surrogate - a,a,a-Trifluorotoluene	100 %	107 %	70-130 %	87 %	87 %
Dilution Factor	1	1	---	1	1
Analysis Date	04.14.00	04.14.00	---	04.24.00	04.24.00
Batch ID	1B0414	1B0414	---	1D0424	1D0424

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Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	78 %	41-130 %	10U	76 %
Acenaphthylene, ug/l	0.39J	95 %	41-121 %	10U	93 %
Acenaphthene, ug/l	10U	90 %	36-121 %	10U	89 %
Fluorene, ug/l	10U	92 %	50-124 %	10U	92 %
Phenanthrene, ug/l	0.75J	91 %	50-121 %	10U	91 %
Anthracene, ug/l	10U	89 %	45-126 %	10U	89 %
Fluoranthene, ug/l	10U	99 %	41-129 %	10U	100 %
Pyrene, ug/l	10U	99 %	31-139 %	10U	100 %
Chrysene, ug/l	0.90J	99 %	44-128 %	10U	88 %
Benzo(a)anthracene, ug/l	0.61J	92 %	33-136 %	10U	91 %
Benzo(b)fluoranthene, ug/l	0.82J	76 %	33-132 %	10U	78 %
Benzo(k)fluoranthene, ug/l	0.74J	99 %	33-150 %	10U	98 %
Benzo(a)pyrene, ug/l	1.2J	91 %	45-120 %	10U	84 %
Indeno(1,2,3-cd)pyrene, ug/l	1.2J	89 %	37-140 %	10U	69 %
Dibenzo(a,h)anthracene, ug/l	10U	87 %	33-143 %	10U	83 %
Benzo(g,h,i)perylene, ug/l	1.3J	77 %	28-146 %	10U	84 %
2-Methylnaphthalene, ug/l	10U	84 %	43-130 %	10U	86 %
Surrogate-2FBP	88 %	92 %	36-124 %	76 %	84 %

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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Surrogate-NBZ	86 %	82 %	34-130 %	72 %	76 %
Surrogate-TPH	92 %	84 %	14-148 %	84 %	80 %
Dilution Factor	1	1	---	1	1
Prep Date	04.14.00	04.14.00	---	04.18.00	04.18.00
Analysis Date	04.17.00	04.17.00	---	04.20.00	04.20.00
Batch ID	0414B	0414B	---	0418C	0418C
Dissolved Gases (SOP AR30)					
Carbon Dioxide, ug/l	630J	81 %	75-125 %	---	---
Methane, % REC	---	---	75-125 %	---	---
Dilution Factor	1	1	1	---	---
Analysis Date	04.20.00	04.20.00	---	---	---
Batch ID	1C0420	1C0420	---	---	---
Biochemical Oxygen Demand (5 Day) (405.1/5210B), mg/l	2.0U	99 %	85-115 %		
Prep Date	04.12.00	04.12.00	---	---	---
Analysis Date	04.12.00	04.12.00	---	---	---
Batch ID	0412A	0412A	---	---	---

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1200 Arch Street - Suite 200
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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Alkalinity (to pH 4.5) as CaCO3 (310.1), mg/l	1.0U	98 %	80-120 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.13.00	04.13.00	---	---	---
Analysis Date	04.13.00	04.13.00	---	---	---
Batch ID	0413B	0413B	---	---	---
Chemical Oxygen Demand (410.1), mg/l	20U	86 %	60-140 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.19.00	04.19.00	---	---	---
Analysis Date	04.19.00	04.19.00	---	---	---
Batch ID	0419A	0419A	---	---	---
Ammonia (as N) (350.1), mg/l	0.030U	109 %	85-115 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.14.00	04.14.00	---	---	---
Analysis Date	04.14.00	04.14.00	---	---	---
Batch ID	0414B	0414B	---	---	---

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Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Manganese (Dissolved) (6010)					
Manganese (Dissolved), mg/l	0.010U	101 %	75-125 %	---	---
Dilution Factor	1	1	---	---	---
Prep Date	04.19.00	04.19.00	---	---	---
Analysis Date	04.20.00	04.20.00	---	---	---
Batch ID	0419I	0419I	---	---	---
Iron (Dissolved) (6010)					
Iron (Dissolved), mg/l	0.036B	100 %	75-125 %	---	---
Dilution Factor	1	1	---	---	---
Prep Date	04.19.00	04.19.00	---	---	---
Analysis Date	04.20.00	04.20.00	---	---	---
Batch ID	0419I	0419I	---	---	---
Chloride (325.2), mg/l	0.26B	101 %	85-115 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.18.00	04.18.00	---	---	---
Analysis Date	04.18.00	04.18.00	---	---	---
Batch ID	0428C	0418C	---	---	---

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Nitrate-N (353.2), mg/l	0.050U	116 %	80-120 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.12.00	04.12.00	---	---	---
Analysis Date	04.12.00	04.12.00	---	---	---
Batch ID	0416B	0416B	---	---	---
Ortho-Phosphate-P (365.2), mg/l	0.050U	105 %	90-110 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.12.00	04.12.00	---	---	---
Analysis Date	04.12.00	04.12.00	---	---	---
Batch ID	0412A	0412A	---	---	---
Sulfate as SO4 (375.4), mg/l	5.0U	119 %	75-125 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.20.00	04.20.00	---	---	---
Analysis Date	04.20.00	04.20.00	---	---	---
Batch ID	0420A	0420A	---	---	---

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Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-1	Method Blank		SCB07
SCB07-2	Lab Control Standard % Recovery		SCB07
SCB07-3	LCS Accuracy Control Limit (%R)		SCB07
SCB07-6	Method Blank		SCB07
SCB07-7	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-1	SCB07-2	SCB07-3	SCB07-6	SCB07-7
Total Organic Carbon (415.1), mg/l	1.0U	103 %	80-120 %		
Dilution Factor	1	1	---	---	---
Prep Date	04.14.00	04.14.00	---	---	---
Analysis Date	04.14.00	04.14.00	---	---	---
Batch ID	0414A	0414A	---	---	---

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-8	Method Blank		SCB07
SCB07-9	Lab Control Standard % Recovery		SCB07
SCB07-10	Method Blank		SCB07
SCB07-11	Lab Control Standard % Recovery		SCB07
SCB07-12	Method Blank		SCB07

PARAMETER	SCB07-8	SCB07-9	SCB07-10	SCB07-11	SCB07-12
Halogenated and Aromatic Volatiles (8021)					
Benzene, ug/l	1.0U	90 %	1.0U	95 %	1.0U
Ethylbenzene, ug/l	1.0U	85 %	1.0U	95 %	1.0U
Toluene, ug/l	1.0U	90 %	1.0U	95 %	1.0U
o-Xylene, ug/l	1.0U	68 %	1.0U	75 %	0.39J
m&p-Xylene, ug/l	1.0U	82 %	1.0U	92 %	1.0U
Surrogate - a,a,a-Trifluorotoluene	87 %	83 %	93 %	90 %	77 %
Dilution Factor	1	1	1	1	1
Analysis Date	04.25.00	04.25.00	04.26.00	04.26.00	04.19.00
Batch ID	1D0425	1D0425	1D0426	1D0426	1D0419

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-8	Method Blank		SCB07
SCB07-9	Lab Control Standard % Recovery		SCB07
SCB07-10	Method Blank		SCB07
SCB07-11	Lab Control Standard % Recovery		SCB07
SCB07-12	Method Blank		SCB07

PARAMETER	SCB07-8	SCB07-9	SCB07-10	SCB07-11	SCB07-12
Semivolatile Organics (8270)					
Naphthalene, ug/l	10U	84 %	---	---	---
Acenaphthylene, ug/l	10U	110 %	---	---	---
Acenaphthene, ug/l	10U	100 %	---	---	---
Fluorene, ug/l	10U	110 %	---	---	---
Phenanthrene, ug/l	10U	110 %	---	---	---
Anthracene, ug/l	10U	110 %	---	---	---
Fluoranthene, ug/l	10U	120 %	---	---	---
Pyrene, ug/l	10U	110 %	---	---	---
Chrysene, ug/l	10U	110 %	---	---	---
Benzo(a)anthracene, ug/l	10U	100 %	---	---	---
Benzo(b)fluoranthene, ug/l	10U	100 %	---	---	---
Benzo(k)fluoranthene, ug/l	10U	130 %	---	---	---
Benzo(a)pyrene, ug/l	10U	110 %	---	---	---
Indeno(1,2,3-cd)pyrene, ug/l	10U	110 %	---	---	---
Dibenzo(a,h)anthracene, ug/l	10U	110 %	---	---	---
Benzo(g,h,i)perylene, ug/l	10U	110 %	---	---	---
2-Methylnaphthalene, ug/l	10U	89 %	---	---	---
Surrogate-2FBP	92 %	124 %	---	---	---

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Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-8	Method Blank		SCB07
SCB07-9	Lab Control Standard % Recovery		SCB07
SCB07-10	Method Blank		SCB07
SCB07-11	Lab Control Standard % Recovery		SCB07
SCB07-12	Method Blank		SCB07

PARAMETER	SCB07-8	SCB07-9	SCB07-10	SCB07-11	SCB07-12
Surrogate-NBZ	98 %	112 %	---	---	---
Surrogate-TPH	108 %	108 %	---	---	---
Dilution Factor	1	1	---	---	---
Prep Date	04.20.00	04.20.00	---	---	---
Analysis Date	05.02.00	05.02.00	---	---	---
Batch ID	0420D	0420D	---	---	---
Dissolved Gases (SOP AR30)					
Methane, % REC	---	---	47U	91 %	---
Carbon Dioxide (4500-CO2D), % REC	---	---	360J	88 %	---
Dilution Factor	---	---	1	1	---
Analysis Date	---	---	04.17.00	04.20.00	---
Batch ID	---	---	1C0417	1C0417	---
Biochemical Oxygen Demand (5 Day) (405.1/5210B)					
Alkalinity (to pH 4.5) as CaCO3 (310.1)					
Chemical Oxygen Demand (410.1)					
Ammonia (as N) (350.1)					

Savannah Laboratories
Division of Severn Trent Laboratories, Inc.
5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165 • www.stlsavlab.com

LOG NO: S0-SCB07
Received: 12 APR 00
Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-8	Method Blank		SCB07
SCB07-9	Lab Control Standard % Recovery		SCB07
SCB07-10	Method Blank		SCB07
SCB07-11	Lab Control Standard % Recovery		SCB07
SCB07-12	Method Blank		SCB07

PARAMETER	SCB07-8	SCB07-9	SCB07-10	SCB07-11	SCB07-12
Manganese (Dissolved) (6010)					
Iron (Dissolved) (6010)					
Chloride (325.2), mg/l					
Nitrate-N (353.2), mg/l					
Ortho-Phosphate-P (365.2)					
Sulfate as SO4 (375.4)					
Total Organic Carbon (415.1)					

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-13	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-13
Halogenated and Aromatic Volatiles (8021)	
Benzene, %	110 %
Ethylbenzene, %	100 %
Toluene, %	105 %
o-Xylene, %	80 %
m&p-Xylene, %	98 %
Surrogate - a,a,a-Trifluorotoluene	87 %
Dilution Factor	1
Analysis Date	04.19.00
Batch ID	1D0419

Semivolatile Organics (8270)

Dissolved Gases (SOP AR30)

Biochemical Oxygen Demand (5 Day) (405.1/5210B)

Alkalinity (to pH 4.5) as CaCO3 (310.1)

Chemical Oxygen Demand (410.1)

Ammonia (as N) (350.1)

Manganese (Dissolved) (6010)

Iron (Dissolved) (6010)

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Reported: 11 MAY 00

Mr. Jeff Hale
Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-13	Lab Control Standard % Recovery		SCB07

PARAMETER	SCB07-13				
Chloride (325.2), mg/l					
Nitrate-N (353.2), mg/l					
Ortho-Phosphate-P (365.2)					
Sulfate as SO4 (375.4)					
Total Organic Carbon (415.1)					

Methods: EPA SW-846, Update III and EPA 40 CFR Part 136.

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Reported: 11 MAY 00

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Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-4	Matrix Spike % Recovery (P-02R)		SCB07
SCB07-5	Matrix Spike Duplicate % Recovery (P-02R)		SCB07

PARAMETER	SCB07-4	SCB07-5
Halogenated and Aromatic Volatiles (8021)		
Benzene, %	0 %	4 %
Toluene, %	0 %	5 %
Surrogate - a,a,a-Trifluorotoluene	73 %	80 %
Ethylbenzene, %	0 %	15 %
o-Xylene, %	0 %	0 %
m&p-Xylene, %	0 %	0 %
Dilution Factor	2	2
Analysis Date	04.24.00	04.24.00
Batch ID	1D0424	1D0420

Savannah Laboratories
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Received: 12 APR 00
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Key Environmental, Inc.
1200 Arch Street - Suite 200
Pittsburgh, PA 15106

Client PO. No.: 00552-09200300

Project: Beazer South Cavalcade/99-785
Sampled By: Client
Code: 153300511

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
SCB07-4	Matrix Spike % Recovery (P-02R)		SCB07
SCB07-5	Matrix Spike Duplicate % Recovery (P-02R)		SCB07

PARAMETER	SCB07-4	SCB07-5
Semivolatile Organics (8270)		
Naphthalene, ug/l	0 %	0 %
Acenaphthylene, ug/l	70 %	73 %
Acenaphthene, ug/l	0 %	0 %
Fluorene, ug/l	49 %	49 %
Phenanthrene, ug/l	53 %	53 %
Anthracene, ug/l	68 %	69 %
Fluoranthene, ug/l	70 %	70 %
Pyrene, ug/l	82 %	81 %
Chrysene, ug/l	75 %	77 %
Benzo(a)anthracene, ug/l	80 %	80 %
Benzo(b)fluoranthene, ug/l	76 %	76 %
Benzo(k)fluoranthene, ug/l	64 %	65 %
Benzo(a)pyrene, ug/l	72 %	72 %
Indeno(1,2,3-cd)pyrene, ug/l	70 %	73 %
Dibenzo(a,h)anthracene, ug/l	67 %	69 %
Benzo(g,h,i)perylene, ug/l	69 %	69 %
2-Methylnaphthalene, ug/l	40 %	20 %
Surrogate-2FBP	64 %	68 %
Surrogate-NBZ	68 %	64 %
Surrogate-TPH	66 %	64 %
Dilution Factor	1	1
Prep Date	04.18.00	04.18.00
Analysis Date	04.20.00	04.20.00
Batch ID	0418C	0418C

Angie Weimerskirk, Project Manager

Quanterra
450 William Pitt Way
Pittsburgh, Pennsylvania 15238-1330

412 820-8380 Telephone
412 820-2080 Fax

ANALYTICAL REPORT

PROJECT NO. 99-785

South Cavalcade

Lot #: C0B020121

Jeff Hale

Key Environmental, Inc

QUANTERRA INCORPORATED

Dave Dunlap
Project Manager

February 4, 2000

CASE NARRATIVE

The sample cooler temperature, when checked upon receipt, was 20°C.

The holding time for analysis was expired upon receipt.

METHODS SUMMARY

C0B020121

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Total Organic Carbon	SMCA WALKLEY-BL	WALKLEY WALKLEY
Total Residue as Percent Solids	MCAWW 160.3 MOD	MCAWW 160.3 MOD

References:

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SMCA 90-3, Standard Methods of Chemical Analysis, 6th Edition, D. Van Nostrand Co., Princeton, N.J., 1963.

SAMPLE SUMMARY

C0B020121

WO #	SAMPLE#	CLIENT SAMPLE ID	DATE	TIME
D84FM	001	DPS-TN3-1214	12/03/99	08:15
D84FP	002	DPS-TN3-1618	12/03/99	08:25
D84FQ	003	DPS-TS3-1012	12/03/99	09:05
D84FR	004	DPS-TS3-1820	12/03/99	09:30
D84FT	005	DPN-TN3-1012	12/06/99	15:45
D84FV	006	DPN-TN3-1618	12/06/99	16:00
D84FX	007	DPN-TS3-1820	12/06/99	16:45
D84G1	008	DPN-TS3-1012	12/06/99	16:30

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPS-TN3-1214

General Chemistry

Lot-Sample #...: C0B020121-001 **Work Order #...:** D84FM **Matrix.....:** SOLID
Date Sampled...: 12/03/99 **Date Received..:** 02/02/00
% Moisture.....: 14

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	85.5		%	MCAWW 160.3 MOD	02/02-02/03/00	0034223
	Dilution Factor: 1		MS Run #.....: 0034058			
Total Organic Carbon	1300	58.5	mg/kg	SMCA WALKLEY-BLAC	02/03/00	0034230
	Dilution Factor: 1		MS Run #.....: 0034063			

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPS-TN3-1618

General Chemistry

Lot-Sample #...: C0B020121-002 **Work Order #...:** D84FP **Matrix.....:** SOLID
Date Sampled...: 12/03/99 **Date Received..:** 02/02/00
% Moisture.....: 13

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**87.0**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1			MS Run #.....: 0034058		
Total Organic Carbon	**453**	**57.5**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1			MS Run #.....: 0034063		

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPS-TS3-1012

General Chemistry

Lot-Sample #...: C0B020121-003 **Work Order #...:** D84FQ **Matrix.....:** SOLID
Date Sampled...: 12/03/99 **Date Received..:** 02/02/00
% Moisture.....: 15

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**85.2**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1		MS Run #.....: 0034058			
Total Organic Carbon	**1070**	**58.7**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1		MS Run #.....: 0034063			

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPS-TS3-1820

General Chemistry

Lot-Sample #...: C0B020121-004 **Work Order #...:** D84FR **Matrix.....:** SOLID
Date Sampled...: 12/03/99 **Date Received..:** 02/02/00
% Moisture.....: 15

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**85.2**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1			MS Run #.....: 0034058		
Total Organic Carbon	**921**	**58.7**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1			MS Run #.....: 0034063		

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPN-TN3-1012

General Chemistry

Lot-Sample #...: C0B020121-005 **Work Order #...:** D84FT **Matrix.....:** SOLID
Date Sampled...: 12/06/99 **Date Received..:** 02/02/00
% Moisture.....: 12

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**88.2**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1			MS Run #.....: 0034058		
Total Organic Carbon	**1120**	**56.7**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1			MS Run #.....: 0034063		

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPN-TN3-1618

General Chemistry

Lot-Sample #...: C0B020121-006 **Work Order #...:** D84FV **Matrix.....:** SOLID
Date Sampled...: 12/06/99 **Date Received..:** 02/02/00
% Moisture.....: 13

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**87.1**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1		MS Run #.....: 0034058			
Total Organic Carbon	**379**	**57.4**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1		MS Run #.....: 0034063			

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPN-TS3-1820

General Chemistry

Lot-Sample #...: C0B020121-007 **Work Order #...:** D84FX **Matrix.....:** SOLID
Date Sampled...: 12/06/99 **Date Received..:** 02/02/00
% Moisture.....: 12

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**88.0**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1			MS Run #.....: 0034058		
Total Organic Carbon	**1860**	**56.8**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1			MS Run #.....: 0034063		

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

KEY ENVIRONMENTAL, INC

Client Sample ID: DPN-TS3-1012

General Chemistry

Lot-Sample #...: C0B020121-008 **Work Order #...:** D84G1 **Matrix.....:** SOLID
Date Sampled...: 12/06/99 **Date Received..:** 02/02/00
% Moisture.....: 15

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	**85.1**		**%**	**MCAWW 160.3 MOD**	**02/02-02/03/00**	**0034223**
	Dilution Factor: 1			MS Run #.....: 0034058		
Total Organic Carbon	**1230**	**58.7**	**mg/kg**	**SMCA WALKLEY-BLAC**	**02/03/00**	**0034230**
	Dilution Factor: 1			MS Run #.....: 0034063		

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

METHOD BLANK REPORT

General Chemistry

Client Lot #...: C0B020121 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Total Organic Carbon		Work Order #:	D867H101	MB Lot-Sample #:	C0B030000-230	
	ND	50.0	mg/kg	SMCA WALKLEY-BLAC	02/03/00	0034230
		Dilution Factor: 1				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: C0B020121 **Matrix.....:** SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Total Organic Carbon		Work Order #: D867H102	LCS Lot-Sample#: C0B030000-230		
	98	(75 - 125)	SMCA WALKLEY-BLAC	02/03/00	0034230

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: C0B020121 **Work Order #...:** D84FP-SMP D84FP-DUP **Matrix.....:** SOLID

Date Sampled...: 12/03/99 **Date Received..:** 02/02/00

% Moisture.....: 13

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	C0B020121-002	
	87.0	88.2	%	1.5	(0-20)	MCAWW 160.3 MOD	02/02-02/03/00	0034223
		Dilution Factor: 1						
		Prep Date.....: 0034058			Analysis Date..:		Prep Batch #...:	
Total Organic Carbon						SD Lot-Sample #:	C0B020121-002	
	453	378	mg/kg	18	(0-20)	SMCA WALKLEY-BLAC	02/03/00	0034230
		Dilution Factor: 1						
		Prep Date.....: 0034063			Analysis Date..:		Prep Batch #...:	

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

December 13, 1999

Mr. Jeff Hale
Key Environmental
1200 Arch Street, #200
Carnegie, PA 15106

RE: **WATER SAMPLES – SOUTH CAVALCADE SUPERFUND SITE – HOUSTON, TEXAS – PROJECT # 99-785**

TEG-Texas project #T3-991201

Mr. Hale:

Please find enclosed the data report for the water samples from the South Cavalcade Superfund Site in Houston, Texas for Key Environmental. All samples were analyzed in TEG-Texas' environmental laboratory for the following:

- 65 water samples for Benzene and Napthalene (USEPA Method 8021B).

You will also find enclosed chain of custody records and appropriate QA/QC data for the above-mentioned project.

TEG-Texas appreciates the opportunity to work with Key Environmental on this project. If you have any questions regarding these data or need further information, please do not hesitate to call (830) 420-3516.

Sincerely,

Julie A. Pieper

Julie A. Pieper
General Manager

Transglobal Environmental Geochemistry ★ Texas
306 Sea Willow Drive • Marion, TX 78124-6518
Phone: 830-420-3516
Fax: 830-420-3603

Key Environmental
Client Project # 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

TEG Project#T3-991201

Benzene and Napthalene (USEPA Method 8021B) Analyses of Waters

Sample ID	Depth (ft)	Analysis Date	Analysis Time	Benzene (µg/L)	Napthalene (µg/L)	Surrogate Recovery %
Method Blank	----	12/1/99	8:29	<5	<5	106
Method Blank	----	12/2/99	7:57	<5	<5	112
Method Blank	----	12/3/99	8:04	<5	<5	114
Method Blank	----	12/4/99	9:22	<5	<5	113
DPN-T0	10-12	12/1/99	14:02	<5	<5	111
DPN-T0	12-14	12/1/99	15:14	<5	<5	103
DPN-T0	14-16	12/1/99	16:29	<5	**31**	110
DPN-T0	16-18	12/2/99	8:50	**5**	**263***	105
DPN-T0	18-20	12/2/99	9:14	<5	**31**	106
DPN-TN1	9-11	12/1/99	14:27	<5	<5	111
DPN-TN1	11-13	12/1/99	14:51	<5	<5	111
DPN-TN1	13-15	12/1/99	15:37	<5	<5	105
DPN-TN1	15-17	12/1/99	16:05	**22**	**>566 sat**	106
DPN-TN1	17-19	12/2/99	8:26	**27**	**>587 sat**	104
DPN-TN2	10.5-12.5	12/1/99	9:42	<5	<5	88
DPN-TN2	12.5-14.5	12/1/99	10:09	<5	<5	104
DPN-TN2	14.5-16.5	12/1/99	10:34	<5	**260***	101
DPN-TN2	16.5-18.5	12/1/99	13:11	<5	**364***	102
DPN-TN2	18.5-20.5	12/1/99	13:36	<5	**269***	107
DPN-TN3	10-12	12/1/99	11:25	<5	<5	102
DPN-TN3	12-14	12/1/99	9:13	<5	<5	114
DPN-TN3	14-16	12/1/99	11:53	<5	<5	118
DPN-TN3	16-18	12/1/99	12:18	<5	**5**	109
DPN-TN3	18-20	12/1/99	12:45	<5	**172***	112
DPN-TS1	9-11	12/2/99	9:39	<5	<5	111
DPN-TS1	11-13	12/2/99	10:05	<5	<5	111
DPN-TS1	13-15	12/2/99	10:29	**5**	**291***	105
DPN-TS1	15-17	12/2/99	10:53	**25**	**>697 sat**	107
DPN-TS2	9-11	12/2/99	16:07	<5	<5	92
DPN-TS2	11-13	12/2/99	16:30	<5	<5	91
DPN-TS2	13-15	12/2/99	16:52	<5	**21**	99
DPN-TS2	15-17	12/2/99	11:18	**11**	**263***	102
DPN-TS2	17-18	12/2/99	11:45	**16**	**302***	102
DPN-TS3	10-12	12/3/99	9:31	<5	<5	112
DPN-TS3	12-14	12/4/99	9:56	<5	**199***	125
DPN-TS3	14-16	12/3/99	14:13	<5	**296***	111
DPN-TS3	16-18	12/2/99	12:36	<5	<5	94
DPN-TS3	18-20	12/2/99	14:05	<5	**87**	85

Acceptable surrogate recovery: 65-150%
" * " - above calibration limits
" sat " - saturated detector

Analyses performed on site in TEG's Mobile Environmental Laboratory
Analyses performed by: Jeff Robinson
Data Reviewed by: R. Scott Pieper

Key Environmental
Client Project # 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

TEG Project#T3-991201

Benzene and Napthalene (USEPA Method 8021B) Analyses of Waters

Sample ID	Depth (ft)	Analysis Date	Analysis Time	Benzene (µg/L)	Napthalene (µg/L)	Surrogate Recovery %
DPN-L1	11-13	12/4/99	11:02	<5	<5	88
DPN-L1	13-15	12/4/99	11:32	<5	<5	81
DPN-L1	15-17	12/2/99	15:18	<5	**242***	98
DPN-L1	17-19	12/2/99	14:29	**8**	**298***	109
DPN-L2	12-14	12/4/99	13:25	<5	<5	141
DPN-L2	14-16	12/4/99	13:58	<5	**255***	110
DPN-L2	16-18	12/2/99	15:43	**13**	**>556 sat**	100
DPN-L2	18-19	12/2/99	14:54	**7**	**288***	98
DPS-TO	12-14	12/3/99	12:15	<5	<5	90
DPS-TO	14-16	12/3/99	11:52	<5	<5	91
DPS-TO	16-18	12/3/99	11:29	<5	<5	90
DPS-TN1	14-16	12/4/99	15:33	<5	<5	70
DPS-TN1	16-18	12/3/99	11:07	<5	<5	91
DPS-TN1	18-19	12/4/99	16:04	<5	<5	144
DPS-TN2	12-14	12/4/99	10:30	<5	<5	113
DPS-TN2	14-16	12/3/99	12:39	<5	<5	88
DPS-TN2	16-18	12/3/99	13:25	<5	**18**	113
DPS-TN3	12-14	12/4/99	16:59	<5	<5	135
DPS-TS1	16-18	12/4/99	16:31	<5	<5	143
DPS-TS1	18-20	12/3/99	9:59	<5	<5	103
DPS-TS1	20-21	12/3/99	9:36	<5	<5	110
DPS-TS2	15-17	12/4/99	15:30	<5	<5	75
DPS-TS2	17-19	12/4/99	14:30	<5	<5	86
DPS-TS2	19-20	12/3/99	13:50	<5	<5	115
DPS-TS3	16-18	12/3/99	10:21	<5	<5	108
DPS-TS3	18-20	12/3/99	10:44	<5	<5	99

Acceptable surrogate recovery: 65-150%
" * " - above calibration limits
" sat " - saturated detector

Analyses performed on site in TEG's Mobile Environmental Laboratory
Analyses performed by: Jeff Robinson
Data Reviewed by: R. Scott Pieper

Key Environmental
Client Project # 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

TEG Project# T3-991201

Matrix Spike(MS)/Matrix Spike Duplicate(MSD) for USEPA 8021B analyses of waters.

Analysis Date:12/01/99 Spiked Sample ID:DI H2O

COMPOUND	Spike Conc. (ng)	MS Conc. (ng)	MS Rec. %	MSD Conc. (ng)	MSD Rec. %	RPD %	Acceptable RPD	Acceptable % Rec.
Benzene	25.0	21.8	87%	23.2	93%	6.3%	15%	65%-135%
Napthalene	25.0	25.5	102%	24.8	99%	2.9%	15%	65%-135%

Analysis Date:12/02/99 Spiked Sample ID:DI H2O

COMPOUND	Spike Conc. (ng)	MS Conc. (ng)	MS Rec. %	MSD Conc. (ng)	MSD Rec. %	RPD %	Acceptable RPD	Acceptable % Rec.
Benzene	25.0	18.5	74%	17.9	72%	3.4%	15%	65%-135%
Napthalene	25.0	24.8	99%	23.1	92%	7.3%	15%	65%-135%

Analysis Date:12/03/99 Spiked Sample ID:DI H2O

COMPOUND	Spike Conc. (ng)	MS Conc. (ng)	MS Rec. %	MSD Conc. (ng)	MSD Rec. %	RPD %	Acceptable RPD	Acceptable % Rec.
Benzene	25.0	25.1	100%	25.6	102%	1.9%	15%	65%-135%
Napthalene	25.0	25.1	100%	25.0	100%	0.5%	15%	65%-135%

Analysis Date:12/04/99 Spiked Sample ID:DI H2O

COMPOUND	Spike Conc. (ng)	MS Conc. (ng)	MS Rec. %	MSD Conc. (ng)	MSD Rec. %	RPD %	Acceptable RPD	Acceptable % Rec.
Benzene	25.0	24.5	98%	22.0	88%	10.7%	15%	65%-135%
Napthalene	25.0	26.4	106%	23.7	95%	10.8%	15%	65%-135%

Spike Conc. - Concentration spiked into sample matrix
MS Conc./MSD Conc. - Analyzed concentration from spiked sample
% Rec. - Percent recovery of spike from sample matrix
RPD - Relative Percent Difference between MS and MSD % recoveries

Analyses performed by:Jeff Robinson
Data Reviewed by: R. Scott Pieper

EG Project#T3-991201

Key Environmental
Client Pro[illegible] 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

QA/QC Data Report for USEPA Method 8021B

Date:12/01/99

Time:		8:03			10:59			16:53		
COMPONENTS	Quantity Injected (ng)	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD
Benzene	25.0	23.6	94	6%	20.8	83	18%	21.1	84	17%
Nathalene	25.0	25.0	100	0%	25.2	101	1%	28.0	112	11%

Date:12/02/99

Time:		7:33			13:41			18:00		
COMPONENTS	Quantity Injected (ng)	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD
Benzene	25.0	26.9	108	7%	22.1	88	12%	20.2	81	21%
Nathalene	25.0	25.0	100	0%	25.7	103	3%	23.8	95	5%

Date:12/03/99

Time:		7:41			13:03			14:59		
COMPONENTS	Quantity Injected (ng)	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD
Benzene	25.0	27.1	108	8%	26.8	107	7%	22.5	90	11%
Nathalene	25.0	28.6	114	13%	27.4	110	9%	27.9	112	11%

Date:12/04/99

Time:		8:53			12:55			17:27		
COMPONENTS	Quantity Injected (ng)	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD
Benzene	25.0	26.1	105	4%	29.0	116	15%	25.9	104	4%
Nathalene	25.0	26.9	108	7%	27.0	108	8%	26.1	104	4%

% Recovery - Percent Recovery of analytes from standard
RPD - Relative Percent Difference
Analyses performed by:Jeff Robinson
Data Reviewed by: R. Scott Pieper

Key Environmental
Client Project # 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

TEG Project# T3-991201

Benzene and Napthalene (USEPA Method 8021B) Analyses of Waters

Sample ID	Depth (ft)	Analysis Date	Analysis Time	Benzene (µg/L)	Napthalene (µg/L)	Surrogate Recovery %
Method Blank	----	12/7/99	11:16	<5	<5	133
DPS-L1	14-16	12/7/99	12:42	<5	**>688 sat**	126
DPS-L1	16-18	12/7/99	12:13	<5	**>682 sat**	134
DPS-L1	18-19	12/7/99	11:41	**47**	**>685 sat**	127
DPS-TN3	14-16	12/7/99	19:40	<5	<5	114
DPS-TN3	16-18	12/7/99	19:09	<5	<5	110

Acceptable surrogate recovery: 65-150%
" * " - above calibration limits
" sat " - saturated detector

Analyses performed in TEG's Mobile Environmental Laboratory
Analyses performed by: R. Scott Pieper
Data Reviewed by: R. Scott Pieper

Key Environmental
Client Project # 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

TEG Project# T3-991201

QA/QC Data Report for USEPA Method 8021B

Date:12/07/99

Time:		10:39			20:18		
COMPONENTS	Quantity Injected (ng)	Analyzed Recovery (ng)	% Recovery	RPD	Analyzed Recovery (ng)	% Recovery	RPD
Benzene	25.00	28.13	113	12%	21.58	86	15%
Nathalene	25.00	28.90	116	14%	31.20	125	22%

% Recovery - Percent Recovery of analytes from standard
RPD - Relative Percent Difference
Analyses performed by: R. Scott Pieper
Data Reviewed by: R. Scott Pieper

Key Environmental
Client Project # 99-785
South Cavalcade Superfund Site
Houston, Texas 77026

TEG Project# T3-991201

Matrix Spike(MS)/Matrix Spike Duplicate(MSD) for USEPA 8021B analyses of waters.

Analysis Date:12/08/99 Spiked Sample ID:DI H2O

COMPOUND	Spike Conc. (ng)	MS Conc. (ng)	MS Rec. %	MSD Conc. (ng)	MSD Rec. %	RPD %	Acceptable RPD	Acceptable % Rec.
Benzene	25.00	21.22	85%	19.81	79%	6.9%	15%	65%-135%
Napthalene	25.00	29.42	118%	25.91	104%	12.7%	15%	65%-135%

Spike Conc. - Concentration spiked into sample matrix
MS Conc./MSD Conc. - Analyzed concentration from spiked sample
% Rec. - Percent recovery of spike from sample matrix
RPD - Relative Percent Difference between MS and MSD % recoveries

Analyses performed by: R. Scott Pieper
Data Reviewed by: R. Scott Pieper

Serial Number 142845

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

☒ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (904) 878-9504
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-1163

PROJECT REFERENCE: Beazer South Cavalcade
PROJECT NO.: 99-785
P.O. NUMBER:
PROJECT LOC. (State): TX
SAMPLER(s) NAME: R. DeLisio / E. Witmer
PHONE: (412) 279 3363
FAX: (412) 279 4332
CLIENT NAME: Key Environmental
CLIENT PROJECT MANAGER: Jim Zubrow
CLIENT ADDRESS (CITY, STATE, ZIP): 1200 Arch St. Carnegie, PA 15106

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES — PAGE 1 OF 1

☒ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID	TOC (SOIL)	BTEX	PAH	DISSOLVED GASES	BOD/ALK	COD	NH3	Mn/Fe (FILTER)	Cl/NO3/PO4/SO4	TOC (AQ)	REMARKS
								—	HCL	—	—	—	H_2SO_4	H_2SO_4	HNO_3	—	HCL	
12/6	1545		DPN-TN3-1012		X			1										
12/6	1600		DPN-TN3-1618		X			1										
12/6	1645		DPN-TS3-1820		X			1										
12/6	1630		DPN-TS3-1012		X			1										
12/6	1400		DPN-L1-120699	X					3	2	3	1	1	1	1	1	1	
12/6	1500		DPN-L2-120699	X					3	2	3	1	1	1	1	1	1	
			TRIP BLANK	X					3									
			TEMP. BLANK INCLUDED															

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	11/27/99		R. Oufrin	12/6/99	1800			
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
R. Oufrin	12/6/99		FEDEX 803154362560	12/6/99	1800			

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
S. Campbell	12/7/99	8:41	☒ YES ☐ NO		S918204	

AW

ORIGINAL

Serial Number 142846

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

☒ 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
☐ 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

* 3 COOLERS SENT *

PROJECT REFERENCE: BEAZER SOUTH CAVALCADE
PROJECT NO.: 99-785
P.O. NUMBER:
PROJECT LOC. (State): TX
SAMPLER(s) NAME: R DELISIO / E. WITTMER
PHONE: (412) 279 3363
FAX: (412) 279-4332
CLIENT NAME: KEY ENVIRONMENTAL
CLIENT PROJECT MANAGER: JIM ZUBROW
CLIENT ADDRESS (CITY, STATE, ZIP): 1200 ARCH ST. CARNEGIE, PA 15106 ~~15126~~

PAGE 1 OF 1

☒ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES / NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID	TOC (SOIL)	BTEX	PAH	DISSOLVED GASES	BOD/ALK	COD	NH_3	Mn/Fe (FILT.)	Cl/NO_3/PO_4/SO_4	TOC (AQ.)	REMARKS
								—	HCl	—	—	—	H_2SO_4	H_2SO_4	HNO_3	—	HCl	
12/7/99	0825		DPN-TN2-120799	X					3	2								
	0910		DPN-TN3-120799	X					3	2								
	0000		DPN-DUP-120799	X					3	2								
	1340		DPN-TN1-120799	X					3	2								
	1410		DPN-TQ-120799	X					3	2								
	1430		DPN-TS1-120799	X					3	2								
	1455		DPN-TS2-120799	X					3	2								
	1550		DPN-TS3-120799	X					3	2								
	1658		DPN-L3-120799	X					3	2								
	1715		DPN-L4-120799	X					3	2								
	1738		DPN-L2-120799	X						2								PAH RESAMPLE OF 12/6/99 SAMPLE
	1748		DPN-L1-120799	X						2								"
			TRIP BLANK	X					3									

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	11/22/99		R. Ocfin	12/7/99	1830			
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
R. Ocfin	12/7/99		FEDEX 815217929330	12/7/99	1830			

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
[signature]	12/8/99	9:25	☑ YES ☐ NO		S9-18252	

ORIGINAL

Au)

001293

Serial Number 142850

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

☐ 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
☐ 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE: Beazer S. Cavalcade
PROJECT NO.: 99-785
P.O. NUMBER:
PROJECT LOC. (State): TX
SAMPLER(s) NAME: R. DeLisio / E. Wittmer
PHONE: (412) 279 3363
FAX: (412) 279-4332
CLIENT NAME: Key
CLIENT PROJECT MANAGER: J. Zubrow
CLIENT ADDRESS (CITY, STATE, ZIP): 1200 Arch St. Carnegie PA 15106

PAGE 1 OF

☒ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID	TOC (SOIL)	BTEX	PAH	DISSOLVED GASES	BOD/ALK	COD	NH_3	Mn/Fe (FILT.)	$Cl/NO_3/PO_4/SO_4$	TOC (AQ.)	REMARKS
								–	HCl	–	–	–	H_2SO_4	H_2SO_4	HNO_3	–	HCl	
12/8/99	0815		DPS-TN3-1214		X			1										
	0825		DPS-TN3-1618		X			1										
	0905		DPS-TS3-1012		X			1										
	0930		DPS-TS3-1820		X			1										
	1540		DPS-TN3-120899	X					3	2								
	1000		DPS-TS3-120899	X					3	2								
	1115		DPS-TS2-120899	X					3	2								
	1400		DPS-TS1-120899	X					3	2								
	1505		DPS-TN1-120899	X					3	2								
	1415		DPS-TQ-120899	X					3	2	3	1	1	1	1	1	1	
	1158		DPS-TN2-120899	X					3	2								
	1715		DPS-L1-120899	X								1	1	1	1	~~2~~ 1	~~2~~ 1	
			TRIP BLANK	X					3									

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Robert J. Oefner	12/8/99	1830						
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
FEDEX 815351240242	12/8/99	1830						

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
[signature]	12/9/99	10:15	☑ YES ☐ NO		59-18307	

ORIGINAL

Serial Number 143047

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

- [X] 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
- [ ] 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (904) 878-9504
- [ ] 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
- [ ] 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049
- [ ] 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-1163

PROJECT REFERENCE: BEAZER SOUTH CAVALCADE
PROJECT NO.: 99-785
P.O. NUMBER:
PROJECT LOC. (State): TX
SAMPLER(s) NAME: R. DELISIO
PHONE: (412) 279-3363
FAX: (412) 279-4332
CLIENT NAME: KEY ENVIRONMENTAL
CLIENT PROJECT MANAGER: J. ZUBROW
CLIENT ADDRESS (CITY, STATE, ZIP): 1200 ARCH ST. CARNEGIE, PA 15106

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: BTEX / PAH / DISSOLVED GASES

PAGE 1 OF

[X] STANDARD REPORT DELIVERY
[ ] EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID	BTEX	PAH	DISSOLVED GASES	REMARKS
								HCl	–	–	
12/9/99	0748		DPN-TS3-120999	X					1		DO NOT ANALYZE UNLESS NECESSARY. SENT AS REPLACEMENT FOR BROKEN JAR FROM 12/07/99 SAMPLES.
	0840		PSG-2-120999	X				3	2		
	0750		DPS-L1-120999	X				3	2	3	
	0925		PSG-3-120999	X				3	2		
	1135		PSG-6-120999	X				3	2		
	1530		PSG-5-120999	X				3	2		
	1427		PSG-1-120999	X				3	2		
	1440		PSG-4-120999	X				3	2		

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
F Swafford	12/2/99	3:30	Robt F. Ofsin	12/9/99	1600			
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
Robt F. Ofsin	12/9/99	1530	FEDEX 816978363418	12/9/99	1600	F Swafford	12/10/99	9:45

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
[signature]	12/10/99	9:45	[X] YES [ ] NO		5918345	

ORIGINAL

AW

Serial Number 021285

Savannah Laboratories
a division of Severn Trent Laboratories, Inc

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

☒ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
○ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (850) 878-3994 — Fax: (850) 878-9504
○ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
○ 6712 Benjamin Rd., Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049

2 Coolers Sent

PROJECT REFERENCE	So. Cavalcade
PROJECT NO.	99-785
PROJECT LOCATION (STATE)	TX
STL (LAB) PROJECT MANAGER	Angie Weimerskirk
P.O. NUMBER	
CONTRACT NO.	Hurp 552
CLIENT (SITE) PM	Jeff Hale
CLIENT PHONE	(412) 279-3363
CLIENT FAX	(412) 279-4332
CLIENT NAME	Key Environmental
CLIENT EMAIL	
CLIENT ADDRESS	1200 Arch St Carnegie PA 15106
COMPANY CONTRACTING THIS WORK (if applicable)	Benzer
PAGE	
OF	
STANDARD REPORT DELIVERY	☒
DATE DUE	
EXPEDITED REPORT DELIVERY (SURCHARGE)	○
DATE DUE	
NUMBER OF COOLERS SUBMITTED PER SHIPMENT:	

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	COMPOSITE (C) OR GRAB (G) INDICATE	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (OIL, SOLVENT, ETC)	BTEX	PAH	Dissolved Gases	BOD / ALK	COD	NH_3	Mn/Fe (Filter)	Cl/NO_3/NO_2/SO_4	TOC (Ag)		REMARKS
								HCL	—	—	—	H_2SO_4	H_2SO_4	HNO_3	—	HCL		
								NUMBER OF CONTAINERS SUBMITTED										
12/13/99	1350	OW1Q-121399	G	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/13/99	1350	OW1Q-MS-121399	G	X	-	-	-	3	2									
12/13/99	1350	OW1Q-MSD-121399	G	X	-	-	-	3	2									
12/13/99	0000	DUP01-121399	G	X	-	-	-	3	2									
12/13/99	1620	MW03-121399	G	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/13/99	1700	OW07-121399	G	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/13/99	1755	FB-121399	G	X	-	-	-	3	2									
12/13/99	—	TB-121399	G	X	-	-	-	3										
		Temp Blank Included																

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
L Wofford	12/7/99	4:50	[signature]	12/13/99	1845			

RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	STL-SL LOG NO.	LABORATORY REMARKS:
C. Vanguy	12/14/99	9:07	YES ✓ NO		S9-18430	

ORIGINAL

AW

Serial Number 143290

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

☒ 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (904) 878-3994 — Fax: (904) 878-9504
☐ 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 — Phone: (504) 764-1100 — Fax: (504) 725-1163

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE: Beazer So. Cavalcade
PROJECT NO.: 99-785
P.O. NUMBER: Harp 552
PROJECT LOC. (State): TX
SAMPLER(s) NAME: Eric Wittmer / Jeff Hale
PHONE: 412/279-3363
FAX: 412/279-4332
CLIENT NAME: Key Environmental
CLIENT PROJECT MANAGER: Jim Zubrow
CLIENT ADDRESS (CITY, STATE, ZIP): 1200 Arch St. Carnegie PA 15106

PAGE 1 OF 1

☒ STANDARD REPORT DELIVERY
☐ EXPEDITED REPORT DELIVERY (surcharge)
Date Due:

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES — NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID	BTEX	PAH	Dissolved Gases	BOD/ALK	COD	NH3	Mn/Fe (Filter)	Cl/NO3/PO4/SO4	TOC (aq)		REMARKS
								HCL	—	—	—	H_2SO_4	H_2SO_4	HNO_3	—	HCL		
12/14/99	920		OW02-121499	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/14/99	920		OW02-MS-121499	X	-	-	-	3	2									
12/14/99	920		OW02-MSD-121499	X	-	-	-	3	2									
12/14/99	0000		Dup02-121499	X	-	-	-	3	2									
12/14/99	1135		MW07-121499	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/14/99	1130		FB-121499	X	-	-	-	3	2									
12/14/99	1410		MW08-121499	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/14/99	1640		MW24-121499	X	-	-	-	3	2	3	1	1	1	1	1	1		
12/14/99	—		TB-121499	X	-	-	-	3										

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	12-14-99	1830						
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
S. Campbell	12/15/99	9:15	☒ YES ☐ NO		9918475	

ORIGINAL

Serial Number 021346

Savannah Laboratories
a division of Severn Trent Laboratories, Inc

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

(X) 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
( ) 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (850) 878-3994 — Fax: (850) 878-9504
( ) 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
( ) 6712 Benjamin Rd., Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049

PROJECT REFERENCE: South Cavalcade	PROJECT NO.: 99785	PROJECT LOCATION (STATE): TX
STL (LAB) PROJECT MANAGER: Angie Weimerskirk	P.O. NUMBER:	CONTRACT NO.:
CLIENT (SITE) PM: Jeff Hale/Jim Zubrow	CLIENT PHONE: 412-279-3363	CLIENT FAX: 412-279-0677
CLIENT NAME: South Cavalcade	CLIENT EMAIL: Jhale@keyenvir.com	
CLIENT ADDRESS: Key Environmental, 1200 Arch St, Carnegie PA 15106		
COMPANY CONTRACTING THIS WORK (if applicable): Beazer		

PAGE 1 OF 1

STANDARD REPORT DELIVERY (X)

DATE DUE

EXPEDITED REPORT DELIVERY (SURCHARGE) ( )

DATE DUE

NUMBER OF COOLERS SUBMITTED PER SHIPMENT:

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	COMPOSITE (C) OR GRAB (G) INDICATE	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (OIL, SOLVENT, ETC)	REQUIRED ANALYSES: BTEX 8021	REQUIRED ANALYSES: PAH 8270	REMARKS
12/15/99	1000	RWS1-121599					X	X	X	
12/15/99	1130	RWS2-121599					X	X	X	
12/15/99	1230	RWS5-121599					X	X	X	
12/15/99	1300	RWN4-121599					X	X	X	

NUMBER OF CONTAINERS SUBMITTED

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
J. Swafford	12/9/99	4:40	J. Hale	12/15/99	1745			
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	STL-SL LOG NO.	LABORATORY REMARKS:
	12/16/99	9:45	YES / NO		99-18503	

ORIGINAL

AW

Serial Number 015666

STL Savannah Laboratories
a division of Severn Trent Laboratories, Inc

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

(✓) 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
( ) 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (850) 878-3994 — Fax: (850) 878-9504
( ) 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
( ) 6712 Benjamin Rd., Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049

PROJECT REFERENCE: South Cavalcade	PROJECT NO.: 99-785	PROJECT LOCATION (STATE): TX
STL (LAB) PROJECT MANAGER: Angie Weimerskirk	P.O. NUMBER: See Harp	CONTRACT NO.: See Harp
CLIENT (SITE) PM: Jeff Hale	CLIENT PHONE: 412-279-3363	CLIENT FAX: 412-279-4332
CLIENT NAME: Key Environmental	CLIENT EMAIL:	
CLIENT ADDRESS: 1200 Arch St, Carnegie, PA 15106		
COMPANY CONTRACTING THIS WORK (if applicable): Beazer		

PAGE 1 OF 1

STANDARD REPORT DELIVERY (✓)
DATE DUE See Harp
EXPEDITED REPORT DELIVERY (SURCHARGE) ( )
DATE DUE _____

NUMBER OF COOLERS SUBMITTED PER SHIPMENT: ~~2~~ 1

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	COMPOSITE (C) OR GRAB (G) INDICATE	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (OIL, SOLVENT, ETC)	PAH	Alk/BOD	Cl/NO_3/SO_4/PO_4	COD/NH_3	TOC	BTEX	Methane/CO_2	Diss Fe/Mn			REMARKS
		REQUIRED ANALYSES																
		NUMBER OF CONTAINERS SUBMITTED						1	–	–	H_2SO_4	HCL	HCL	–	HNO_3			
4/11/00	1615	MW-01	–	X	–	–	–	2	1	1	1	1	3	3	1			
4/11/00	1730	FB-01-041100	–	X	–	–	–	2	–	–	–	–	3	–	–			
4/11/00	—	Trip Blank	–	X	–	–	–	–	–	–	–	–	3	–	–			

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	4/11/00	1820						
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
Fed Ex								

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	STL-SL LOG NO.	LABORATORY REMARKS:
[signature]	4/12/00	9:05	(YES) NO		5002343	

ORIGINAL

Serial Number 015665

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Savannah Laboratories
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- [x] 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
- [ ] 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (850) 878-3994 — Fax: (850) 878-9504
- [ ] 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
- [ ] 6712 Benjamin Rd., Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049

PROJECT REFERENCE: So. Cavalcade	PROJECT NO.: 99-785	PROJECT LOCATION (STATE): TX	PAGE 1 OF 1
STL (LAB) PROJECT MANAGER: A Weimerskirk	P.O. NUMBER: See Harp	CONTRACT NO.: See Harp	STANDARD REPORT DELIVERY [x] DATE DUE: See Harp
CLIENT (SITE) PM: ~~Key Environ~~ EW Jeff Hale	CLIENT PHONE: 412-279-3363	CLIENT FAX: 412-279-4332	EXPEDITED REPORT DELIVERY (SURCHARGE) [ ] DATE DUE:
CLIENT NAME: Key Environmental	CLIENT EMAIL: JHale@Keyenvir.com		
CLIENT ADDRESS: 1200 Arch St, Carnegie, PA 15106			NUMBER OF COOLERS SUBMITTED PER SHIPMENT: 2
COMPANY CONTRACTING THIS WORK (if applicable): Beazer			

MATRIX TYPE: COMPOSITE (C) OR GRAB (G) INDICATE; AQUEOUS (WATER); SOLID OR SEMISOLID; AIR; NONAQUEOUS LIQUID (OIL, SOLVENT, ETC)

REQUIRED ANALYSES: PAH; BTEX

NUMBER OF CONTAINERS SUBMITTED: 1; HCL

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	COMPOSITE (C) OR GRAB (G) INDICATE	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (OIL, SOLVENT, ETC)	PAH	BTEX	REMARKS
4/13/00	920	MW-12R	-	X	-	-	-	2	3	
4/13/00	1440	FB-02-041300	-	X	-	-	-	2	3	
4/14/00	900	P-02R	-	X	-	-	-	2	3	
4/14/00	900	P-02R-MS	-	X	-	-	-	2	3	
4/14/00	900	P-02R-MSD	-	X	-	-	-	2	3	
4/14/00	1815	FB-03-041400	-	X	-	-	-	2	3	
4/14/00	—	Trip Blank	-	X	-	-	-	—	3	

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
F Swafford	3/29/00		[signature]	4/14/00	1850			
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
			Fed Ex	4/14/00				

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	STL-SL LOG NO.	LABORATORY REMARKS:
K Conner	4/17/00	8:55	YES NO		SO-02457	

ORIGINAL

Serial Number 016103

STL Savannah Laboratories
a division of Severn Trent Laboratories, Inc.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

(X) 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
( ) 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (850) 878-3994 Fax: (850) 878-9504
( ) 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
( ) 6712 Benjamin Rd., Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049

PROJECT REFERENCE: So. Cavalcade	PROJECT NO.: 99-785	PROJECT LOCATION (STATE): TX
STL (LAB) PROJECT MANAGER: Angie Weimerskirk	P.O. NUMBER: See Hrp	CONTRACT NO.: See Hrp
CLIENT (SITE) PM: Jeff Hale	CLIENT PHONE: 412-279-3363	CLIENT FAX: 412-279-4332
CLIENT NAME: Key Environmental	CLIENT EMAIL: JHale@Keyenvir.Com	
CLIENT ADDRESS: 1200 Arch St Carnegie, PA 15106		
COMPANY CONTRACTING THIS WORK (if applicable): Benzer		

PAGE 1 OF 1

STANDARD REPORT DELIVERY (X)
DATE DUE See Hrp
EXPEDITED REPORT DELIVERY (SURCHARGE) ( )
DATE DUE _____
NUMBER OF COOLERS SUBMITTED PER SHIPMENT: 2

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	COMPOSITE (C) OR GRAB (G) INDICATE	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (OIL, SOLVENT, ETC)	PAH	BTEX								REMARKS
								NUMBER OF CONTAINERS SUBMITTED									
4/17/00	1630	P-03R	–	X	–	–	–	2	3								
4/17/00	1745	MW-25	–	X	–	–	–	2	3								
4/17/00	1925	MW-14R	–	X	–	–	–	2	3								
4/17/00	0000	Dup-01-041700	–	X	–	–	–	2	3								
4/17/00	2010	FB-04-041700	–	X	–	–	–	2	3								
4/18/00	1330	MW-26	–	X	–	–	–	2	3								
4/18/00	—	Trip Blank	–	X	–	–	–	–	3								

MATRIX TYPE

REQUIRED ANALYSES: PAH, BTEX; HCL

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	4/18/00	1720						
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
Fed Ex	4/18/00		[signature]	4/19/00	9:10			

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	STL-SL LOG NO.	LABORATORY REMARKS:
[signature]	4/19/00	9:10	(YES) NO		5002509	

ORIGINAL

Chain of Custody Record

Quanterra

QUA-4124 0797

Client	Project Manager	Date	Chain of Custody Number
Key Environmental	J. Zubrow	2/1/00	05928

Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page 1 of 1
1200 Arch St.	(412) 279-3363		

City	State	Zip Code	Site Contact	Lab Contact
Carnegie, PA 15106			J. Hale	Dave Dunlap

Project Name	Carrier/Waybill Number
South Cavalcade	

Contract/Purchase Order/Quote No.: P10002001

Analysis (Attach list if more space is needed)

Special Instructions/ Conditions of Receipt

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Matrix: Sed.	Matrix: Soil	Containers & Preservatives: Unpres.	H2SO4	HNOS	HCl	NaOH	ZnAc/NaOH	TOC (Walkley-Black)	Special Instructions/ Conditions of Receipt
DPS-TN3-1214	12/3/99	815	–	–	X							1	
DPS-TN3-1618	↓	825	–	–	X							1	
DPS-TS3-1012	↓	905	–	–	X							1	
DPS-TS3-1820	↓	930	–	–	X							1	
DPN-TN3-1012	12/6/99	1545	–	–	X							1	
DPN-TN3-1618	↓	1600	–	–	X							1	
DPN-TS3-1820	↓	1645	–	–	X							1	
DPN-TS3-1012	↓	1630	–	–	X							1	

Possible Hazard Identification: ☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☑ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other_____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: [signature]	2/1/00	1615	1. Received By: [signature]	2/2/00	10:00
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments: Samples are over the Holding Time

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Transglobal Environmental Geochemistry
CHAIN-OF-CUSTODY RECORD

P.O.# _____

CLIENT: KEY ENVIRONMENTAL | DATE: 12/03/99 | PAGE 1 OF 1

ADDRESS: 1200 ARCH ST #300, CARNEGIE, PA 15106 | TEG PROJECT #: T3-991201

PHONE: 412-279-3363 | FAX: 412-279-4332 | LOCATION: SOUTH CAVALCADE SUPERFUND, HOUSTON, TX

CLIENT PROJECT #: 99-785 | PROJECT MANAGER: JIM ZUBROW | COLLECTOR: TEG | DATE OF COLLECTION: 12/03/99

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	MTBE	Methane	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 g + d	PNA 610/8100	PEST/PCBs 8080	Oxygen	Nitrogen	Carbon Dioxide	FIELD NOTES	Total No. of Containers	Laboratory Note No.
DPS-TS1	16-18	8:20	H_2O	40mL VOA	/													16-18'	2	
DPS-TS1	18-20	8:40	"	"	/														2	
DPS-TS1	20-21	9:00	"	"	/														2	
DPS-TS3	16-18	9:30	"	"	/														1	
DPS-TN1	14-16	9:50	"	"	/														2	
DPS-TS3	18-20	10:05	"	"	/														2	
DPS-TN1	16-18	10:20	"	"	/														2	
DPS-TS2	15-17	10:30	"	"	/														2	
DPS-TN1	18-19	10:50	"	"	/														2	
DPS-TS2	17-19	11:00	"	"	/														2	
DPS-TS2	19-20	11:15	"	"	/														2	
DPS-TN2	12-14	11:30	"	"	/														2	
DPS-TN2	14-16	12:10	"	"	/														2	
DPS-TN2	16-18	13:00	"	"	/														2	
DPS-TN3	12-14	13:50	"	"	/														2	

RELINQUISHED BY (Signature) | DATE/TIME | RECEIVED BY (SIGNATURE) | DATE/TIME 12/03/99

RELINQUISHED BY (Signature) | DATE/TIME | RECEIVED BY (SIGNATURE) | DATE/TIME

SAMPLE RECEIPT

Total No. of Containers

Seals Intact? Y/N/NA

Received Good Cond./Cold

Notes:

Laboratory Notes:

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL/$2.00@ ☐ RETURN ☐ PICKUP

MMP 11/95

001303

Transglobal Environmental Geochemistry
CHAIN-OF-CUSTODY RECORD

P.O.#

CLIENT: KEY ENVIRONMENTAL

DATE: 12/02/99 PAGE 1 OF 1

ADDRESS: 1200 ARCH ST #200, CARNEGIE PA 15106

TEG PROJECT #: T3-991201

PHONE: 412-279-3363 FAX: 412-279-4332

LOCATION: SOUTH CAVALCADE SUPERFUND, HOUSTON, TX

CLIENT PROJECT #: 99-785 PROJECT MANAGER: JIM ZUBROW

COLLECTOR: TEG DATE OF COLLECTION: 12/02/99

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	MTBE	Methane	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 #4	PNA 610/8100	PEST/PCBs 8080	Oxygen	Nitrogen	Carbon Dioxide							FIELD NOTES	Total No. of Containers	Laboratory Note No.
DPN-L2	12-14	8:00	H2O	40ml VOA	/																				2	
DPN-L2	14-16	8:30	"	"	/																				2	
DPN-L2	16-18	9:00	"	"	/																				2	
DPN-L2	18-19	9:30	"	"	/																				2	
DPS-T0	12-14	12:00	"	"	/																				2	
DPS-T0	14-16	12:30	"	"	/																				2	
DPS-T0	16-18	12:45	"	"	/																				2	

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME
		[signature]	12/02/99
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME

SAMPLE RECEIPT

Total No. of Containers	
Seals Intact? Y/N/NA	
Received Good Cond./Cold	
Notes:	

Laboratory Notes:

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL/$2.00@ ☐ RETURN ☐ PICKUP

MMP 11/95

Transglobal Environmental Geochemistry
CHAIN-OF-CUSTODY RECORD

P.O.#

CLIENT: KEY ENVIRONMENTAL
DATE: 12/01/99
PAGE 2 OF 3

ADDRESS: 1200 ARCH ST #200, CARNEGIE, PA 15106
TEG PROJECT #: T3991201

PHONE: 412-279-3363
FAX: 412-279-4332
LOCATION: SOUTH CAVALCADE SUPERFUND SITE, HOUSTON, TX

CLIENT PROJECT #: 99-785
PROJECT MANAGER: JIM ZUBROW
COLLECTOR: TEG
DATE OF COLLECTION: 12/01/99

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES VOA 601/8010	VOA 602/8020	MTBE	Methane	TPH 418.1	TPH 8015	TPH 8015	TPH 8015	PNA 610/8100	PEST/PCBs 8080	Oxygen	Nitrogen	Carbon Dioxide							FIELD NOTES	Total No. of Containers	Laboratory Note No.
DPN-TO	16-18	10:30	H_2O	40ml VOA		1																			2	
DPN-TN1	17-19	10:45	"	"		1																			2	
DPN-TO	18-20	10:55	"	"		1																			2	
DPN-TS1	9-11	13:50	"	"		1																			2	
DPN-TS1	11-13	14:00	"	"		1																			2	
DPN-TS2	9-11	14:00	"	"		1																			2	
DPN-TS2	11-13	14:35	"	"		1																			2	
DPN-TS1	13-15	14:15	"	"		1																			2	
DPN-TS1	15-17	14:30	"	"		1																			2	
DPN-TS2	13-15	14:55	"	"		1																			2	
DPN-TS2	15-17	15:05	"	"		1																			2	
DPN-TS2	17-18	15:25	"	"		1																			2	
DPN-L1	11-13	16:10	"	"		1																			1	
DPN-L1	13-15	16:30	"	"		1																			2	
DPN-L1	15-17	16:50	"	"		1																			2	
DPN-TS3	10-12	17:05	"	"		1																			2	
DPN-TS3	12-14	17:15	"	"		1																			3	

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME
[signature]		[signature]	12/01/99
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME

SAMPLE RECEIPT

Total No. of Containers	
Seals Intact? Y/N/NA	
Received Good Cond./Cold	
Notes:	

Laboratory Notes:

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL/$2.00@ ☐ RETURN ☐ PICKUP

MMP 11/95

Transglobal Environmental Geochemistry
CHAIN-OF-CUSTODY RECORD

teg

P.O.#

CLIENT: KEY ENVIRONMENTAL

DATE: 12/01/99 PAGE 1 OF 3

ADDRESS: 1200 ARCH ST #200, CARNEGIE, PA 15106

TEG PROJECT #: T3-991201

PHONE: (412) 279-3363 FAX: (412) 279-4332

LOCATION: SOUTH CAVALCADE SUPERFUND SITE ~~2000 COLLINGSWORTH, HOUSTON, TX 77026~~

CLIENT PROJECT #: 99-785 PROJECT MANAGER: JIM ZUBROW

COLLECTOR: TEG

DATE OF COLLECTION: ~~12~~ 11-30-99 - 12-01-99

Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020/8	MTBE	Methane	TPH 418.1	TPH 8015 (Gasoline)	TPH 8015 (diesel)	TPH 8015 (g + d)	PNA 610/8100	PEST/PCBs 8080	Oxygen	Nitrogen	Carbon Dioxide	FIELD NOTES	Total No. of Containers	Laboratory Note No.
DPN-TN3	12-14	15:20	H_2O	40ml VOA	/													COLLECTED 11-30-99	2	
DPN-TN2	10.5-12.5		"	"	/													"	2	
DPN-TN2	12.5-14.5		"	"	/													"	2	
DPN-TN2	14.5-16.5		"	"	/													"	2	
DPN-TN3	10-12	15:05	"	"	/													"	2	
DPN-TN2	16.5-18.5		"	"	/													"	2	
DPN-TN2	18.5-20.5		"	"	/													"	2	
DPN-TN3	18-20		"	"	/													"	2	
DPN-TN3	16-18		"	"	/													"	2	
DPN-TN3	14-16		"	"	/													"	2	
DPN-TO	10-12	9:00	"	"	/													COLLECTED 12-1-99	2	
DPN-TN1	9-11	9:40	"	"	/													"	2	
DPN-TO	12-14	10:10	"	"	/													"	2	
DPN-TN1	11-13	10:15	"	"	/													"	2	
DPN-TN1	13-15	10:20	"	"	/													"	2	
DPN-TO	14-16	10:25	"	"	/													"	2	
DPN-TN1	15-17	10:30	"	"	/													"	2	

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME
[redacted]		[redacted]	12/01/99 [redacted]
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME
[redacted]		[redacted]	

SAMPLE RECEIPT

Total No. of Containers	
Seals Intact? Y/N/NA	
Received Good Cond./Cold	
Notes:	

Laboratory Notes:

SAMPLE DISPOSAL INSTRUCTIONS

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001306

Transglobal Environmental Geochemistry
CHAIN-OF-CUSTODY RECORD

P.O.# _____

CLIENT: KEY ENVIRONMENTAL
DATE: 12/01/99
PAGE 3 OF 3

ADDRESS: 1200 ARCH ST #200, CARNEGIE, PA 15106
TEG PROJECT #: T3-991201

PHONE: 412-279-3363
FAX: 412-279-4332
LOCATION: SOUTH CAVALCADE SUPERFUND, HOUSTON, TX

CLIENT PROJECT #: 99-785
PROJECT MANAGER: Jim ZUBROW
COLLECTOR: TEG
DATE OF COLLECTION: 12/01/99

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES: VOA 601/8010	VOA 602/8020	MTBE	Methane	TPH 418.1	TPH 8015	TPH 8015	TPH 8015	PNA 610/8100	PEST/PCBs 8080	Oxygen	Nitrogen	Carbon Dioxide							FIELD NOTES	Total No. of Containers	Laboratory Note No.
DPN-L1	17-19	17:25	H_2O	40mL VOA		/																			2	
DPN-TS3	14-16	17:45	"	"		/																			1	
DPN-TS3	16-18	18:00	"	"		/																			1	
DPN-TS3	18-20	18:15	"	"		/																			1	

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME
[signature]	12/01/99	[signature]	12/01/99
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (SIGNATURE)	DATE/TIME

SAMPLE RECEIPT

Total No. of Containers	
Seals Intact? Y/N/NA	
Received Good Cond./Cold	
Notes:	

Laboratory Notes:

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL/$2.00@ ☐ RETURN ☐ PICKUP

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APPENDIX D
GEOTECHNICAL TESTING REPORT

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LABORATORY TEST REPORT

December 22, 1999

Project No. 99304-01

Mr. Jim Zubrow
Key Environmental, Inc.
1200 Arch Street, Suite 200
Carnegie, PA 15106

RE: Soils Testing – Beazer – S. Cavalcade 99-785

Transmitted herein are the results of the soils testing performed for the above referenced project and verified on the Project Verification Form, submitted December 10, 1999. The testing was performed in accordance with the ASTM methods listed on the enclosed data sheets. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

Disclaimer

The test results are believed to be representative of the samples submitted but are indicative only of the specimens which were evaluated. Geotechnics has no direct knowledge of the origin of the samples, implies no position with regard to the disposition of the test results, i.e. pass/fail, and makes no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization of the Client and Geotechnics. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please do not hesitate to contact our office.

Respectively submitted,

David R. Backstrom
Laboratory Director

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	10.0-12.0
Project No.	99304-01	Shelby Tube No.	DPN-TS3
Lab ID	99304-01.001	Recovery(ft)	1.6

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	1393	19			
Wt. Tare & WS(gm.)	110.00	126.57			
Wt. Tare & DS(gm.)	100.50	121.06			
Wt. Tare(gm.)	50.49	90.96			
Moisture Content(%)	19.00	18.31			

UNIT WEIGHT

Wt. Tube & WS.(gms.)	412.70
Wt. Of Tube(gms.)	20.98
Wt. Of WS.(gms.)	391.72
Length 1 (in.)	7.222
Length 2 (in.)	7.207
Length 3 (in.)	7.166
Top Diameter (in.)	1.439
Middle Diameter (in.)	1.465
Bottom Diameter (in.)	1.473
Sample Volume (cc)	197.21
Moisture Content(%)	18.31
Unit Wet Wt.(gms/cc)	1.99
Unit Wet Wt.(pcf.)	123.9
Unit Dry Wt.(gms/cc)	**1.68**
Unit Dry Wt.(pcf.)	**104.8**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
10.0						
10.5						
11.0						
11.5			2		BROWN GRAY CLAYEY SAND	GRAINSIZE SPECIFIC GRAVITY UNIT WGT. WC
12.0			1			WC

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By Date 12/21/99

DCN: CT-S37 DATE: 1-29-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[K251.xls]Sheet1

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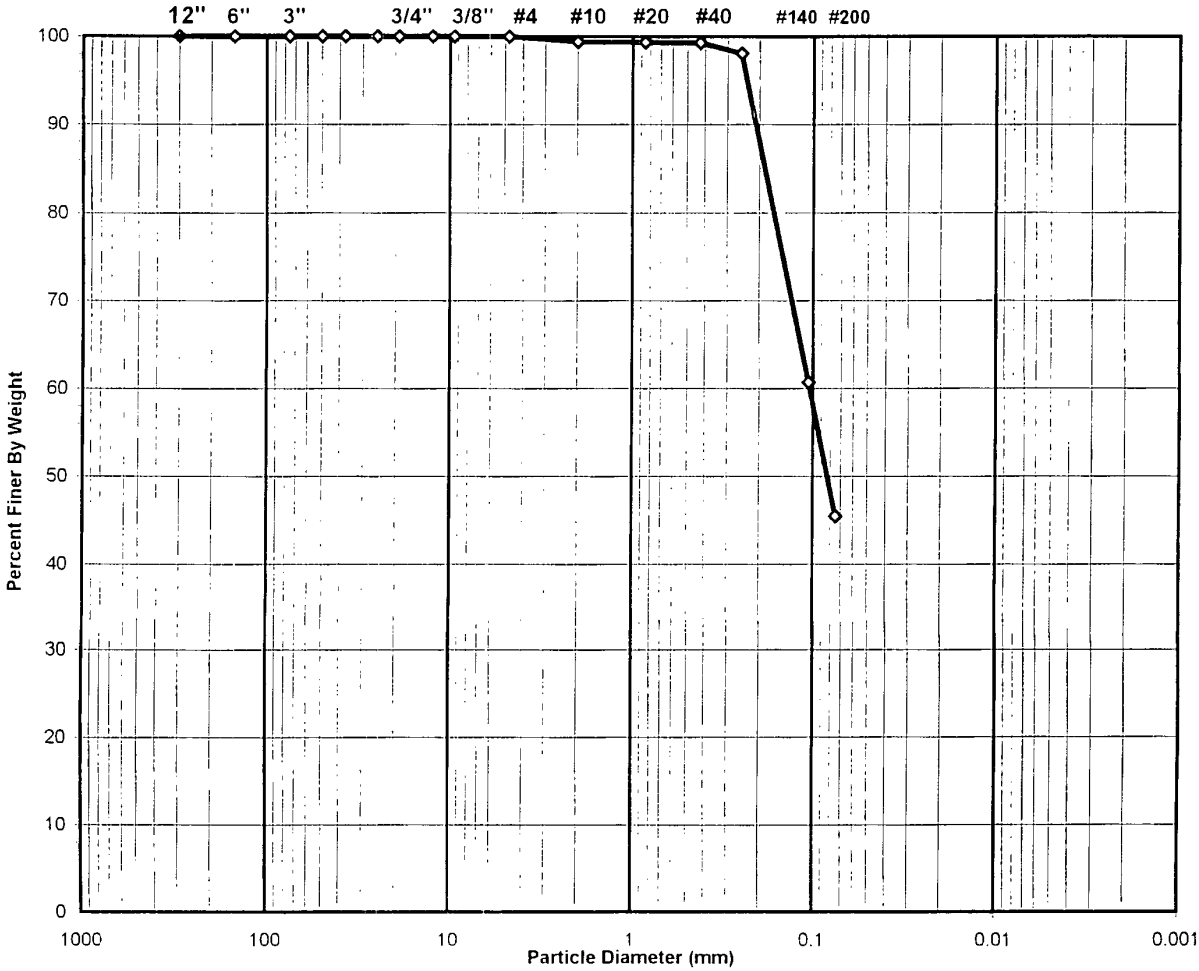
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPN-TS3
Lab ID	99304-01.001	Soil Color	**BROWN GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***sc, ASSUMED***

USCS Classification ***CLAYEY SAND***

Tested By JP Date 12/13/99 Checked By Date 12/14/99

page 1 of 2 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MY DOCUMENTS\PrintQ\E227.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPN-TS3
Lab ID	99304-01.001	Soil Color	**BROWN GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2497	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	299.68	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	268.62	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	95.52	Weight of Tare (gm)	NA
Weight of Water (gm)	31.06	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	173.10	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**17.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	173.10
Dry Weight - 3/4" Sample (gm)	94.5	Weight of minus #200 material (gm)	78.65
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	94.45
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.98	0.57	0.57	99.43	**99.43**
#20	0.850	0.20	0.12	0.68	99.32	**99.32**
#40	0.425	0.09	0.05	0.73	99.27	**99.27**
#60	0.250	2.02	1.17	1.90	98.10	**98.10**
#140	0.106	64.86	37.47	39.37	60.63	**60.63**
#200	0.075	26.30	15.19	54.56	45.44	**45.44**
Pan	-	78.65	45.44	100.00	-	-

Tested By JP Date 12/13/99 Checked By Date 12/16/99

DCN: CT-S3C DATE 5-25-98 REVISION: 2

MY DOCUMENTS\PrintQUE227.xls]Sheet1

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPN-TS3
Lab ID	99304-01.001	Visual Description	**BROWN GRAY FINE SANDY CLAY** (MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	718.5	706.1
Temperature, T (°Celsius)	26.5	26.3
Weight of Pycnometer + Water (gm)	680.25	667.97
Tare Number	1343	516
Weight of Tare + Dry Soil (gm)	162.88	160.26
Weight of Tare (gm)	100.92	98.4
Weight of Dry Soil (gm)	61.96	61.86
Specific Gravity of Soil @ T	2.614	2.607
Specific Gravity of Water @ T	0.9967	0.9967
Conversion Factor for Temperature T	0.9984	0.9985
Specific Gravity @ 20° Celsius	2.618	2.610

Average Specific Gravity @ 20° Celsius	2.61

Tested By TO *Date* 12/14/99 *Checked By* [illegible] *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 C:\MY DOCUMENTS\PrintQ\E214.xls]Sheet1

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

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Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	18.0-20.0
Project No.	99304-01	Shelby Tube No.	DPN-TS3
Lab ID	99304-01.002	Recovery(ft)	1.6

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	448				
Wt. Tare & WS(gm.)	133.11				
Wt. Tare & DS(gm.)	128.99				
Wt. Tare(gm.)	100.14				
Moisture Content(%)	14.28				

UNIT WEIGHT

Wt. Tube & WS.(gms.)	285.89
Wt. Of Tube(gms.)	15.87
Wt. Of WS.(gms.)	270.02
Length 1 (in.)	4.748
Length 2 (in.)	4.712
Length 3 (in.)	4.763
Top Diameter (in.)	1.447
Middle Diameter (in.)	1.452
Bottom Diameter (in.)	1.427
Sample Volume (cc)	126.88
Moisture Content(%)	14.28
Unit Wet Wt.(gms/cc)	2.13
Unit Wet Wt.(pcf.)	132.8
Unit Dry Wt.(gms/cc)	**1.86**
Unit Dry Wt.(pcf.)	**116.2**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
18.0						
18.5						
19.0						
19.5			2		GRAY SILTY SAND	SPECIFIC GRAVITY
20.0			1			UNIT WGT. WC. GRAINSIZE

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By *JK* Date *12/31/99*

DCN: CT-S37 DATE: 1-29-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[K253.xls]Sheet1*

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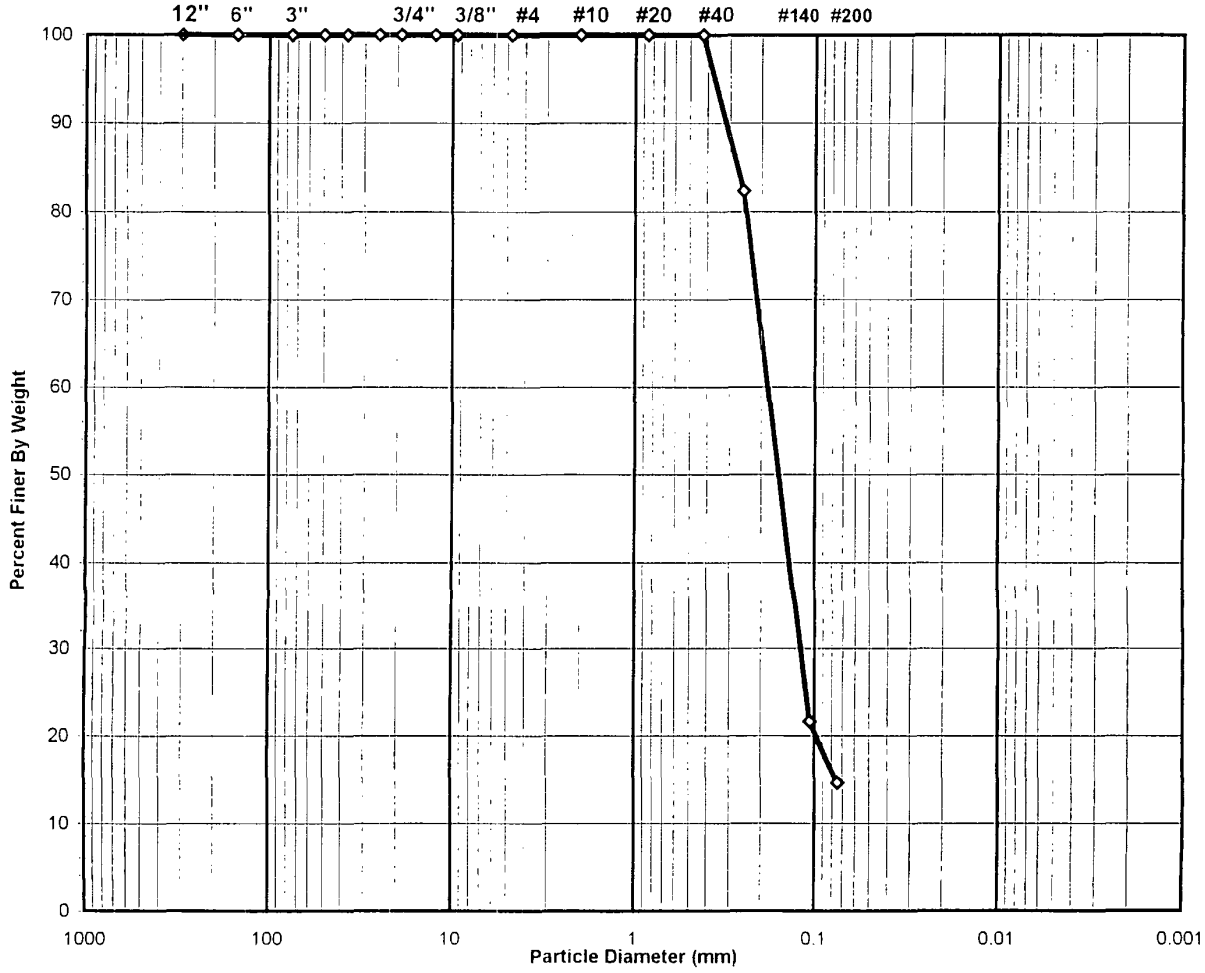
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	18-20
Project No.	99304-01	Sample No.	DPN-TS3
Lab ID	99304-01.002	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***sm, ASSUMED***

USCS Classification ***SILTY SAND***

Tested By JP Date 12/13/99 Checked By Date 12/16/99

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MY DOCUMENTS\PrintQ\[E228.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	18-20
Project No.	99304-01	Sample No.	DPN-TS3
Lab ID	99304-01.002	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1666	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	334.33	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	303.70	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.02	Weight of Tare (gm)	NA
Weight of Water (gm)	30.63	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	204.68	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**15.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	204.68
Dry Weight - 3/4" Sample (gm)	174.9	Weight of minus #200 material (gm)	29.83
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	174.85
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.00	0.00	0.00	100.00	**100.00**
#40	0.425	0.04	0.02	0.02	99.98	**99.98**
#60	0.250	36.13	17.65	17.67	82.33	**82.33**
#140	0.106	124.22	60.69	78.36	21.64	**21.64**
#200	0.075	14.46	7.06	85.43	14.57	**14.57**
Pan	-	29.83	14.57	100.00	-	-

Tested By JP Date 12/13/99 Checked By Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	18-20
Project No.	99304-01	Sample No.	DPN-TS3
Lab ID	99304-01.002	Visual Description	**GRAY FINE SAND**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	740.2	730.2
Temperature, T (°Celsius)	24.8	24.7
Weight of Pycnometer + Water (gm)	680.47	668.18
Tare Number	2476	509
Weight of Tare + Dry Soil (gm)	191.47	205.26
Weight of Tare (gm)	94.57	104.93
Weight of Dry Soil (gm)	96.90	100.33
Specific Gravity of Soil @ T	2.607	2.619
Specific Gravity of Water @ T	0.9971	0.9972
Conversion Factor for Temperature T	0.9989	0.9989
Specific Gravity @ 20° Celsius	2.610	2.622

Average Specific Gravity @ 20° Celsius	2.62

Tested By TO *Date* 12/14/99 *Checked By* *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 C:\MY DOCUMENTS\PrintQ\[E215.xls]Sheet1

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	10.0-12.0
Project No.	99304-01	Shelby Tube No.	DPN-TN3
Lab ID	99304-01.003	Recovery(ft)	1.6

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	139				
Wt. Tare & WS(gm.)	161.52				
Wt. Tare & DS(gm.)	152.54				
Wt. Tare(gm.)	94.83				
Moisture Content(%)	15.56				

UNIT WEIGHT

Wt. Tube & WS.(gms.)	342.29
Wt. Of Tube(gms.)	17.03
Wt. Of WS.(gms.)	325.26
Length 1 (in.)	6.024
Length 2 (in.)	6.010
Length 3 (in.)	5.951
Top Diameter (in.)	1.414
Middle Diameter (in.)	1.435
Bottom Diameter (in.)	1.435
Sample Volume (cc)	157.34
Moisture Content(%)	15.56
Unit Wet Wt.(gms/cc)	2.07
Unit Wet Wt.(pcf.)	129.0
Unit Dry Wt.(gms/cc)	**1.79**
Unit Dry Wt.(pcf.)	**111.6**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
10.0						
10.5						
11.0					VOID	
11.5			2		BROWN GRAY CLAYEY SAND	GRAINSIZE SPECIFIC GRAVITY UNIT WGT
12.0			1			WC

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By *JK* Date *12/21/99*

DCN: CT-S37 DATE: 1-29-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\K252.xls]Sheet1

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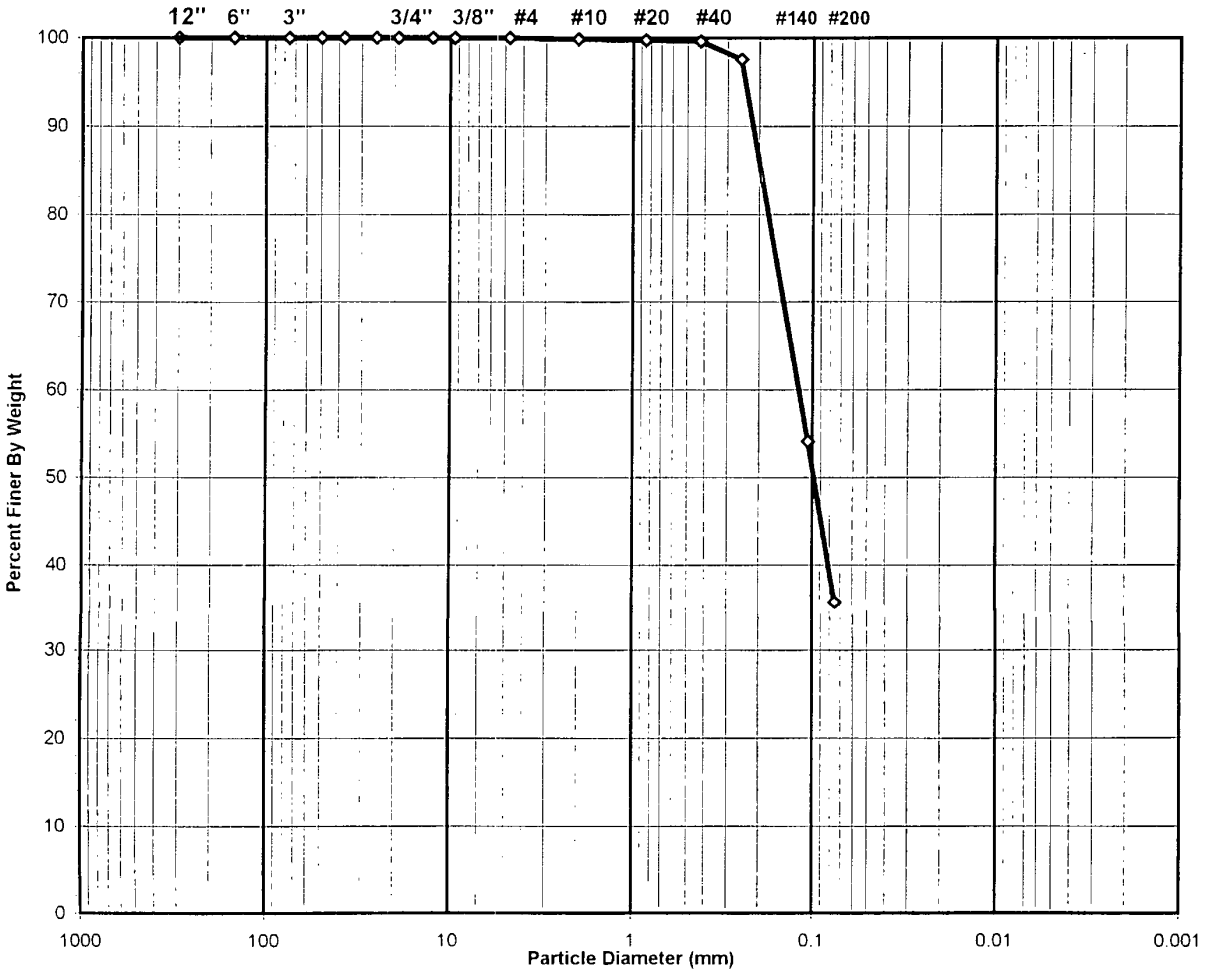
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.003	Soil Color	**GRAY BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***sc, ASSUMED***

USCS Classification ***CLAYEY SAND***

Tested By JP Date 12/13/99 Checked By Date 12/16/99

page 1 of 2 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MY DOCUMENTS\PrintQ\[E229.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.003	Soil Color	**GRAY BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	528	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	283.10	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	253.60	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	98.09	Weight of Tare (gm)	NA
Weight of Water (gm)	29.50	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	155.51	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**19.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	155.51
Dry Weight - 3/4" Sample (gm)	100.1	Weight of minus #200 material (gm)	55.44
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	100.07
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.23	0.15	0.15	99.85	**99.85**
#20	0.850	0.21	0.14	0.28	99.72	**99.72**
#40	0.425	0.16	0.10	0.39	99.61	**99.61**
#60	0.250	3.26	2.10	2.48	97.52	**97.52**
#140	0.106	67.54	43.43	45.91	54.09	**54.09**
#200	0.075	28.67	18.44	64.35	35.65	**35.65**
Pan	-	55.44	35.65	100.00	-	-

Tested By JP Date 12/13/99 Checked By [illegible] Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.003	Visual Description	**GRAY BROWN CLAYEY FINE SAND**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	715.1	702.3
Temperature, T (°Celsius)	25.5	25.5
Weight of Pycnometer + Water (gm)	680.38	668.08
Tare Number	1339	1923
Weight of Tare + Dry Soil (gm)	159.05	158.41
Weight of Tare (gm)	102.59	102.83
Weight of Dry Soil (gm)	56.46	55.58
Specific Gravity of Soil @ T	2.597	2.602
Specific Gravity of Water @ T	0.9969	0.9969
Conversion Factor for Temperature T	0.9987	0.9987
Specific Gravity @ 20° Celsius	2.601	2.606

Average Specific Gravity @ 20° Celsius	2.60

Tested By TO *Date* 12/14/99 *Checked By* *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 C:\MY DOCUMENTS\PrintQ\E216.xls\Sheet1

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	16.0-18.0
Project No.	99304-01	Shelby Tube No.	DPN-TN3
Lab ID	99304-01.004	Recovery(ft)	1

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	118				
Wt. Tare & WS(gm.)	148.12				
Wt. Tare & DS(gm.)	142.41				
Wt. Tare(gm.)	104.44				
Moisture Content(%)	15.04				

UNIT WEIGHT

Wt. Tube & WS.(gms.)	308.29
Wt. Of Tube(gms.)	14.45
Wt. Of WS.(gms.)	293.84
Length 1 (in.)	5.202
Length 2 (in.)	5.285
Length 3 (in.)	5.207
Top Diameter (in.)	1.414
Middle Diameter (in.)	1.406
Bottom Diameter (in.)	1.432
Sample Volume (cc)	135.25
Moisture Content(%)	15.04
Unit Wet Wt.(gms/cc)	2.17
Unit Wet Wt.(pcf.)	135.6
Unit Dry Wt.(gms/cc)	**1.89**
Unit Dry Wt.(pcf.)	**117.8**

SOIL PROFILE AND SAMPLING

DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
16.0					
16.5					
17.0				THIS PORTION OF TUBE COLLAPSED AND BENT	NO TEST
17.5		2		GRAY POORLEY GRADED SAND WITH SILT	UNIT WGT. WC. GRAINSIZE SPECIFIC GRAVITY
18.0		1			

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By *[illegible]* Date *12/21/99*

DCN: CT-S37 DATE:1-29-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[K254.xls]Sheet1*

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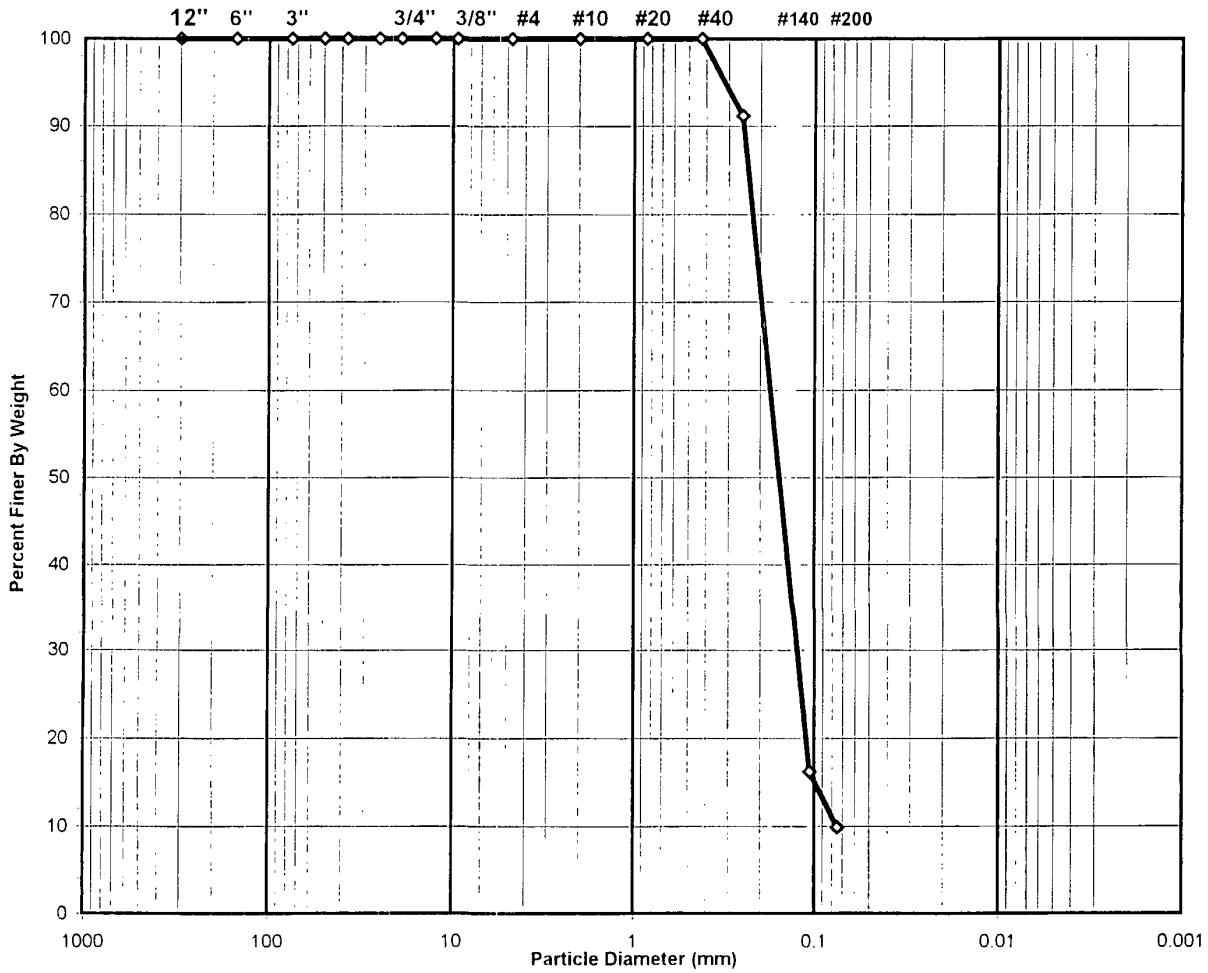
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	16-18
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.004	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol	***sp-sm, ASSUMED***	**D60 =**	**0.2**	**CC =**	**1.2**
USCS Classification	***POORLY GRADED SAND WITH SILT***	**D30 =**	**0.1**	**CU =**	**2.3**
		D10 =	**0.1**		

Tested By JP Date 12/13/99 Checked By JP Date 12/16/99

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MY DOCUMENTS\PrintQ\[E230.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	16-18
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.004	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2459	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	264.64	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	243.04	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	94.74	Weight of Tare (gm)	NA
Weight of Water (gm)	21.60	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	148.30	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**14.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	148.30
Dry Weight - 3/4" Sample (gm)	133.7	Weight of minus #200 material (gm)	14.61
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	133.69
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.00	0.00	0.00	100.00	**100.00**
#40	0.425	0.00	0.00	0.00	100.00	**100.00**
#60	0.250	13.11	8.84	8.84	91.16	**91.16**
#140	0.106	111.09	74.91	83.75	16.25	**16.25**
#200	0.075	9.49	6.40	90.15	9.85	**9.85**
Pan	-	14.61	9.85	100.00	-	-

Tested By JP Date 12/13/99 Checked By Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	16-18
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.004	Visual Description	**GRAY FINE SAND**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	711.7	701.4
Temperature, T (°Celsius)	24.7	25
Weight of Pycnometer + Water (gm)	680.48	668.14
Tare Number	1679	2447
Weight of Tare + Dry Soil (gm)	148.69	153.89
Weight of Tare (gm)	97.95	99.8
Weight of Dry Soil (gm)	50.74	54.09
Specific Gravity of Soil @ T	2.599	2.596
Specific Gravity of Water @ T	0.9972	0.9971
Conversion Factor for Temperature T	0.9989	0.9988
Specific Gravity @ 20° Celsius	2.602	2.599

Average Specific Gravity @ 20° Celsius	2.60

Tested By TO *Date* 12/14/99 *Checked By* *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 *C:\MY DOCUMENTS\PrintQ\E217.xls]Sheet1*

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	12.0-14.0
Project No.	99304-01	Shelby Tube No.	DPS-TN3
Lab ID	99304-01.005	Recovery(ft)	1.6

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	24				
Wt. Tare & WS(gm.)	116.62				
Wt. Tare & DS(gm.)	112.62				
Wt. Tare(gm.)	91.25				
Moisture Content(%)	18.72				

UNIT WEIGHT

Wt. Tube & WS.(gms.)	424.70
Wt. Of Tube(gms.)	21.50
Wt. Of WS.(gms.)	403.20
Length 1 (in.)	7.230
Length 2 (in.)	7.227
Length 3 (in.)	7.197
Top Diameter (in.)	1.446
Middle Diameter (in.)	1.446
Bottom Diameter (in.)	1.441
Sample Volume (cc)	193.80
Moisture Content(%)	18.72
Unit Wet Wt.(gms/cc)	2.08
Unit Wet Wt.(pcf.)	129.8
Unit Dry Wt.(gms/cc)	**1.75**
Unit Dry Wt.(pcf.)	**109.4**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
12.0						
12.5						
13.0					TUBE SPLIT OPEN APPROX. 1/4 INCH	
13.5			1		BROWN SANDY CLAY	UNIT WGT. WC. GRAINSIZE SPECIFIC GRAVITY
14.0						

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By Date *12/21/99*

DCN: CT-S37 DATE:1-29-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\K257.xls]Sheet1*

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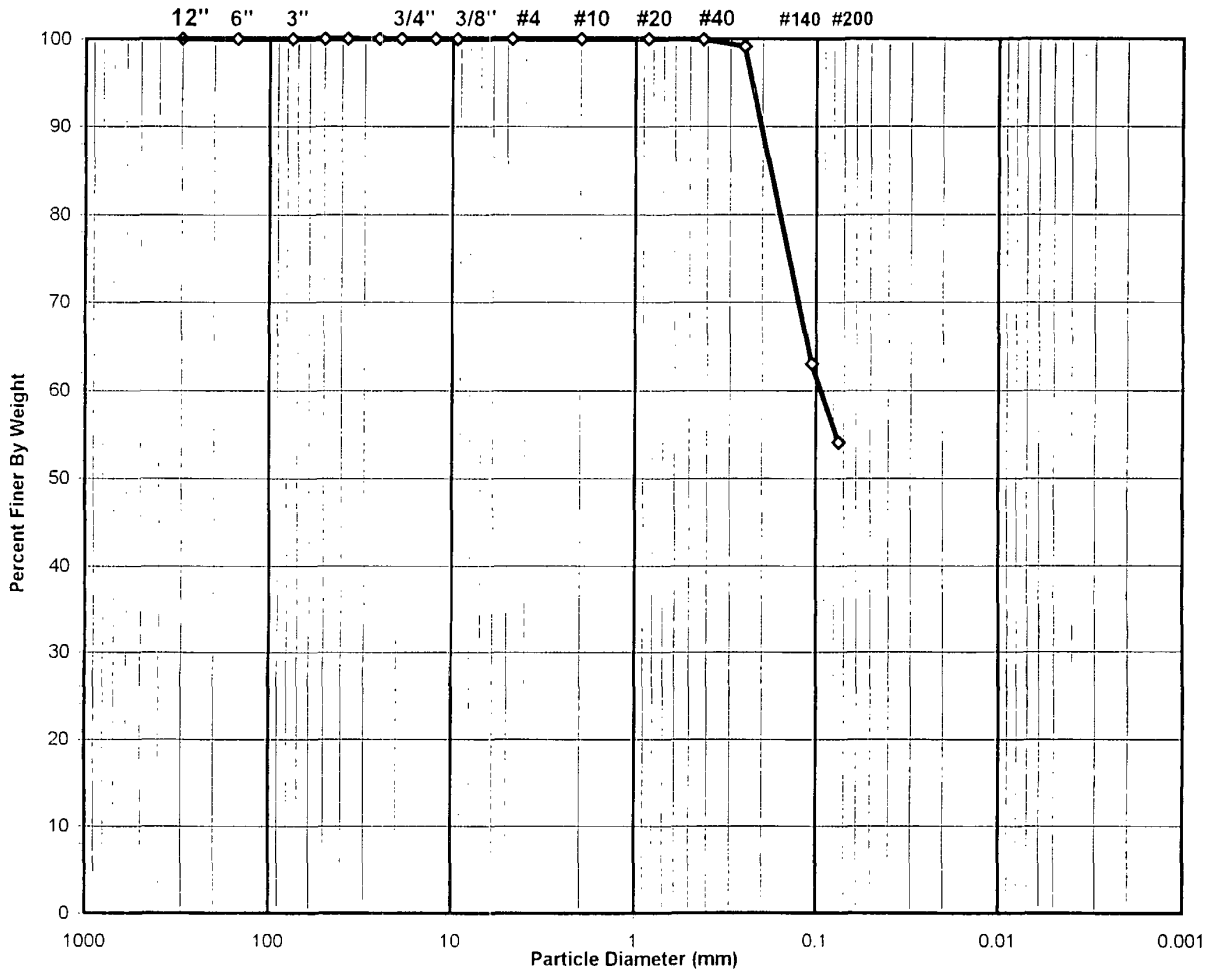
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	12-14
Project No.	99304-01	Sample No.	DPS-TN3
Lab ID	99304-01.005	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***cl, ASSUMED***

USCS Classification ***SANDY LEAN CLAY***

Tested By JP Date 12/13/99 Checked By Date 12/16/99

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	12-14
Project No.	99304-01	Sample No.	DPS-TN3
Lab ID	99304-01.005	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	500	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	318.15	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	286.70	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.46	Weight of Tare (gm)	NA
Weight of Water (gm)	31.45	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	185.24	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**17.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	185.24
Dry Weight - 3/4" Sample (gm)	85.1	Weight of minus #200 material (gm)	100.14
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	85.10
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.04	0.02	0.02	99.98	**99.98**
#40	0.425	0.14	0.08	0.10	99.90	**99.90**
#60	0.250	1.44	0.78	0.87	99.13	**99.13**
#140	0.106	66.97	36.15	37.03	62.97	**62.97**
#200	0.075	16.51	8.91	45.94	54.06	**54.06**
Pan	-	100.14	54.06	100.00	-	-

Tested By JP Date 12/13/99 Checked By JP Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	12-14
Project No.	99304-01	Sample No.	DPN-TN3
Lab ID	99304-01.005	Visual Description	**BROWN CLAYEY FINE SAND**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	722.3	710.1
Temperature, T (°Celsius)	23.1	23.1
Weight of Pycnometer + Water (gm)	680.68	668.38
Tare Number	2454	2452
Weight of Tare + Dry Soil (gm)	167.59	166.12
Weight of Tare (gm)	100.34	98.77
Weight of Dry Soil (gm)	67.25	67.35
Specific Gravity of Soil @ T	2.624	2.628
Specific Gravity of Water @ T	0.9975	0.9975
Conversion Factor for Temperature T	0.9993	0.9993
Specific Gravity @ 20° Celsius	2.626	2.630

Average Specific Gravity @ 20° Celsius	2.63

Tested By TO *Date* 12/15/99 *Checked By* *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 C:\MY DOCUMENTS\PrintQ\E218.xls\Sheet1

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	16-18
Project No.	99304-01	Shelby Tube No.	DPS-TN3
Lab ID	99304-01.006	Recovery(ft)	1.6

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	11170				
Wt. Tare & WS(gm.)	149.45				
Wt. Tare & DS(gm.)	140.28				
Wt. Tare(gm.)	94.08				
Moisture Content(%)	19.85				

UNIT WEIGHT

Wt. Tube & WS.(gms.)	407.70
Wt. Of Tube(gms.)	22.56
Wt. Of WS.(gms.)	385.14
Length 1 (in.)	7.189
Length 2 (in.)	7.198
Length 3 (in.)	7.197
Top Diameter (in.)	1.455
Middle Diameter (in.)	1.442
Bottom Diameter (in.)	1.440
Sample Volume (cc)	193.53
Moisture Content(%)	19.85
Unit Wet Wt.(gms/cc)	1.99
Unit Wet Wt.(pcf.)	124.2
Unit Dry Wt.(gms/cc)	**1.66**
Unit Dry Wt.(pcf.)	**103.6**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
16.0						
16.5						
17.0						
17.5			2		GRAYISH BROWN CLAYEY SAND	GRAINSIZE SPECIFIC GRAVITY UNIT WGT.
18.0			1			WC

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By *Jcm* Date *12-22-99*

DCN: CT-S37 DATE: 1-29-98 REVISION: 2 *C:\MSOffice\Excel\PRINTQ\[K250.xls]Sheet1*

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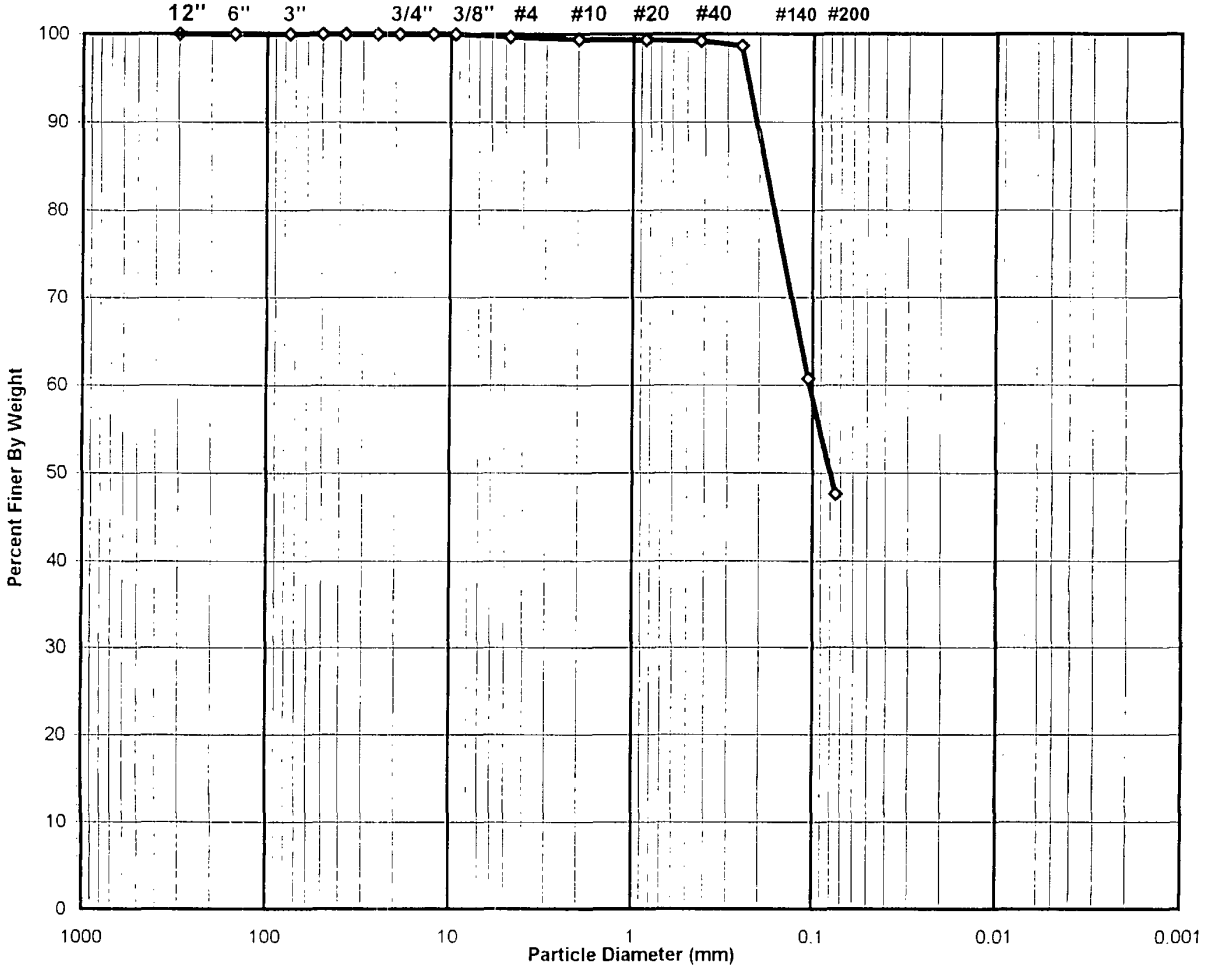
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	16-18
Project No.	99304-01	Sample No.	DPS-TN3
Lab ID	99304-01.006	Soil Color	**GRAYISH BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***sc, ASSUMED***

USCS Classification ***CLAYEY SAND***

Tested By JP Date 12/13/99 Checked By JP Date 12/16/99

page 1 of 2 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MY DOCUMENTS\PrintQ\[E232.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	16-18
Project No.	99304-01	Sample No.	DPS-TN3
Lab ID	99304-01.006	Soil Color	**GRAYISH BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1619	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	313.79	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	277.49	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	95.98	Weight of Tare (gm)	NA
Weight of Water (gm)	36.30	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	181.51	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**20.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	181.51
Dry Weight - 3/4" Sample (gm)	95.3	Weight of minus #200 material (gm)	86.24
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	95.27
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.66	0.36	0.36	99.64	**99.64**
#10	2.00	0.38	0.21	0.57	99.43	**99.43**
#20	0.850	0.19	0.10	0.68	99.32	**99.32**
#40	0.425	0.23	0.13	0.80	99.20	**99.20**
#60	0.250	1.00	0.55	1.36	98.64	**98.64**
#140	0.106	68.89	37.95	39.31	60.69	**60.69**
#200	0.075	23.92	13.18	52.49	47.51	**47.51**
Pan	-	86.24	47.51	100.00	-	-

Tested By JP Date 12/13/99 Checked By Date 12/14/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	16-18
Project No.	99304-01	Sample No.	DPS-TN3
Lab ID	99304-01.006	Visual Description	**GRAYISH BROWN CLAYEY, SILTY SAND** (MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	721.5	709.4
Temperature, T (°Celsius)	24	24.1
Weight of Pycnometer + Water (gm)	680.57	668.26
Tare Number	1636	863
Weight of Tare + Dry Soil (gm)	164.37	171.22
Weight of Tare (gm)	98.04	104.49
Weight of Dry Soil (gm)	66.33	66.73
Specific Gravity of Soil @ T	2.612	2.608
Specific Gravity of Water @ T	0.9973	0.9973
Conversion Factor for Temperature T	0.9991	0.9991
Specific Gravity @ 20° Celsius	2.614	2.611

Average Specific Gravity @ 20° Celsius	2.61

Tested By TO *Date* 12/15/99 *Checked By* [illegible] *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 C:\MY DOCUMENTS\PrintQ\E219.xls]Sheet1

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	10.0-12.0
Project No.	99304-01	Shelby Tube No.	DPS-TS3
Lab ID	99304-01.007	Recovery(ft)	1.7

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number			76		
Wt. Tare & WS(gm.)			96.07		
Wt. Tare & DS(gm.)			86.00		
Wt. Tare(gm.)			7.94		
Moisture Content(%)			12.90		

UNIT WEIGHT

Wt. Tube & WS.(gms.)	431.10
Wt. Of Tube(gms.)	20.25
Wt. Of WS.(gms.)	410.85
Length 1 (in.)	7.283
Length 2 (in.)	7.320
Length 3 (in.)	7.265
Top Diameter (in.)	1.443
Middle Diameter (in.)	1.447
Bottom Diameter (in.)	1.451
Sample Volume (cc)	196.43
Moisture Content(%)	12.90
Unit Wet Wt.(gms/cc)	2.09
Unit Wet Wt.(pcf.)	130.5
Unit Dry Wt.(gms/cc)	**1.85**
Unit Dry Wt.(pcf.)	**115.6**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
10.0			3			WC
10.5			2	ROCK	GRAY SANDY CLAY	UNIT WGT. GRAINSIZE SPECIFIC GRAVITY
11.0						
11.5			1			
12.0						

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By Date *12/21/99*

DCN: CT-S37 DATE: 1-29-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\K255.xls]Sheet1*

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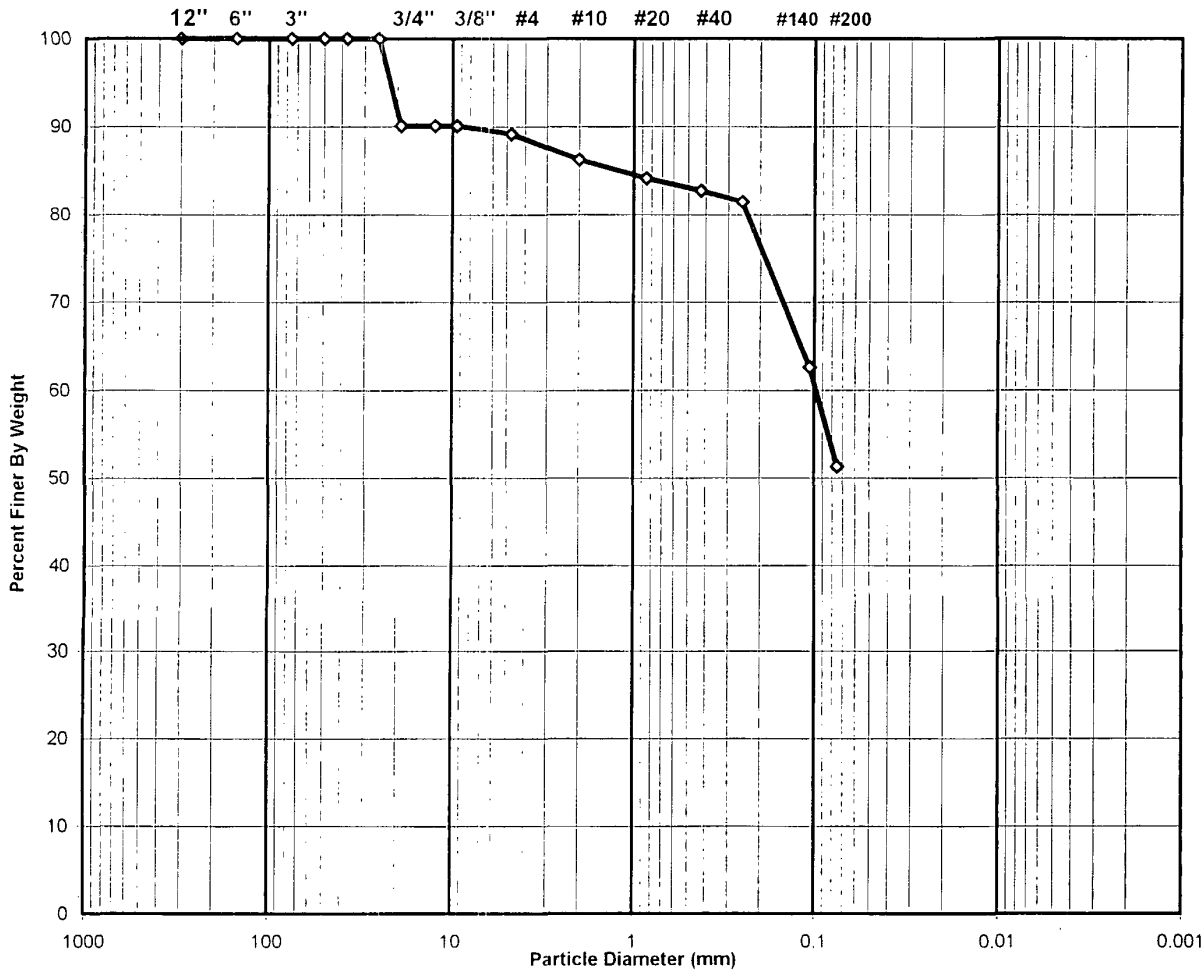
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPS-TS3
Lab ID	99304-01.007	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***cl, ASSUMED***

USCS Classification ***SANDY LEAN CLAY***

Tested By JP Date 12/13/99 Checked By Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPS-TS3
Lab ID	99304-01.007	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	517	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	333.44	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	303.71	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.39	Weight of Tare (gm)	NA
Weight of Water (gm)	29.73	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	203.32	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**14.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	203.32
Dry Weight - 3/4" Sample (gm)	78.9	Weight of minus #200 material (gm)	104.29
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	99.03
Dry Weight + 3/4" Sample (gm)	20.15		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	20.15	9.91	9.91	90.09	**90.09**
1/2"	12.50	0.00	0.00	9.91	90.09	**90.09**
3/8"	9.50	0.00	0.00	9.91	90.09	**90.09**
#4	4.75	1.84	0.90	10.82	89.18	**89.18**
#10	2.00	5.96	2.93	13.75	86.25	**86.25**
#20	0.850	4.34	2.13	15.88	84.12	**84.12**
#40	0.425	2.92	1.44	17.32	82.68	**82.68**
#60	0.250	2.51	1.23	18.55	81.45	**81.45**
#140	0.106	38.43	18.90	37.45	62.55	**62.55**
#200	0.075	22.88	11.25	48.71	51.29	**51.29**
Pan	-	104.29	51.29	100.00	-	-

Tested By JP Date 12/13/99 Checked By Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	10-12
Project No.	99304-01	Sample No.	DPS-TS3
Lab ID	99304-01.007	Visual Description	**GRAY CLAY AND FINE SAND** (MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	725.4	713.3
Temperature, T (°Celsius)	25.3	25.3
Weight of Pycnometer + Water (gm)	680.40	668.10
Tare Number	1005	1003
Weight of Tare + Dry Soil (gm)	177.63	171.43
Weight of Tare (gm)	105.08	98.49
Weight of Dry Soil (gm)	72.55	72.94
Specific Gravity of Soil @ T	2.633	2.629
Specific Gravity of Water @ T	0.9970	0.9970
Conversion Factor for Temperature T	0.9988	0.9988
Specific Gravity @ 20° Celsius	2.636	2.632

Average Specific Gravity @ 20° Celsius	2.63

Tested By TO *Date* 12/15/99 *Checked By* *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5

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SHELBY TUBE UNIT WEIGHT

(SOP - S37)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER S. CAVALCADE 99-785	Depth Pushed(ft)	18.0-20.0
Project No.	99304-01	Shelby Tube No.	DPS-TS3
Lab ID	99304-01.008	Recovery(ft)	1.6

MOISTURE CONTENT

Section Number	1	2	3	4	5
Tare Number	456				
Wt. Tare & WS(gm.)	124.75				
Wt. Tare & DS(gm.)	121.07				
Wt. Tare(gm.)	99.49				
Moisture Content(%)	17.05				

UNIT WEIGHT

Wt. Tube & WS.(gms.)	414.50
Wt. Of Tube(gms.)	23.96
Wt. Of WS.(gms.)	390.54
Length 1 (in.)	7.247
Length 2 (in.)	7.245
Length 3 (in.)	7.241
Top Diameter (in.)	1.432
Middle Diameter (in.)	1.437
Bottom Diameter (in.)	1.429
Sample Volume (cc)	191.37
Moisture Content(%)	17.05
Unit Wet Wt.(gms/cc)	2.04
Unit Wet Wt.(pcf.)	127.3
Unit Dry Wt.(gms/cc)	**1.74**
Unit Dry Wt.(pcf.)	**108.8**

SOIL PROFILE AND SAMPLING

	DEPTH ( )	ELEV ( )	SECTION No.	SOIL PROFILE	SOIL DESCRIPTION AND REMARKS	TEST PERFORMED
18.0						
18.5						
19.0					TUBE IS HALF FILLED WITH WATER & SOIL	
19.5			1		GRAY CLAYEY SAND	UNIT WGT. WC. GRAINSIZE SPECIFIC GRAVITY
20.0						

Note: When full recovery is not achieved, the elevation can not be accurately defined.
Indicate each cut of the tube with an arrow.
Indicate dividing line between soil types with a solid line.
Indicate wax by cross-hatching. Indicate soil types by standard symbols.

Tested By *JP* Date *12/13/99* Checked By Jem Date 12-22-99

DCN: CT-S37 DATE: 1-29-98 REVISION: 2 C:\MSOffice\Excel\PRINTQ\[K256.xls]Sheet1

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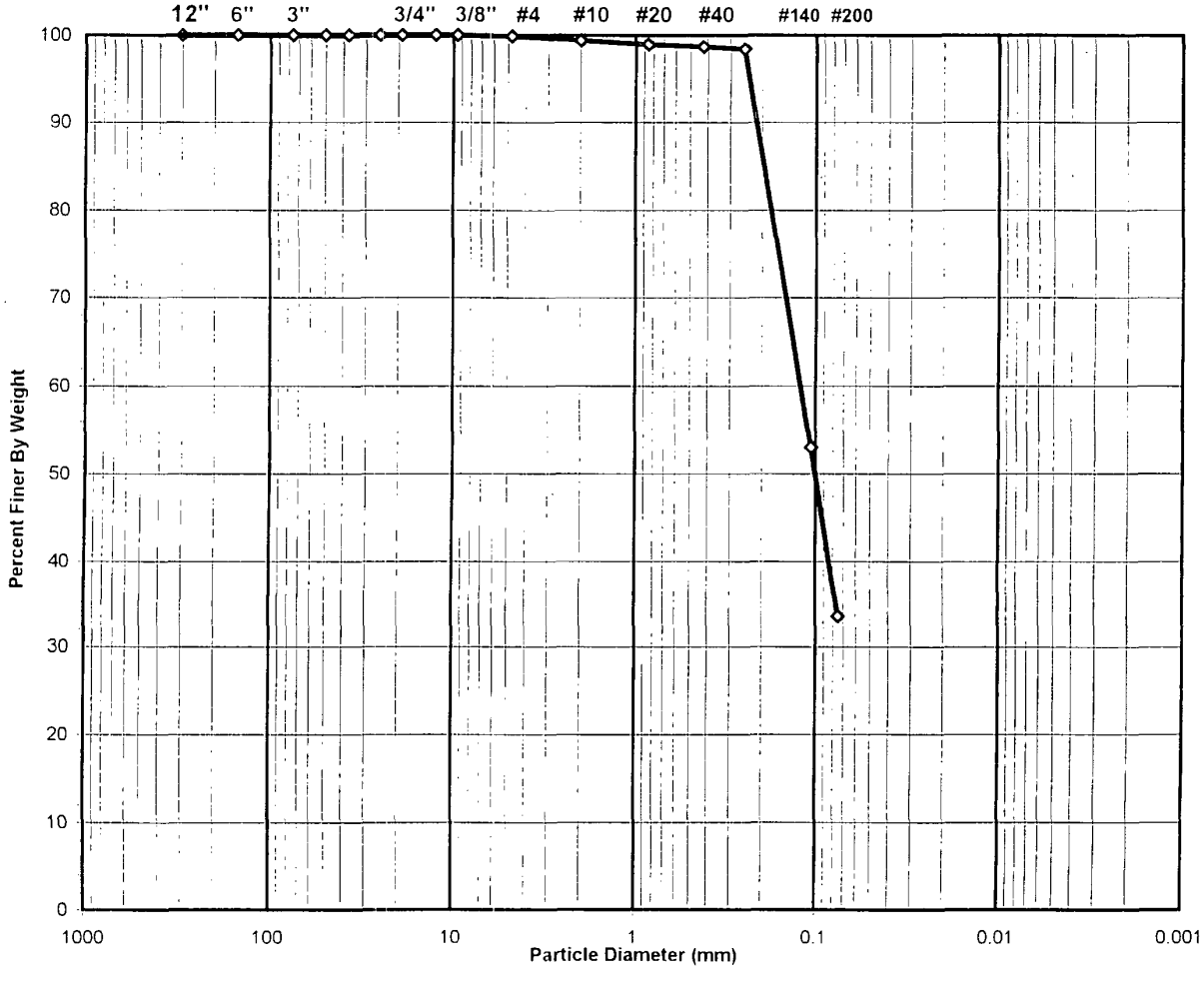
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	18-20
Project No.	99304-01	Sample No.	DPS-TS3
Lab ID	99304-01.008	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***sc, ASSUMED***

USCS Classification ***CLAYEY SAND***

Tested By JP Date 12/13/99 Checked By JP Date 12/16/99

page 1 of 2 DCN: CT-S3C DATE 6-25-98 REVISION: 2 C:\MY DOCUMENTS\PrintQ\[E234.xls]Sheet1

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S.CAVALCADE 99-785	Depth (ft)	18-20
Project No.	99304-01	Sample No.	DPS-TS3
Lab ID	99304-01.008	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1680	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	334.17	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	299.48	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	104.39	Weight of Tare (gm)	NA
Weight of Water (gm)	34.69	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	195.09	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**17.8**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	195.09
Dry Weight - 3/4" Sample (gm)	129.9	Weight of minus #200 material (gm)	65.22
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	129.87
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.25	0.13	0.13	99.87	**99.87**
#10	2.00	0.98	0.50	0.63	99.37	**99.37**
#20	0.850	0.82	0.42	1.05	98.95	**98.95**
#40	0.425	0.48	0.25	1.30	98.70	**98.70**
#60	0.250	0.55	0.28	1.58	98.42	**98.42**
#140	0.106	88.60	45.41	46.99	53.01	**53.01**
#200	0.075	38.19	19.58	66.57	33.43	**33.43**
Pan	-	65.22	33.43	100.00	-	-

Tested By JP Date 12/13/99 Checked By Date 12/16/99

DCN: CT-S3C DATE 6-25-98 REVISION: 2

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SPECIFIC GRAVITY

ASTM D 854-92 (SOP - S5)

Client	KEY ENVIRONMENTAL	Boring No.	NA
Client Reference	BEAZER-S. CAVALCADE 99-785	Depth (ft)	18-20
Project No.	99304-01	Sample No.	DPS-TS3
Lab ID	99304-01.008	Visual Description	**GRAY CLAY AND FINE SAND** (MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	G 865	G 866
Weight of Pycnometer + Soil + Water (gm)	714.4	703.5
Temperature, T (°Celsius)	25.6	25.2
Weight of Pycnometer + Water (gm)	680.37	668.12
Tare Number	1913	1338
Weight of Tare + Dry Soil (gm)	159.25	160.49
Weight of Tare (gm)	103.72	103.2
Weight of Dry Soil (gm)	55.53	57.29
Specific Gravity of Soil @ T	2.583	2.615
Specific Gravity of Water @ T	0.9969	0.9970
Conversion Factor for Temperature T	0.9987	0.9988
Specific Gravity @ 20° Celsius	2.587	2.618

Average Specific Gravity @ 20° Celsius	2.60

Tested By TO *Date* 12/15/99 *Checked By* *Date* 12/16/99

DCN: CT-S5 Date 04-27-99 Revision: 5 *C:\MY DOCUMENTS\PrintQ\E221.xls\Sheet1*

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APPENDIX E
MICROBIAL TESTING REPORT

MICROBIAL ANALYSIS SUMMARY REPORT

Client: Jim Zubrow
Key Environmental
1200 Arch St.
Carnegie, PA 15106

Phone: (412) 279-3363
Fax: (412) 279-4332

MI Identifier: 1Key

Analysis Performed: PLFA Analysis

Date Received: 12/8-9/99

Report Date: 1/14/00

Project: Beazer South Cavalcade

Project No.: 99-785

SUMMARY OF RESULTS

At these sites:

- Biomass content was lowest in the control sample (OW-07), and highest in samples MW-07 and DPS-T0.
- OW-07 contained a different microbial community (predominantly *Actinomycete*) than did the remaining samples.
- Microbes in the remaining samples were predominantly Gram negative, with relatively high proportions of anaerobic sulfate/metal reducing bacteria.
- Bacteria in DPN-L2 and DPS-L1 demonstrated a physiological response to the contaminants.

RESULTS AND DISCUSSION

BIOMASS

Phospholipid fatty acids (PLFA) are found within the membranes of all living cells but decompose quickly upon cell death. Thus, measuring PLFA content provides a quantitative measure of the viable microbial biomass present (1-2).

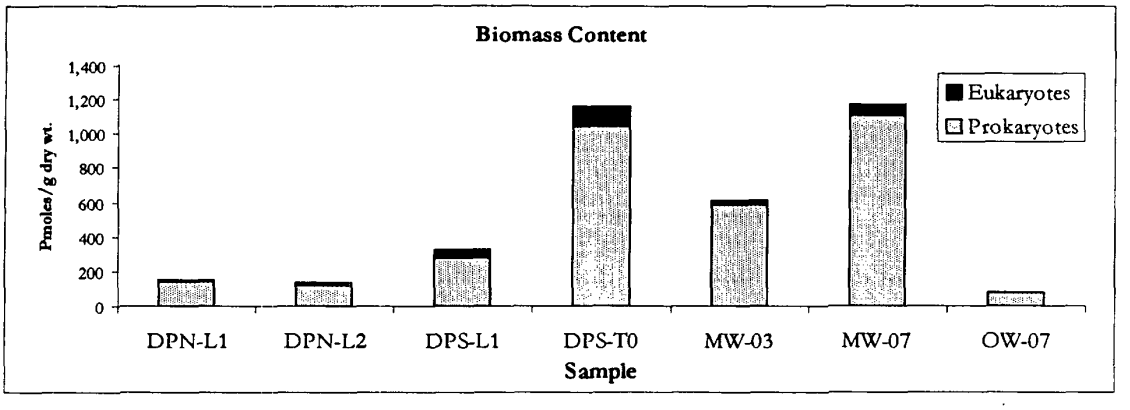

Figure 1. Biomass content.

Biomass content was lowest in sample 0W-07 and highest in samples MW-07 and DPS-T0 (Figure 1).

COMMUNITY COMPOSITION

To relate the complex mixture of PLFA to the organisms present, a structural group interpretation is employed (3-5). In some cases these associations are so strong that fatty acid biomarkers have been identified for particular organisms.

Table 1. PLFA Structure Groups.

PLFA Structural Group	General classification
Monoenoics (Monos)	Found in Gram negative bacteria, which are fast growing, utilize many carbon sources, and adapt quickly to a variety of environments.
Terminally Branched Saturated (TerBrSats)	Representative of Gram positive bacteria, but may also be found in the cell membranes of some Gram negative bacteria.
Branched Monoenoic (BrMonos)	Commonly found in the cell membranes of obligate anaerobes such as sulfate or iron reducing bacteria
Mid-Chain Branched Saturated (MidBrSats)	Common in Actinomycete, sulfate reducing bacteria and certain Gram positive bacteria.
Normal Saturated (Nsats)	Found in both the prokaryotic and eukaryotic kingdoms.
Eukaryotes	Found in organisms such as fungi, protozoa, algae, higher plants and animals.

Comparison of the PLFA profiles showed that all of these samples contained a relatively diverse microbial population (Figure 2). The similarities and differences between these populations are statistically evaluated using principal components analysis

(PCA)[1] (Figure 4). The fatty acid profile for sample 0W-07 contained high proportions of biomarkers typically found in *Actinomycetes* (particularly 10me18:0).

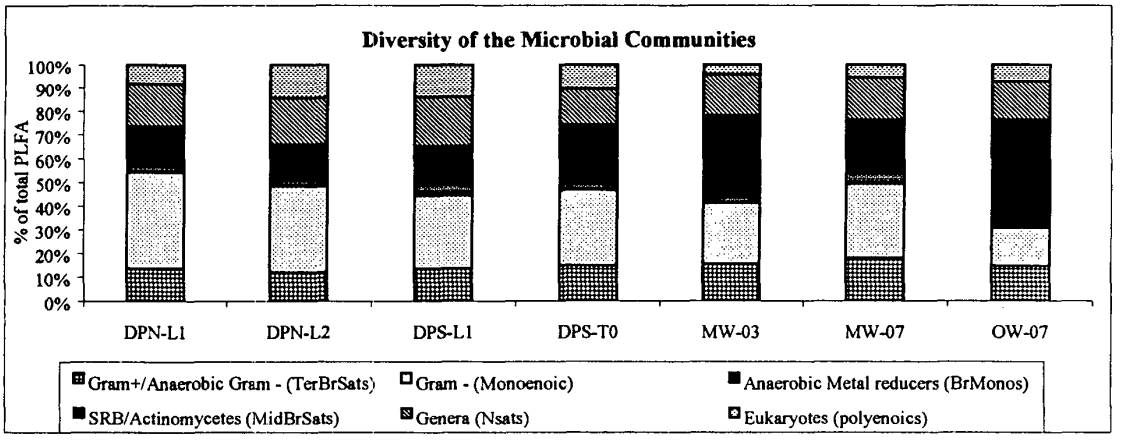

Figure 2. Diversity of the microbial communities.

Conversely the remaining samples were primarily composed of Gram negative bacteria. Additionally, these samples contained higher proportions of 10me16:0, commonly found in anaerobic metal reducing bacteria, suggesting the presence of more anaerobic populations. Environments with more 10me16:0 than 10me18:0 typically feature anaerobic Gram negative sulfate/ metal reducing bacteria.

The microbial communities from samples taken within the plume also contained higher proportions of eukaryotic PLFA. Specifically, the biomarker 18:2ω6, prominently found in fungi but also found in algae protozoa and other higher organisms.

The principal components analysis in Figure 3 shows that the microbial communities in samples OW-07 and DPS-L1 are very different from the remaining samples. As stated above, OW-07 has more *Actinomycete* biomarkers (10me18:0 and br17:0a) while DPS-L1 contains more 18:1ω7c and cy19:0 (typical of a anaerobic Gram negatives). The remaining samples had similar profiles (large amounts of 10me16:0/sulfate/metal reducers) and therefore clustered together.

[1] Principal components analysis (PCA) is built on the assumption that variation implies information, in the same way that HCA is built on the assumption that small multivariate distance implies similarity. Principal components analysis projects the multivariate data (PLFA profiles) onto a reduced number of dimensions (principal components) thereby simplifying the data so relationships between sample sets can easily be observed. Thus, PCA analysis can show which microbial communities are similar.

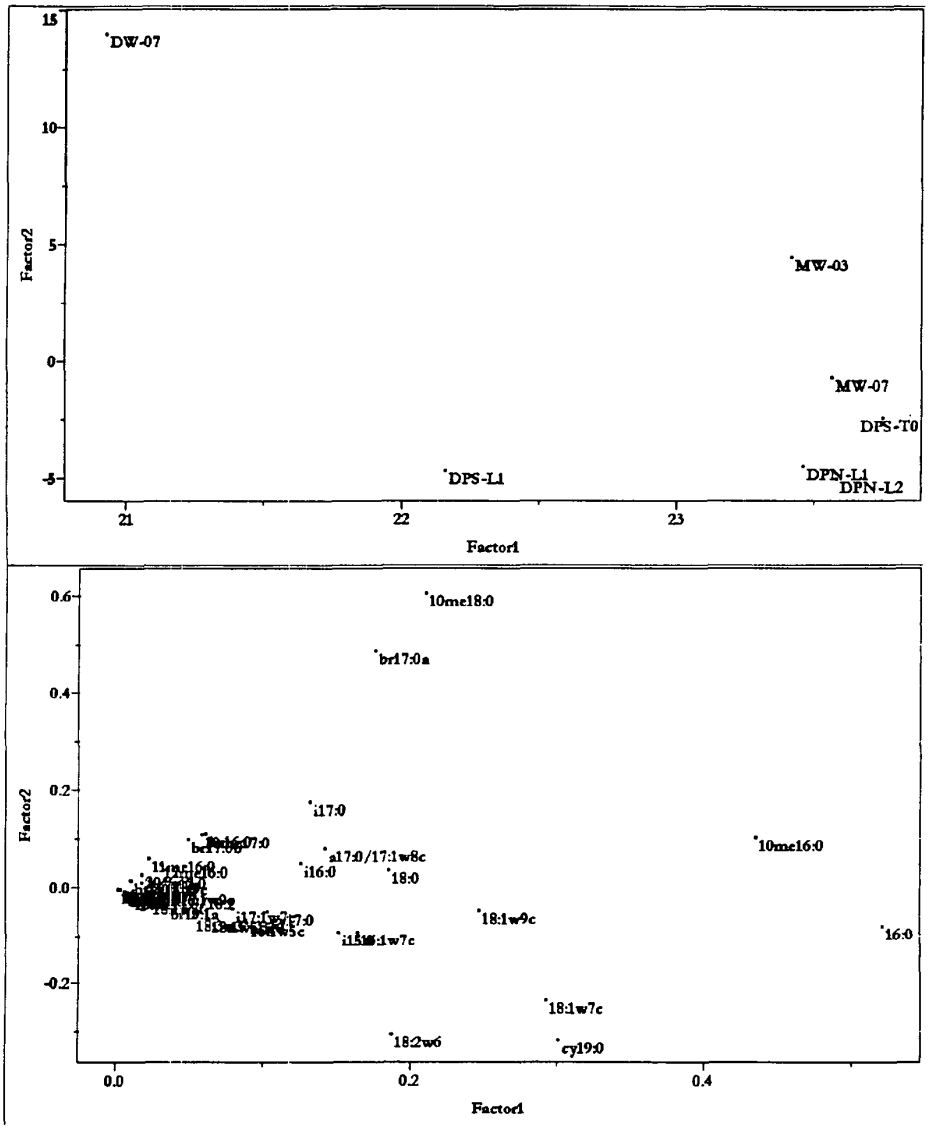

Figure 3. Principal components analysis.

METABOLIC STATUS

The lipid composition of microorganisms is a product of metabolic activity and thus reflects the phenotypic response of the organisms to their environment. The physiological status of Gram-negative communities can be assessed from ratios of different monoenoic biomarkers. Specifically, 16:1ω7c and 18:1ω7c are converted to cyclopropyl fatty acids (cy17:0 & cy19:0) as microbes move from a log to a stationary phase of growth (i.e. slowing of growth). This change is expressed in the two ratios cy17:0/16:1ω7c and cy19:0/18:1ω7c, which may vary from organism to organism or environment to environment but usually will fall within the range of 0.1 (log phase) to 5.0 (stationary phase) when summed. This ratio is inversely proportional to the turnover rate, i.e. a lower ratio infers a higher turnover rate. An increase in cyclopropyl formation also has been associated with anaerobic metabolism. Gram-negative bacteria also generate *trans* fatty acids to alter the permeability of their cellular membranes as adaptation to changes in their environment (for example the presence of petroleum hydrocarbons). Ratios (16:1ω7t/16:1ω7c and 18:1ω7t/18:1ω7c) greater than 0.1 (when summed) have been shown to indicate an adaptation to a the environment resulting in decreased cellular membrane permeability (6).

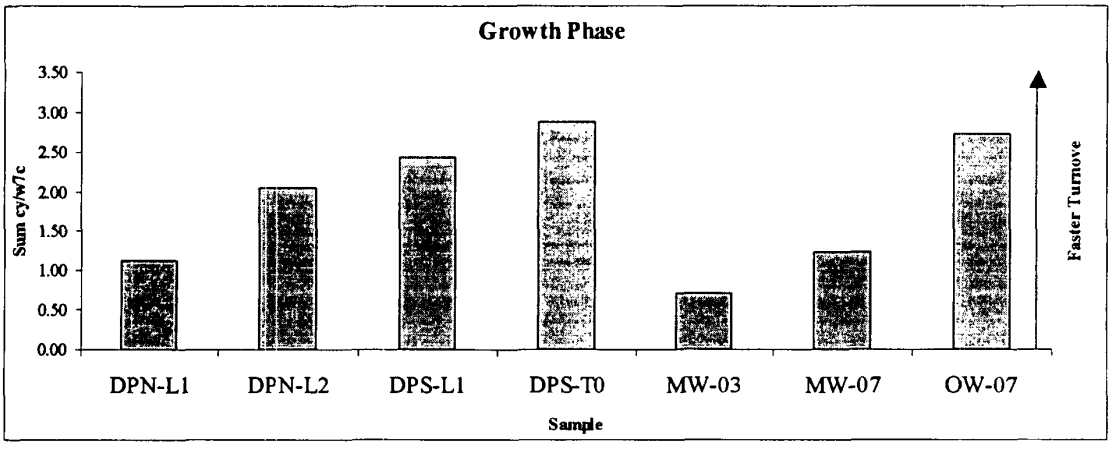

Figure 4. Growth phase of the Gram negative communities.

The Gram negative communities in all of these samples were in the stationary phase of growth, with MW-03, MW-07, and DPN-L1 having the fastest turnover rates.

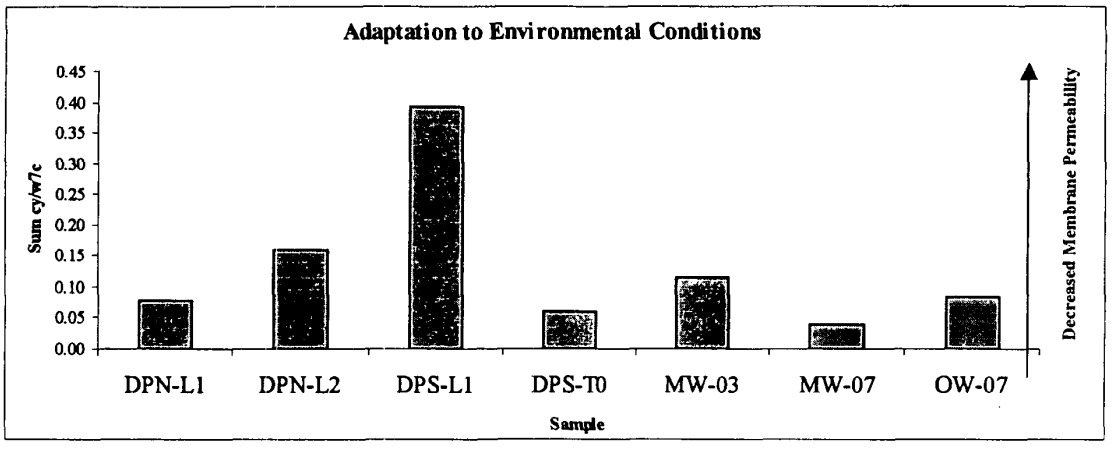

Figure 5. Decreased membrane permeability in the Gram negative communities.

The Gram negative communities in samples DPN-L2 and DPS-L1 had decreased levels of membrane permeability (a bacterial response to environmental stress), most likely due to the Napthalene at these sites.

REFERENCES

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2. Balkwill, D.L., et al. (1988) Equivalence of microbial biomass measures based on membrane lipid and cell wall components, adenosine triphosphate and direct counts in subsurface sediments. Microbial Ecol. 16, 73-84.
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6. Guckert, J.B., et al. (1986) Phospholipid, ester-linked fatty acid profile changes during nutrient deprivation of *Vibrio cholerae:* increases in the *trans* / *cis* ratio and proportions of cyclopropyl fatty acids. Appl. Environ. Microbiol. 52, 794-801.

001349

Microbial Insights, Inc.

Client: Key Environmental

Date Received: 12/8/99

Sample Name	DPN-L1	DPN-L2	DPS-L1	DPS-T0	MW-03	MW-07	OW-07	Blank
Sample Depth	17'-19'	16'-18'	17'-19'	16'-18'	16'-18'	14'-16'	13'-15'	-
Sample Date	12/7/99	12/7/99	12/8/99	12/8/99	12/7/99	12/7/99	12/7/99	-
Wet Weight (g)	76.36	76.74	77.65	77.29	75.77	75.61	76.01	-
Moisture content (% water)	13%	13%	12%	16%	17%	15%	14%	-
Dry Weight (g)	66.09	66.46	67.99	64.81	62.82	64.19	65.28	-
MI Identifier	1key2	1key3	1key7	1key6	1key4	1key5	1key1	1key8
Total Picomoles of PLFA[1]	10,218	9,244	21,918	75,527	38,348	75,189	5,317	ND

Data Summary Sheet

Biomass:								
pmols PLFA/g dry wt.	155	139	322	1,165	610	1,171	81	NC
Cells/g dry wt.	3.09E+06	2.78E+06	6.45E+06	2.33E+07	1.22E+07	2.34E+07	1.63E+06	NC
picomoles prokaryote PLFA	142	119	277	1,044	585	1,108	76	NC
picomoles eukaryote PLFA	13	20	45	121	25	64	6	NC
ratio prokaryote/eukaryote	11	6	6	9	23	17	13	NC
Metabolic Status: (Ratio)								
Growth Phase/Turnover Rate[2]								
cy17:0/16:1w7c	0.42	0.86	1.15	0.64	0.54	0.34	1.39	NC
cy19:0/18:1w7c	0.70	1.18	1.29	2.23	0.17	0.89	1.34	NC
Total	1.12	2.04	2.43	2.87	0.71	1.23	2.73	NC
Environmental Stress[3]								
16:1w7t/16:1w7c	0.05	0.11	0.07	0.00	0.05	0.00	0.00	NC
18:1w7t/18:1w7c	0.02	0.05	0.33	0.06	0.06	0.04	0.08	NC
Total	0.08	0.16	0.39	0.06	0.12	0.04	0.08	NC
Community Structure: (% of Total PLFA)								
Gram+/srb (TerBrSats)	13.8	12.2	13.7	14.9	15.6	17.9	14.8	0.0
Gram - (Monoenoic)	40.4	36.2	30.7	31.8	25.5	31.5	15.9	0.0
SRB (BrMonos)	2.9	2.5	4.4	2.9	2.5	4.1	1.2	0.0
SRB/Actinomycetes (MidBrSats)	16.6	15.4	16.6	24.7	34.7	22.7	44.4	0.0
Genera (Nsats)	18.1	19.4	20.6	15.3	17.6	18.3	16.5	0.0
Eukaryotes (polyenoics)	8.2	14.4	14.0	10.4	4.1	5.5	7.2	0.0

[1] method Modified Bligh & Dyer: Detection limit 50 pmoles total PLFA

[2] ratios < 0.1 log phase, 0.1 to 5.0 Stationary Phase, > 5.0 Decline Phase

[3] ratios > 0.1 adapting to environmentally induced stress

NA: Not Analyzed NC: Not Calculated ND: Not Detected

Microbial Insights, Inc.
Client: Key Environmental
Date Received: 12/8/99

Sample Name		DPN-L1	DPN-L2	DPS-L1	DPS-T0	MW-03	MW-07	OW-07	Blank
Sample Depth		17'-19'	16'-18'	17'-19'	16'-18'	16'-18'	14'-16'	13'-15'	-
Sample Date		12/7/99	12/7/99	12/8/99	12/8/99	12/7/99	12/7/99	12/7/99	-
Wet Weight (g)		76.36	76.74	77.65	77.29	75.77	75.61	76.01	-
Moisture content (% water)		13%	13%	12%	16%	17%	15%	14%	-
Dry Weight (g)		66.09	66.46	67.99	64.81	62.82	64.19	65.28	-
MI Identifier		1key2	1key3	1key7	1key6	1key4	1key5	1key1	1key8
Total Picomoles of PLFA[1]		10,218	9,244	21,918	75,527	38,348	75,189	5,317	ND

Analytical Report

[redacted]

	Equivalent Chain Length								
Terminally Branched Saturates (TerBrSats)									
i14:0	13.62	0.0	0.1	0.3	0.1	0.1	0.2	0.0	0.0
i15:0	14.63	3.0	2.6	4.4	3.6	3.6	5.6	1.2	0.0
a15:0	14.70	2.2	1.9	2.3	2.1	2.1	2.9	0.6	0.0
i16:0	15.63	2.8	2.4	2.5	3.0	3.3	2.9	3.2	0.0
i17:0	16.62	2.6	2.3	2.0	2.9	2.8	2.9	5.7	0.0
a17:0/17:1w8c	16.70	3.2	2.8	2.2	3.3	3.7	3.4	4.0	0.0
		13.8	12.2	13.7	14.9	15.6	17.9	14.8	0.0
Monoenoics (Monos)									
16:1w9c	15.69	0.8	0.7	0.9	0.9	1.3	1.6	0.5	0.0
16:1w7c	15.75	5.0	3.6	2.7	3.3	5.3	5.1	1.0	0.0
16:1w7t	15.78	0.3	0.4	0.2	0.0	0.3	0.0	0.0	0.0
16:1w5c	15.83	2.8	1.8	1.5	1.8	2.3	3.5	0.3	0.0
16:1w13t	15.90	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
cy17:0	16.80	2.1	3.1	3.1	2.1	2.9	1.7	1.3	0.0
18:1w9c	17.69	8.6	6.2	5.7	4.3	4.3	5.1	5.5	0.0
18:1w7c	17.75	11.3	8.7	5.3	5.4	6.3	6.7	2.9	0.0
18:1w7t	17.79	0.3	0.5	1.8	0.3	0.4	0.3	0.2	0.0
18:1w5c	17.84	1.5	1.0	2.6	1.6	1.4	1.7	0.3	0.0
cy19:0	18.81	7.9	10.3	6.9	11.9	1.1	6.0	3.9	0.0
		40.4	36.2	30.7	31.8	25.5	31.5	15.9	0.0
Branched Monoenoics (BrMonos)									
i15:1	14.35	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
br15:1a	14.41	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
i16:1a	15.34	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0
i16:1b	15.41	0.3	0.3	0.1	0.2	0.3	0.3	0.0	0.0
i17:1w7c	16.34	1.9	1.5	1.5	2.2	1.8	3.0	0.7	0.0
br19:1a	18.03	0.7	0.7	2.4	0.4	0.4	0.4	0.5	0.0
		2.9	2.5	4.4	2.9	2.5	4.1	1.2	0.0
Mid-Chain Branched Saturates (MidBrSats)									
10me14:0	14.46	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
br15:0	15.08	0.2	0.1	0.2	0.2	0.3	0.3	0.4	0.0
br15:0	15.48	0.2	0.1	0.2	0.2	0.3	0.3	0.4	0.0

Microbial Insights, Inc.
Client: Key Environmental
Date Received: 12/8/99

Sample Name		DPN-L1	DPN-L2	DPS-L1	DPS-T0	MW-03	MW-07	OW-07	Blank
Sample Depth		17'-19'	16'-18'	17'-19'	16'-18'	16'-18'	14'-16'	13'-15'	-
Sample Date		12/7/99	12/7/99	12/8/99	12/8/99	12/7/99	12/7/99	12/7/99	-
Wet Weight (g)		76.36	76.74	77.65	77.29	75.77	75.61	76.01	-
Moisture content (% water)		13%	13%	12%	16%	17%	15%	14%	-
Dry Weight (g)		66.09	66.46	67.99	64.81	62.82	64.19	65.28	-
MI Identifier		1key2	1key3	1key7	1key6	1key4	1key5	1key1	1key8
Total Picomoles of PLFA[1]		10,218	9,244	21,918	75,527	38,348	75,189	5,317	ND
br16:0	16.07	1.0	0.9	1.0	1.5	1.2	1.1	3.2	0.0
10me16:0	16.43	7.2	7.0	8.9	12.0	15.4	11.7	7.6	0.0
11me16:0	16.47	0.7	0.0	0.0	0.0	2.0	0.0	0.8	0.0
12me16:0	16.52	0.5	0.4	0.3	0.8	1.4	0.5	1.1	0.0
br17:0a	17.05	2.1	2.2	1.9	3.7	4.1	3.3	11.7	0.0
br17:0b	17.11	0.7	0.7	0.7	1.2	1.2	0.8	2.6	0.0
10me17:0	17.41	0.9	1.0	1.1	0.9	1.8	1.0	2.9	0.0
12me17:0/18:2	17.47	0.2	0.2	0.5	0.2	0.2	0.2	0.0	0.0
10me18:0	18.38	2.3	2.9	1.8	3.9	6.4	3.5	13.7	0.0
12me18:0	18.43	0.8	0.0	0.0	0.2	0.3	0.0	0.0	0.0
		16.6	15.4	16.6	24.7	34.7	22.7	44.4	0.0
Normal Saturates (NSats)									
12:0	12.00	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
14:0	14.00	0.2	0.3	0.6	0.2	0.3	0.5	0.0	0.0
15:0	15.00	0.4	0.4	0.8	0.4	0.5	0.5	0.3	0.0
16:0	16.00	12.7	13.7	12.0	10.2	12.3	13.1	9.7	0.0
17:0	17.00	0.7	0.9	0.9	0.9	1.1	0.7	1.2	0.0
18:0	17.98	4.0	4.1	6.2	3.7	3.4	3.5	5.3	0.0
		18.1	19.4	20.6	15.3	17.6	18.3	16.5	0.0
Eukaryotes									
18:2w6	17.59	3.7	6.6	8.9	6.7	1.3	1.9	1.0	0.0
18:3w3	17.63	0.8	2.5	1.8	1.9	0.4	0.4	0.7	0.0
20:4w6	19.19	0.4	0.7	0.3	0.2	0.3	0.8	0.5	0.0
20:3w6	19.38	0.2	0.6	0.3	0.2	0.4	0.4	0.9	0.0
20:2w3	19.60	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0
20:1w11c	19.66	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20:1w9c	19.68	0.3	0.7	0.4	0.4	0.4	0.6	0.8	0.0
20:0	20.00	0.9	1.1	0.6	0.5	0.5	0.5	1.3	0.0
22:0	22.00	0.9	1.1	1.0	0.4	0.5	0.4	1.2	0.0
23:0	23.00	0.4	0.4	0.4	0.0	0.2	0.2	0.2	0.0
24:0	24.00	0.5	0.6	0.4	0.2	0.2	0.3	0.7	0.0
		8.2	14.4	14.0	10.4	4.1	5.5	7.2	0.0

PROJECT REFERENCE	PROJECT NO.	P.O. NUMBER
BEAZER SOUTH CAVALCADE	99-785	

PROJECT LOC. (State)	SAMPLER(s) NAME	PHONE	FAX
TX	R. DELISIO	(412) 279 3363	(412) 279-4332

CLIENT NAME	CLIENT PROJECT MANAGER
KEY ENVIRONMENTAL	JIM ZUBROW

CLIENT ADDRESS (CITY, STATE, ZIP): 1300 ARCH ST, CARNEGIE, PA 15106

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: PLFA / PAH GENERAL

PAGE 1 OF 1

☒ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due:

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (oil, solvent, etc)	PLFA	PAH GENERAL	REMARKS
12/1/99	0835		OW - Q7 (13'-15')	X			X	X		
	0835		DPN - L1 (17'-19')	X			X	X		
	0918		DPN - L2 (16'-18')	X			X	X		
	1000		MW - Q3 (16'-18')	X			X	X		
	1021		MW - Q7 (14'-16')	X			X	X		

NUMBER OF CONTAINERS SUBMITTED

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
[signature]	12/1/99	1830						
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
FEDEX 815217929617	12/1/99	1830						

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
			☐ YES ☐ NO			

ORIGINAL

001353

Serial Number 146049

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

☐ 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
☐ 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
☐ 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

MICROBIAL INSIGHTS

PROJECT REFERENCE	PROJECT NO.	P.O. NUMBER
BEAZER SOUTH CAVALCADE	99-785	

PROJECT LOC. (State)	SAMPLER(s) NAME	PHONE	FAX
TX	R. DELISIO	(412) 279-3363	(412) 279-4332

CLIENT NAME	CLIENT PROJECT MANAGER
KEV ENV.	JIM ZUBROW

CLIENT ADDRESS (CITY, STATE, ZIP): 1200 ARCH ST. CARNEGIE, PA 15106

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (oil, solvent, etc)

REQUIRED ANALYSES: PLFA; PAH (GAS PROBE)

PAGE 1 OF 1

☒ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due:

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (oil, solvent, etc)	PLFA	PAH (GAS PROBE)	REMARKS
12/8/99	1050		DPS-TQ (16'-18')		X		X	X		
12/8/99	1204		DPS-L1 (17'-19')		X		X	X		

RAO

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
Kurt F. Orfan	12/8/99	1830						

RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
FEDEX 815351240231	12/8/99	1830						

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
			☐ YES ☐ NO			

ORIGINAL

APPENDIX F
DNAPL TESTING RESULTS

TEXAS OILTECH LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

10630 FALLSTONE DR, HOUSTON, TEXAS 77099
P.O. BOX 741905, HOUSTON, TEXAS 77274

TEL: (281) 495-2400
FAX: (281) 495-2410

CLIENT:	Key Environmental, Inc.	**REQUESTED BY:**	Mr. Eric Wittmer
SAMPLE:	RWS-1 12/15 10:00	**REPORT DATE:**	December 28, 1999
LABORATORY NO:	16659-01	**PURCHASE ORDER NO:**	99-3299

TEST	RESULT
Viscosity Kinematics @ 22 °C, ASTM D 445, cSt	12.15
Specific Gravity @ 22 °C, ASTM D 1298	1.0819
Surface Tension, ASTM D 971, dynes/cm	43.5

Respectfully submitted,
FOR: TEXAS OILTECH LABORATORIES, INC.

Nader M. Sorurbakhsh, P.E.
Laboratory Director

This analyses, opinions or interpretations are based on material supplied by the client to whom, and for whose exclusive and confidential use this report is made. Texas Oiltech Laboratories, Inc. and its officers assume no responsibility and make no warranty for proper operations of any petroleum, oil, gas or any other material in connection with which this report is used or relied on.

TEXAS OILTECH LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

10630 FALLSTONE DR, HOUSTON, TEXAS 77099
P.O. BOX 741905, HOUSTON, TEXAS 77274

TEL: (281) 495-2400
FAX: (281) 495-2410

CLIENT:	Key Environmental, Inc.	**REQUESTED BY:**	Mr. Eric Wittmer
SAMPLE:	RWS-2 12/15 11:30	**REPORT DATE:**	December 21, 1999
LABORATORY NO:	16659-02	**PURCHASE ORDER NO:**	99-3299

TEST	RESULT
Viscosity Kinematics @ 22 °C, ASTM D 445, cSt	14.62
Specific Gravity @ 22 °C, ASTM D 1298	1.0527
Surface Tension, ASTM D 971, dynes/cm	41.0

Respectfully submitted,
FOR: TEXAS OILTECH LABORATORIES, INC.

Nader M. Sorurbakhsh, P.E.
Laboratory Director

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10630 FALLSTONE DR, HOUSTON, TEXAS 77099
P.O. BOX 741905, HOUSTON, TEXAS 77274

TEL: (281) 495-2400
FAX: (281) 495-2410

CLIENT:	Key Environmental, Inc.	**REQUESTED BY:**	Mr. Eric Wittmer
SAMPLE:	RWN-4 12/15 13:00	**REPORT DATE:**	December 21, 1999
LABORATORY NO:	16659-04	**PURCHASE ORDER NO:**	99-3299

TEST	RESULT
Viscosity Kinematics @ 22 °C, ASTM D 445, cSt	19.86
Specific Gravity @ 22 °C, ASTM D 1298	1.0692
Surface Tension, ASTM D 971, dynes/cm	41.5

Respectfully submitted,
FOR: TEXAS OILTECH LABORATORIES, INC.

Nader M. Sorurbakhsh, P.E.
Laboratory Director

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TEXAS OILTECH LABORATORIES, INC.

CERTIFICATE OF ANALYSIS

10630 FALLSTONE DR, HOUSTON, TEXAS 77099
P.O. BOX 741905, HOUSTON, TEXAS 77274

TEL: (281) 495-2400
FAX: (281) 495-2410

CLIENT:	Key Environmental, Inc.	**REQUESTED BY:**	Mr. Eric Wittmer
SAMPLE:	RWS-5 12/15 12:30	**REPORT DATE:**	December 21, 1999
LABORATORY NO:	16659-03	**PURCHASE ORDER NO:**	99-3299

TEST	RESULT
Viscosity Kinematics @ 22 °C, ASTM D 445, cSt	17.65
Specific Gravity @ 22 °C, ASTM D 1298	1.0788
Surface Tension, ASTM D 971, dynes/cm	42.5

Respectfully submitted,
FOR: TEXAS OILTECH LABORATORIES, INC.

Nader M. Sorurbakhsh, P.E.
Laboratory Director

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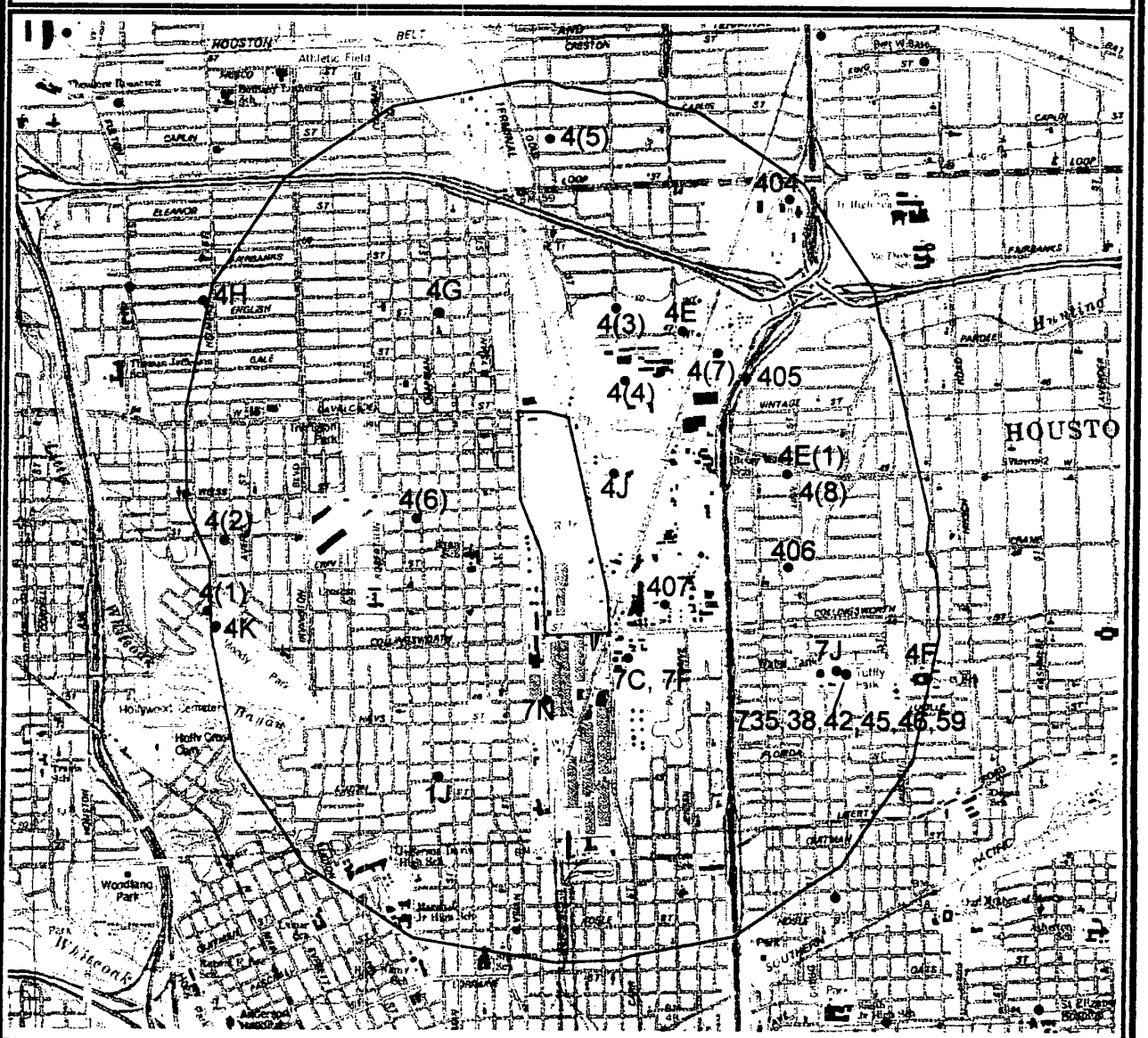
APPENDIX G
WATER USE AND WATER WELL DATABASE

Atlas Job# 00-01-044 - 1 Mile Radial Water Well Search - February 2, 2000
South Cavalcade site
Houston, Texas



Atlas Environmental Research
Austin, Texas
1-800-940-0977

Settegast Quadrangle
7.5' Topographic
Dated: 1982
5' Contour Interval
Harris County, Texas

N
W E
S

1:30000

2000 0 2000 4000 Feet

Atlas E.R. Water Well Search

South Cavalcade Site
Houston, Texas
Atlas Job #00-01-044

Atlas Environmental Research has located **33** water wells in the area of review.

Located Water Wells – 10

65-14-404
65-14-405
65-14-406
65-14-407
65-14-735
65-14-738
65-14-742
65-14-745
65-14-746
65-14-759

Plotted Water Wells - 15

65-14-1J
65-14-4E
65-14-4E(1)
65-14-4F
65-14-4G (2 wells)
65-14-4H
65-14-4J
65-14-4K (2 wells)
65-14-7C
65-14-7F
65-14-7J (2 wells)
65-14-7N

Partially Numbered Water Wells – 8

65-14-4(1)
65-14-4(2)
65-14-4(3)
65-14-4(4)
65-14-4(5)
65-14-4(6)
65-14-4(7)
65-14-4(8) – (filed in section 65-21-5 at the TNRCC)

Unnumbered Water Wells – 0

These wells have been labeled on the attached map with the final portion of the state well number. This portion of the state well number has also been highlighted on the corresponding drillers log. The information for each USGS quadrangle utilized for the well location map is listed below.

Quadrangle	Date	Contour Interval
Settegast, Texas	1982	5 Feet

Quadrangle Scale: 1:24,000; 1 inch = 2,000 feet

Original copy by certified mail to the Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-4-4H
Located on map YES
Received: 6-1-82

1) OWNER MR. PHIL MADDOX (Name) Address 9002 MEADOWVIEW (Street or RFD) HOUSTON (City) TEX. (State) (Zip)

2) LOCATION OF WELL: County HARRIS APP. 10 miles in NORTH (N.E., S.W., etc.) direction from HOUSTON (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:
Date drilled 5-21-82

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
6.75	Surface 0	174

From (ft.)	To (ft.)	Description and color of formation material
0	5	TOP SOIL
5	12	CLAY
12	15	SAND
15	20	CLAY
20	41	CLAY
41	61	CLAY
61	84	CLAY
84	104	CLAY
104	124	CLAY
124	132	CLAY
132	144	UNCONSOLIDATED SAND
144	150	CLAY
150	174	SAND

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other 2 STRING
If Gravel Packed give intervals from _____ ft. to _____ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	PLASTIC	0	164	
2½	N	SLOTTED PLASTIC	164	174	#12

CEMENTING DATA
Cemented from 0 ft. to 164 ft.
Method used PRESSURE
Cemented by Michael L. McClung (Company or Individual)

9) WATER LEVEL:
Static level 110 ft. below land surface Date 5-22-82
Artesian flow _____ gpm. Date _____

10) PACKERS: Type K PACKER RUBBER Depth 159'

11) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

12) WELL TESTS: NONE
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

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AUG 23 1982
DEPT. OF WATER RESOURCES

(Use reverse side if necessary)

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME MICHAEL L. McCLUNG (Type or Print) Water Well Drillers Registration No. 2215

ADDRESS 4602 ELLA BLVD. (Street or RFD) HOUSTON (City) TEXAS (State) 77018 (Zip)

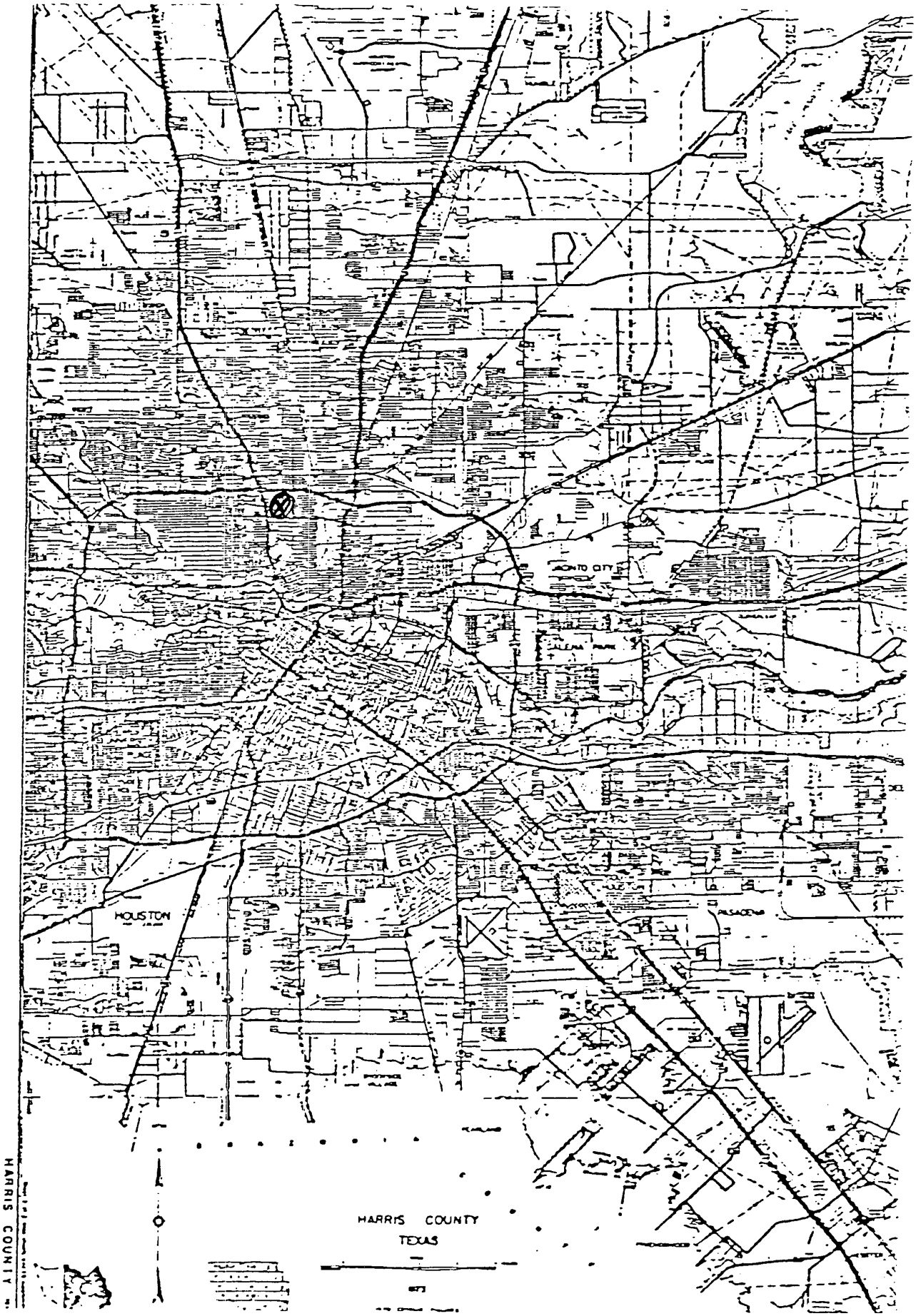
(Signed) Michael L. McClung (Water Well Driller) M+N WELL SERVICE (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79)

DEPARTMENT OF WATER RESOURCES COPY

001364


HOUSTON
HARRIS COUNTY
TEXAS
HARRIS COUNTY

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-14-45
Located on map 45
Received: C.F-8.

1) OWNER MRS. DORIS ADAMS (Name) Address 13803 STONESHIRE (Street or RFD) HOUSTON (City), TEX. (State) 77037 (Zip)

2) LOCATION OF WELL: County HARRIS APPRX. 12 miles in NORTH (N.E., S.W., etc.) direction from HOUSTON (Town)

Driller must complete the legal description to the right with distance and direction from two intersect ng section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled 6-10-82

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6.75	Surface 0	175

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other 2 STRING
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	20	TOP SOIL + CLAY
20	32	SAND
32	40	CLAY
40	50	SAND
50	63	CLAY
63	76	SAND
76	80	CLAY
80	100	CLAY
100	120	CLAY
120	140	CLAY
140	143	CLAY
143	158	BROKEN SAND
158	160	SAND
160	165	SAND-STONE
165	175	SAND

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	PLASTIC	0	165	
2½	N	SLOTTED PLASTIC	165	175	#12

CEMENTING DATA
Cemented from 0 ft. to 165 ft.
Method used PRESSURE
Cemented by Michael L. McClung (Company or Individual)

9) WATER LEVEL:
Static level 115 ft. below land surface Date 6-11-82
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Depth
K PACKER RUBBER 161'

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AUG 23 1982
DEPT. OF WATER RESOURCES

11) TYPE PUMP: ☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

12) WELL TESTS: NONE
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME MICHAEL L. McCLUNG (Type or Print) Water Well Drillers Registration No. 2215

ADDRESS 4602 ELLA BLVD. (Street or RFD) HOUSTON (City) TEXAS (State) 77018 (Zip)

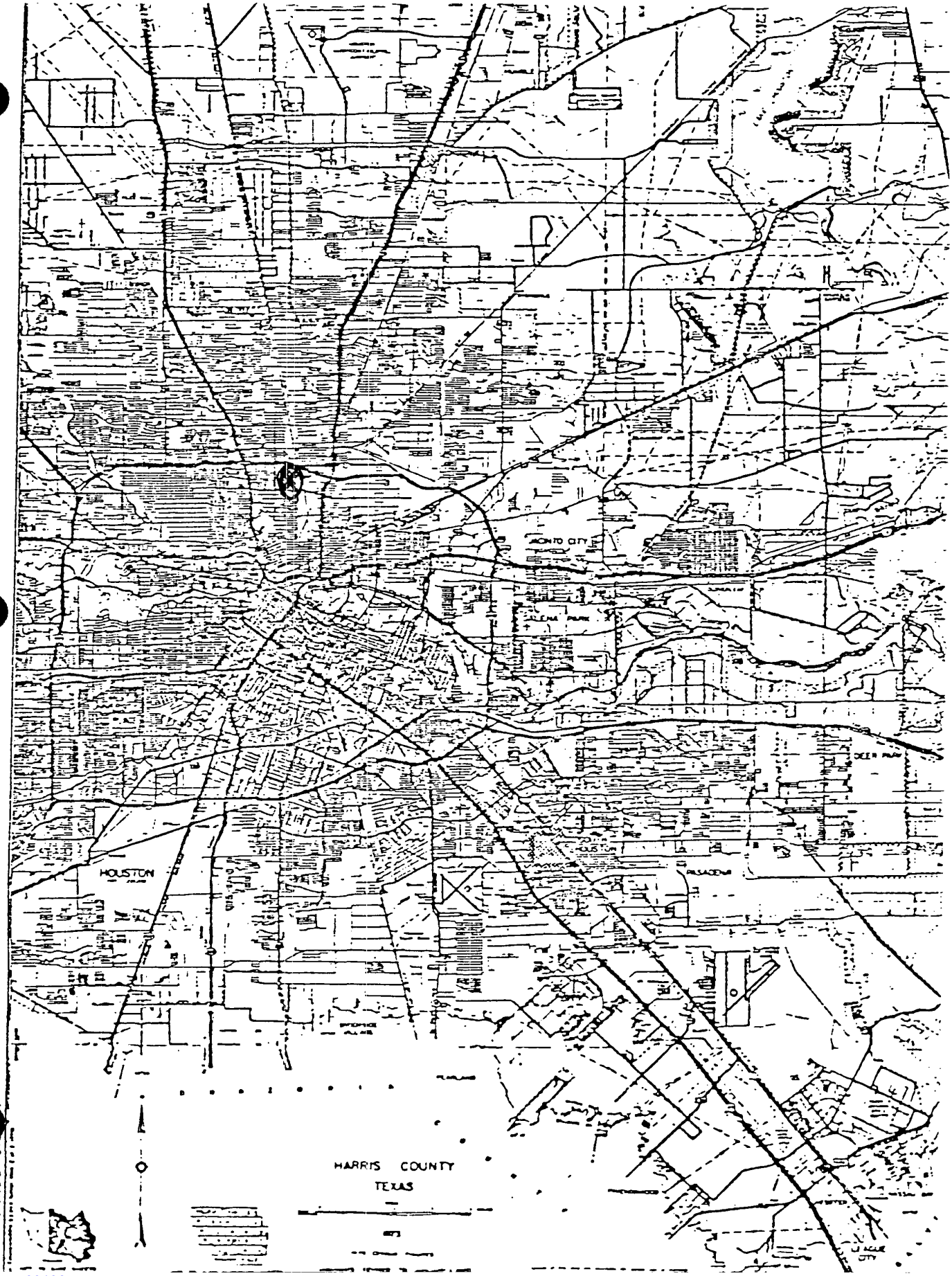
(Signed) Michael L. McClung (Water Well Driller) M+N WELL SERVICE (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79)

DEPARTMENT OF WATER RESOURCES COPY

001366


HOUSTON
HARRIS COUNTY
TEXAS

4(5)

Please use black ink.
Send original copy by certified mail to the Texas Water Commission P.O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER Am. Pump & Well (Name) Address 911 Keller (Street or RFD) Hou. (City) Tx (State) (Zip)

2) LOCATION OF WELL: County Harris 10 miles in N (N.E., S.W., etc.) direction from Houston (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☑ See attached map. on 65-08-8

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other _____

5) DRILLING METHOD (Check): ☑ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____ ☐ Driven

6) WELL LOG:
Date Drilling: Started 3-5 1989 Completed 3-6 1989

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
0	Surface	42

From (ft.)	To (ft.)	Description and color of formation material
0	3	Surface Sand.
3	38	Clay
38	42	Sand.

7) BOREHOLE COMPLETION: ☐ Open Hole ☑ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from 25 ft. to 42 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	N	PVC	0	32	40
2	N	PVC Slotted	32	42	0.12

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 15 ft. No. of Sacks Used 5
_____ ft. to _____ ft. No. of Sacks Used _____
Method used Hand
Cemented by Cullen.

10) SURFACE COMPLETION
☑ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 18 ft. below land surface Date 3/6/89
Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: Did not set.
☐ Turbine ☑ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type Test: ☑ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☑ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Potable Depth of strata 4
Was a chemical analysis made? ☐ Yes ☑ No

(Use reverse side if necessary)

RECEIVED APR 27 1989 TEXAS WATER COMMISSION

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Coastal Water Well (Type or Print) Water Well Driller's License No. 812

ADDRESS P.O. Box 745 (Street or RFD) Porter, (City) Tx. (State) 77365 (Zip)

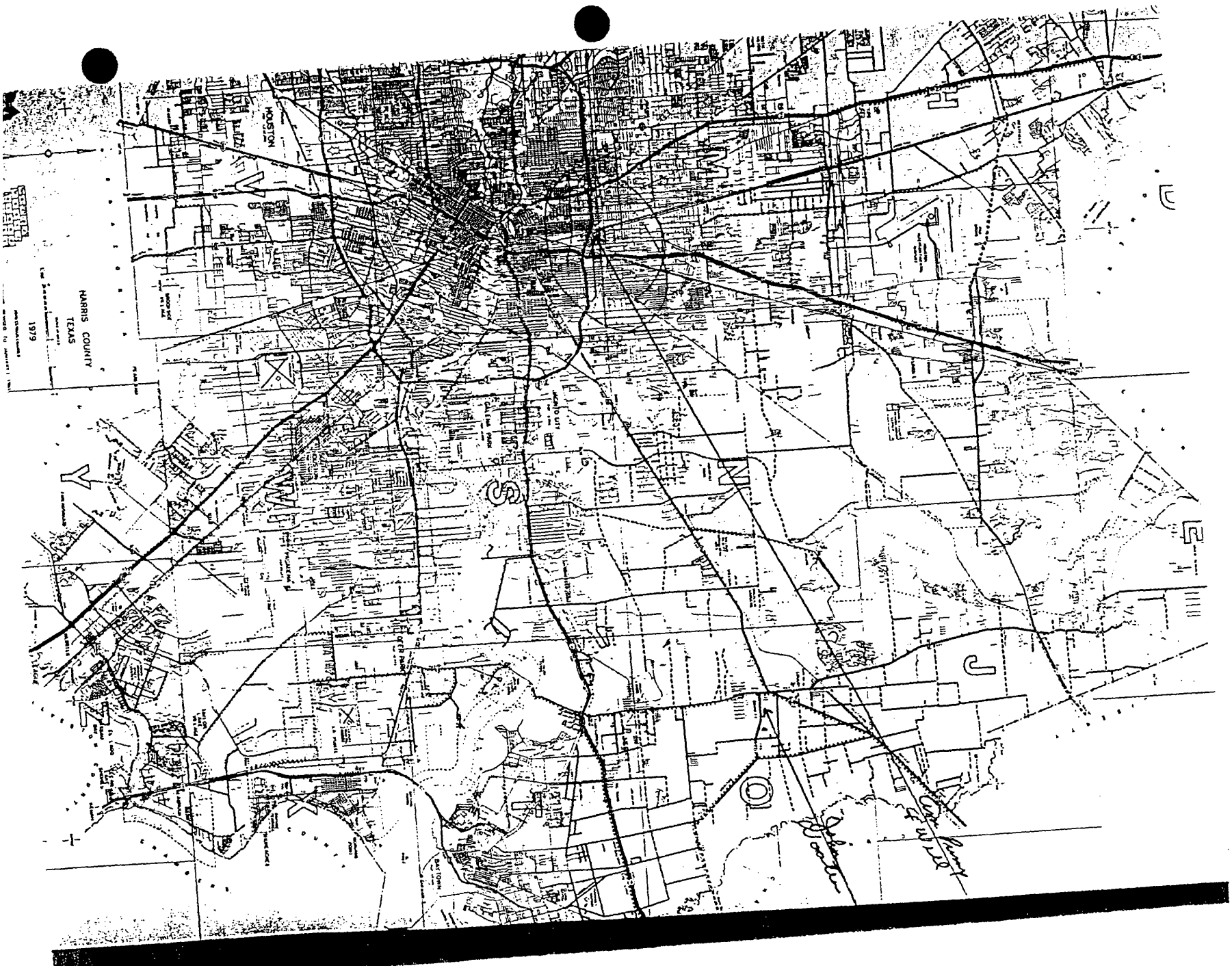
(Signed) H.R. Gehrels (Licensed Water Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only
Well No. 65-14-4
Located on map _____

WWD-012 (Rev.01-28-87) TEXAS WATER COMMISSION COPY

001368


HOUSTON
HARRIS COUNTY
TEXAS
1979

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-404

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD (T. BROWN) R.K.G. (7-11-63)

Record by R.B.A. (3-10-61) Source of data FILES Date 2-20-68 Map 1:24000 Settegast 1955

State Texas 48 County (or town) Harris LJ

Latitude: 29 48 44 N (deg min sec) Longitude: 095 20 09 (degrees min sec) Sequential number: 1

Lat-long accuracy: 1 T. ___ S, R ___ W, Sec ___, ___ ¼, ___ ¼, ___ ¼ B & M

Local well number: LJ-65-14-404 Other number: NORTHEAST #5

Local use: Owner or name: CITY OF HOUSTON

Owner or name: CITY OF HOUSTON Address:

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist M

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other P

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed W

DATA AVAILABLE: Well data 1 Freq. W/L meas.: 1950 — Annual A Field aquifer char.

Hyd. lab. data:

Qual. water data; type:

Freq. sampling: 6-22-49 I Pumpage inventory: yes no, period:

Aperture cards: yes

Log data: E-LOG U-22 0-2502 E

WELL-DESCRIPTION CARD DRILLED TO 2502' & PLUGGED BACK TO 1980'

SAME AS ON MASTER CARD Depth well: 1980 ft 1980 Meas. rept. Driller accuracy 3

Depth cased: (first perf.) 1060 ft 1060 Casing type: S ; Diam. 24-12¾ in 24

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other G

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: 1949 949 Pump intake setting: ft

Driller: TEXAS WATER WELLS INC. HOUSTON, TEXAS (name, address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple, (cent.) (M) multiple, (turb.) (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other T Deep Shallow D

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. 5 Trans. or meter no.

Descrip. MP ft above below LSD. Alt. MP 50'

Alt. LSD: 50' 50 Accuracy: (source) Topo 5 3

Water Level 187.09 ft above below MP; Ft above below LSD Accuracy: MEAS. A

Date meas: 1-5-51 151 Yield: 2180 gpm 2180 Method determined

Drawdown: 38 ft 38 Accuracy: USGS topo Pumping period 22? hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct K x 10⁶ Temp. °F Date sampled

Taste, color, etc.

PL 224.70
187.09
37.61

Well No. LJ-65-14-404

001370

Well No. LJ-65-14-404

Latitude-longitude 29 48 44 (N) S 095 20 09
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAINS 0 3 (20–21) Section:

F (22) Drainage Basin: 5 1 R (23–25) Subbasin: (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat (27)

MAJOR AQUIFER: system, series T (28–29) aquifer, formation, group E (30–31) ✓

Lithology: (32–33) Origin: (34) Aquifer Thickness: ft

(35–37) Length of well open to: 400 ft ✓ 4 0 0 (38–40) Depth to top of: ft (41–43)

MINOR AQUIFER: system, series (44–45) aquifer, formation, group (46–47)

Lithology: (48–49) Origin: (50) Aquifer Thickness: ft

(51–53) Length of well open to: ft (54–56) Depth to top of: ft (57–59)

Intervals Screened: 1060-1130 (70), 1160-1230 (70), 1280-1290 (10), 1350-1390 (40), 1480-1530 (50), 1650-1670 (20)

Depth to consolidated rock: ft (60–63) Source of data: (64)

Depth to basement: ft (65–68) Source of data: (69)

Surficial material: (70–71) Infiltration characteristics: (72)

Coefficient Trans: ✓ gpd/ft (73–75) Coefficient Storage: (76–78)

Coefficient Perm: ✓ gpd/ft^2; Spec cap: ✓ gpm/ft; Number of geologic cards: (79)

CASINGS:

625' OF 24"
1456' OF 12 3/4"
12 3/4 - 524 to 1480'

SCREENS:

1720-1740 20
1760-1790 30
1800-1850 50
1910-1920 10
1930-1960 30

Well No. LJ-65-14-404

GPO 857-700

001371

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-14-46
Located on map Yes
Received: C.F.S.

1) OWNER Goodwill Industries (Name) Address 5200 Jensen (Street or RFD) Houston (City) TX (State) (Zip)

2) LOCATION OF WELL: County Harris miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☒ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:
Well #1 (Standby)
Date drilled 4/29/84

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
10	Surface	500
8	500	561

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from — ft. to — ft.

From (ft.)	To (ft.)	Description and color of formation material
		See attached Well log
		Clean Analysis
		(No E-log run)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
5 1/2	N	Blank Steel casing	+2	500	
3 1/2	N	Blank Steel liner	444	509	
		Lead seal	444		
3 1/2	N	Steel Screen Barweld	509	560	.010

CEMENTING DATA
Cemented from Surface ft. to 500 ft.
Method used Halliburton
Cemented by Halliburton (Company or Individual)

9) WATER LEVEL:
Static level ? ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Depth
None

11) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

12) WELL TESTS: ☒ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 100 gpm with ? ft. drawdown after 4 hrs.

RECEIVED
OCT 18 1984
DEPT. OF WATER RESOURCES

(Use reverse side if necessary)

13) WATER QUALITY: Surface water cased off
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☒ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Leland Lawson (Type or Print) Water Well Drillers Registration No. 28

ADDRESS Po Box 9469 (Street or RFD) Houston (City) TX (State) 77261 (Zip)

(Signed) Leland Lawson #28 (Water Well Driller) Layne Texas Co (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79)

DEPARTMENT OF WATER RESOURCES COPY

001372

LAYNE TEXAS COMPANY
HOUSTON -:- DALLAS

WELL LOG

REPORT NO.
S. O. 1102-2408
PAGE 1 of 1
FILE NO. 4139
DATE 4/29/84

CUSTOMER LOCATION		WELL DATA	
FOR Goodwill Industries		NAME WELL	WELL NO. 1
LOCATION WELL 5200 Block Jensen		ELEVATION	DATUM
		RT C	GR
		TEST HOLE SIZE 7 7/8"	TD 561'
SURVEY	FIELD	DATE STARTED DRILLING	4/28/84
		DATE FINISHED DRILLING	4/29/84
COUNTY Harris	STATE Texas	DRILLER B. Baker	RIG NO. 13
		TYPE MUD Gel	NO. SACKS 10
OTHER LAND MARKS		ELECTRIC LOG	TYPE
		SURVEY None	TYPE
		OTHER	

DEPTH STRATA	EACH STRATUM	DESCRIPTION FORMATION	SAMPLES DEPTH	SAMPLES TYPE	SAMPLES NUMBER
0		Surface			
10'	10'	Top soil			
150'	140'	Clay			
198'	48'	Sand			
220'	22'	Clay			
228'	8'	Sand			
230'	2'	Clay			
252'	22'	Sand			
256'	4'	Clay			
270'	14'	Sand			
315'	45'	Clay			
322'	7'	Sand			
379'	57'	Clay			
404'	25'	Sand			
424'	20'	Clay			
437'	13'	Sand			
444'	7'	Clay			
453'	9'	Sandy clay			
480'	27'	Sand			
490'	10'	Clay			
497'	7'	Sand			
500'	3'	Clay			
561'	61'	Sand			

EDNA WOOD LABORATORIES, INC.
WATER TECHNOLOGISTS · · CHEMISTS · · MICROBIOLOGISTS

7 May 1984

To: Layne Texas Company
P. O. Box 9469
Houston, Texas 77261

SO #1102-2408

Sample marked: Well No. 3, Sample No. 1, Goodwell 5200 Janston. Pumping at 100 gpm. Screened: 510' to 560'. Clear - By Birdwell

Received: 5-1-84. Turbid sample, filtered for analysis thru 0.45μ membrane.

WATER ANALYSIS

results in parts per million (mg/1) except as noted

Dissolved Residue at 350° C		280	Conductance, micromhos/cm, 25°C		500
Total Dissolved Solids, actual†		396	Color, units		15
Total Dissolved Solids, calc.		407	Turbidity, units		19
Silica	SiO_2	23	As Calcium Carbonate, $CaCO_3$:		
Calcium	Ca	54	Phenolphthalein Alkalinity		0
Magnesium	Mg	7	Total Alkalinity		188
Sodium (diff.) Na + K as	Na	42	Total Hardness		163
Carbonate	CO_3	0	Free Carbon Dioxide	CO_2	10
Bicarbonate	HCO_3	229	pH . . . 7.53 at 23°C		
Sulfate	SO_4	12	HYPOTHETICAL COMBINATIONS		
Chloride	Cl	38			
Total Fluoride	F	0.15			
Total Nitrate	NO_3	1.6			
Total Manganese *	Mn	0.02			
Total Iron *	Fe	1.1			
Iron, filtered sample *	Fe	0.02			
*By Atomic Absorption					

†Total Dissolved Solids, actual = Dissolved Residue + 50.8% of bicarbonate (HCO_3) ion

9717
pm

EDNA WOOD LABORATORIES, INC.
By: Alice Perry
Alice Perry, Supervising Chemi

4E

EDNA WOOD LABORATORIES, INC.

WATER TECHNOLOGISTS · · CHEMISTS · · MICROBIOLOGISTS

7 May 1984

To: Layne Texas Company
P. O. Box 9469
Houston, Texas 77261

SO #1102-2408

Sample marked: Well No. 3, Sample No. 1, Goodwell 5200 Janston. Pumping at 100 gpm. Screened: 510' to 560'. Clear - By Birdwell

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WATER ANALYSIS

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Total Dissolved Solids, actual†		396	Color, units		15
Total Dissolved Solids, calc.		407	Turbidity, units		19
Silica	SiO_2	23	As Calcium Carbonate, $CaCo_3$:		
Calcium	Ca	54	Phenolphthalein Alkalinity		0
Magnesium	Mg	7	Total Alkalinity		188
Sodium (diff.) Na + K as	Na	42	Total Hardness		163
Carbonate	CO_3	0	Free Carbon Dioxide	CO_2	10
Bicarbonate	HCO_3	229	pH . . . 7.53 at 23°C		
Sulfate	SO_4	12	HYPOTHETICAL COMBINATIONS		
Chloride	Cl	38			
Total Fluoride	F	0.15			
Total Nitrate	NO_3	1.6			
Total Manganese *	Mn	0.02			
Total Iron *	Fe	1.1			
Iron, filtered sample *	Fe	0.02			

*By Atomic Absorption

†Total Dissolved Solids, actual = Dissolved Residue + 50.8% of bicarbonate (HCO_3) ion

EDNA WOOD LABORATORIES, INC.

By: Alice Perry

Alice Perry, Supervising Chemist

9717
pm

4E

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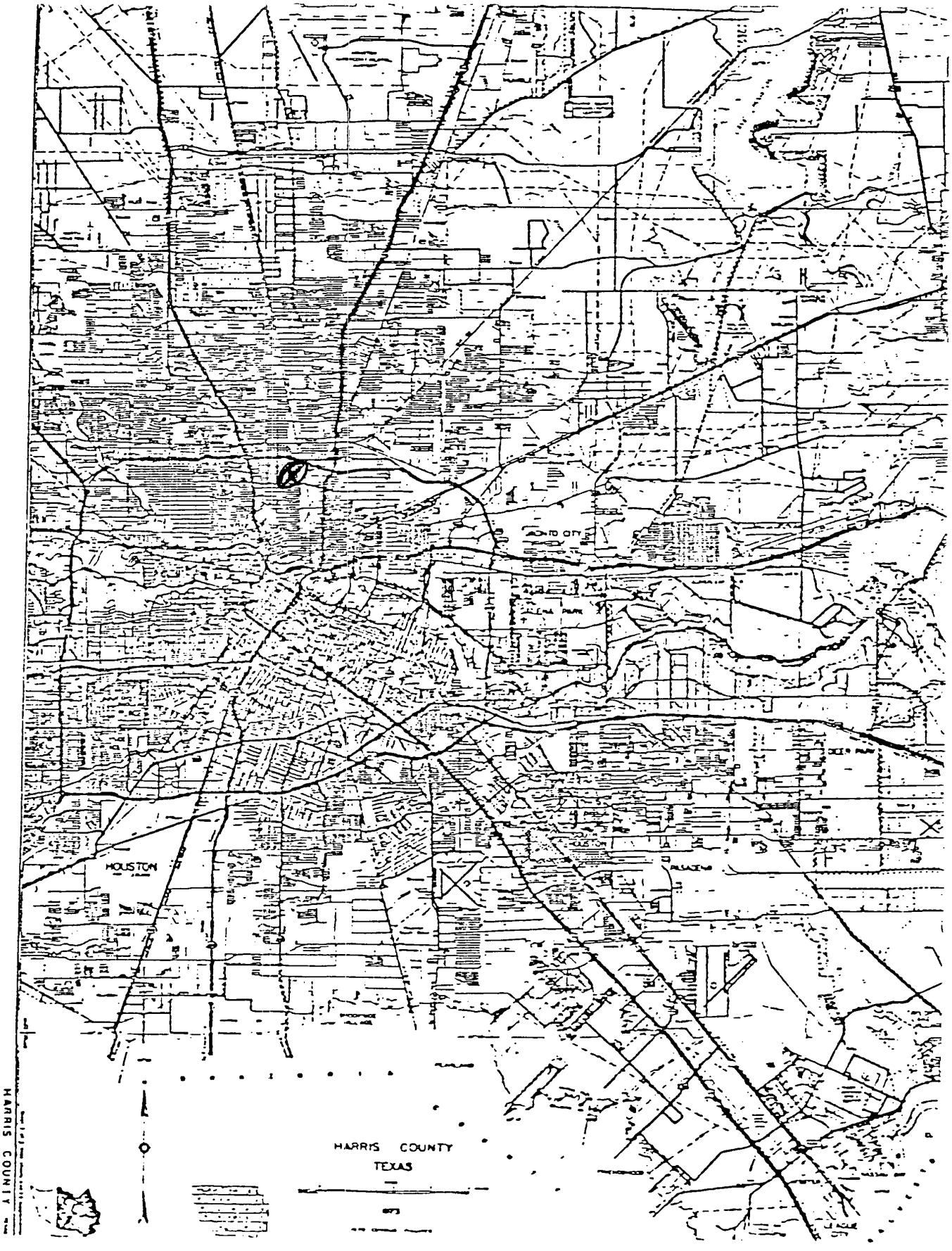

HOUSTON
HARRIS COUNTY
TEXAS
HARRIS COUNTY

44 4(3)

·7m: WIEL

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board P. O. Box 13087 Austin, Texas 78711

1) OWNER Big State Freight (Name) Address 5656 Kelley (Street or RFD) Houston, (City) Tx. (State) 77026 (Zip)

2) LOCATION OF WELL: County Harris 6 miles in NE (N.E., S.W., etc.) direction from Houston (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☐ See attached map. on 65-05-9

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled 4/12/85

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
	Surface	
6-3/4		410

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other 2 string cemented
If Gravel Packed give interval . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2	Concrete
2	10	Clay
10	20	Sand
20	140	Clay
140	160	Sand
160	240	Clay
240	260	Sand
260	300	Clay
300	320	Sand
320	390	Clay & Shale
390	410	Sand

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4"	N	PVC Casing	0	400	Sch.
2½"	N	Blank Liner	380	400	40
2½"	N	PVC Slotted Screen	400	410	.012

CEMENTING DATA
Cemented from top ft. to bottom ft.
Method used Halliburton
Cemented by Robinson Water Well (Company or Individual)

9) WATER LEVEL:
Static level 220 ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

10) PACKERS: Type K Depth 380

MAY 0 7 [illegible]

(Use reverse side if necessary)

11) TYPE PUMP: 2HP Pump #251 Tank
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., 300 ft.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? potable Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

COMPANY NAME Robinson Water Well Service, Inc. (Type or Print) Water Well Driller's License No. 1464

ADDRESS 11607 FM 149 (Street or RFD) Houston, (City) Tx. (State) 77086 (Zip)

(Signed) M. G. Rob[illegible] (Licensed Water Well Driller) (Signed) _____ (Registered Driller Trainee)

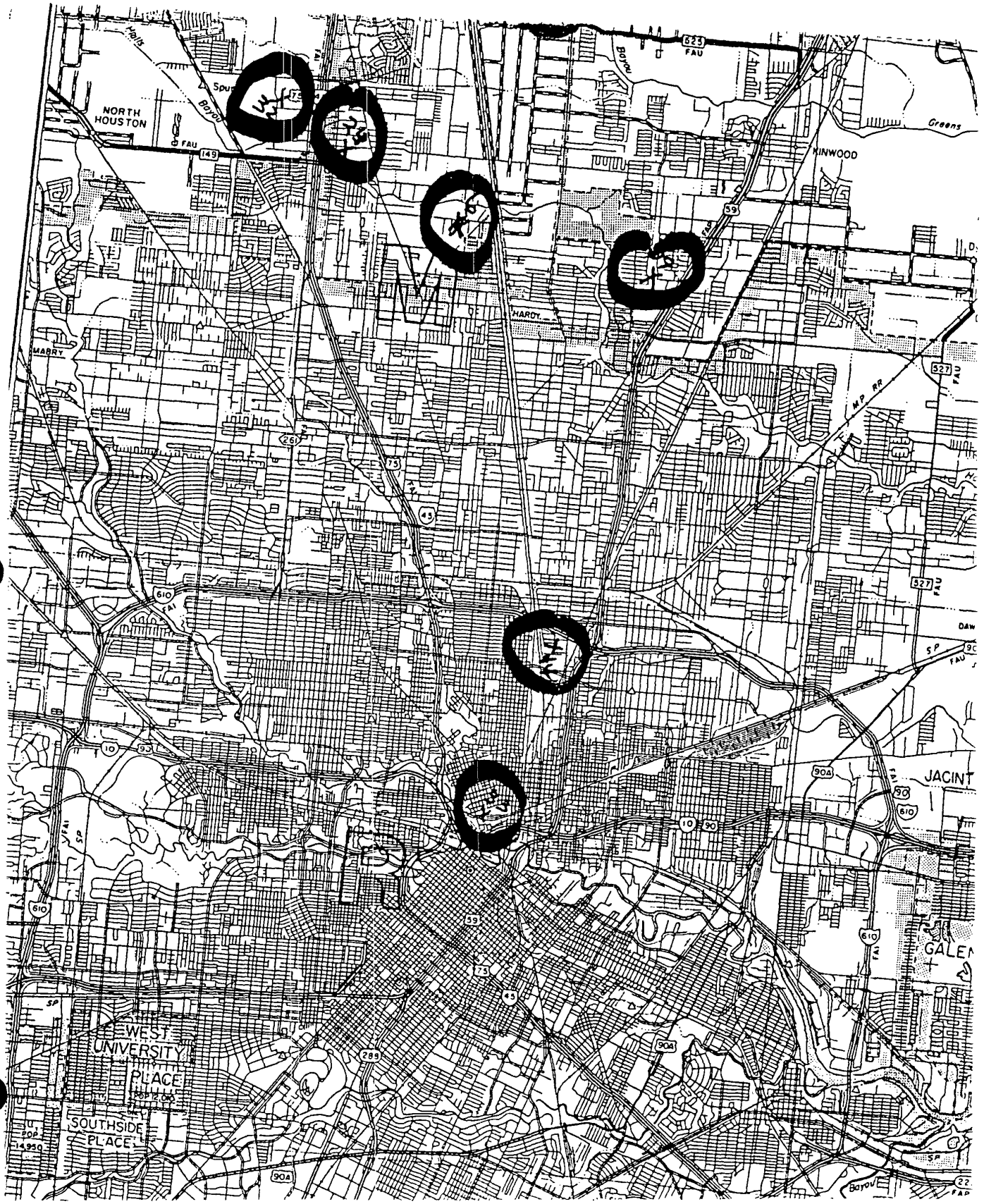
For TDWR use only Well No. 65-14-4 Located on map _____

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 5-27-82)

DEPARTMENT OF WATER RESOURCES COPY

001377


NORTH HOUSTON
KINWOOD
HARDY
MABRY
WEST UNIVERSITY PLACE
SOUTHSIDE PLACE
JACINT
GALEN
Bayou
Greens

4(4)

Please use black ink.
Send original copy by certified mail to the Texas Water Commission P.O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER DR T.V. Tran (Name) Address 1505 Mesquit Houston Texas (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Harris miles in (N.E., S.W., etc.) direction from (Town)
Mail Add. 2420 Dunlany Houston Tx 77006

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ Other _____

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:
Date Drilling: Started 10-10 1987 Completed 10-12 1987

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface 0	363

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other 2 String
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	27	TS & Clay
27	35	Sand Red
35	80	Clay
80	90	Sand Red
90	190	Clay
190	198	Sand
198	210	Clay
210	215	Sand
215	343	Clay
343	363	Sand Bottom on H.7.

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	PVC Casing	0	343	
2 1/2	N	PVC Well Screen	343	363	10

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 0 ft. to 343 ft. No. of Sacks Used 12
_____ ft. to _____ ft. No. of Sacks Used _____
Method used Pressure
Cemented by Steve Buffin

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 250 ft. below land surface Date 10-12-87
Artesian flow _____ gpm. Date _____

12) PACKERS: Type 4X2 1/2 R+R K. Packer Depth 338

13) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., 500 ft.

14) WELL TESTS: None
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

RECEIVED
NOV 23 1987
TEXAS WATER COMMISSION

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME ALLWEATHER W.W. Inc (Type or Print) Water Well Driller's License No. 1929

ADDRESS 25330 Richard Rd Spring Tex 77386 (Street or RFD) (City) (State) (Zip)

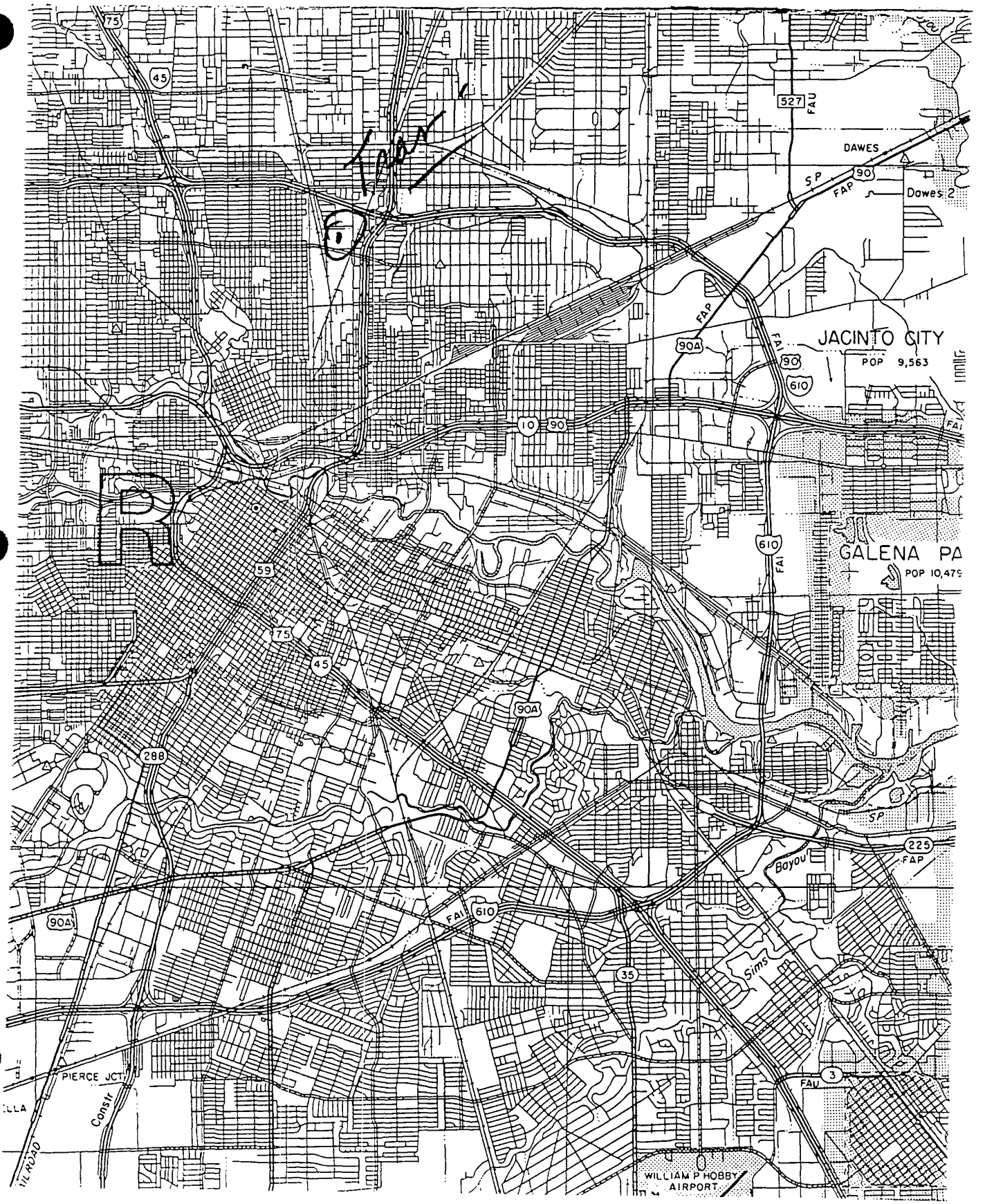
(Signed) R.K. Billings (Licensed Water Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only
Well No. 65-14-4
Located on map _____

WWD-012 (Rev.01-28-87) TEXAS WATER COMMISSION COPY

001379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Sims
PIERCE JCT
Constr
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3
WILLIAM P HOBBY
AIRPORT

4(7)

Please use black ink.

File WHITE COPY with:
TNRCC
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

State of Texas
PLUGGING REPORT

(This form must be completed and filed with the TNRCC within 30 days following the date the well is plugged as required by current statutory law.)

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

A. WELL IDENTIFICATION AND LOCATION DATA

1) OWNER CHERRY DEMOLITION - METRO (Name) ADDRESS 9235 EDGEBROOK (Street or RFD) HOUSTON (City) TX (State) 77075 (Zip)

2) ADDRESS OF WELL: County HARRIS 5020 IVY (Street, RFD or other) HOUSTON (City) TX (State) (Zip) GRID # 65-14-4

3) OWNER'S WELL NO: —

4) WELL TYPE (Check): ☑ Water ☐ Monitor ☐ Injection ☐ De-watering

5)

Driller, Pump Installer, or Landowner performing the plugging operations must locate and identify the location of the well within a specific grid on a full scale-gridded County map available from the TNRCC/Installers Certification Program. The location of the well should be denoted within the grid by placing a corresponding dot in the grid to the right. The legal description section below is optional.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____

Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section lines or survey lines: _____

N

B. HISTORICAL DATA ON WELL TO BE PLUGGED (If available)

6) Driller NOT KNOWN License No. — City —

7) Drilled — 19___; 8) Diameter of hole 2 inches; 9) Total depth of well 48 feet.

C. CURRENT PLUGGING DATA

10) Date well plugged 1-10, 1995

11) Sketch of well: Using space at right, show method of plugging the well including all casing and cemented intervals.

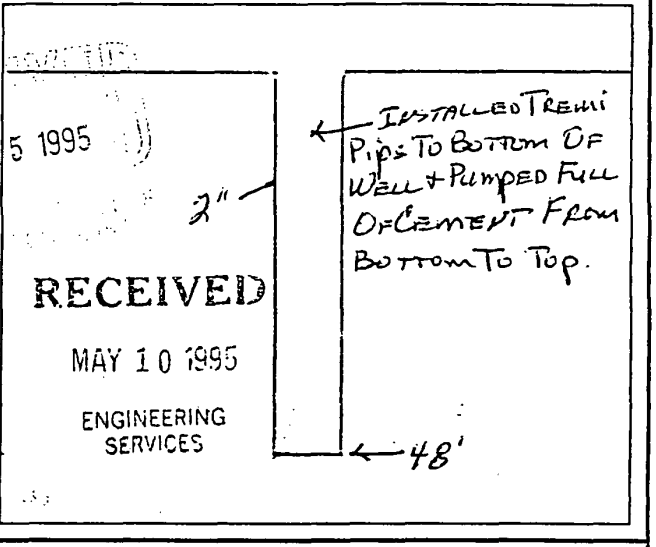
12) Name of Driller/Pump Installer actually performing the plugging operations: JOHN PYBURN

License number 843 WI

13) Casing and cementing data relative to the plugging operations:

DIAMETER (Inches)	CASING LEFT IN WELL FROM (feet)	CASING LEFT IN WELL TO (feet)
2	0	48

CEMENT PLUG(S) PLACED IN WELL FROM (feet)	CEMENT PLUG(S) PLACED IN WELL TO (feet)	SACK(S) OF CEMENT USED
0	48	8
		1 GAL



MAY 15 1995

RECEIVED
MAY 10 1995
ENGINEERING SERVICES

D. VALIDATION OF INFORMATION INCLUDED IN FORM

I hereby certify that this well was plugged by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 13 will result in the report(s) being returned for completion and resubmittal.

Company or Individual's Name (type or print) ALMEDA WATER WELL SERVICE

Address: Street or RFD P.O. BOX 266 City MANVEL State TX Zip 77578

Signatures:

John A. Pyburn — Licensed Driller/Pump Installer — 1-10-95 Date

METRO / EBWard — Owner of Well — 5/10/95 Date

_____ Trainee/Apprentice _____ Date

White - TNRCC Yellow - Well Owner Pink - Licensed Well Driller/Pump Installer

TNRCC-0055 (Rev. 01-12-95)

001381

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Please use black ink.

File WHITE COPY with:
TNRCC
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

State of Texas
PLUGGING REPORT

(This form must be completed and filed with the TNRCC within 30 days following the date the well is plugged as required by current statutory law.)

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

A. WELL IDENTIFICATION AND LOCATION DATA

1) OWNER Cherry Demolition - Metro (Name) ADDRESS 9235 Edgebrook (Street or RFD) Houston (City) Tx (State) 77075 (Zip)

2) ADDRESS OF WELL: County Harris 5023 Ivy (Street, RFD or other) Houston (City) Tx (State) (Zip) GRID # 65-14-4

3) OWNER'S WELL NO: —

4) WELL TYPE (Check): ☑ Water ☐ Monitor ☐ Injection ☐ De-watering

5)

Driller, Pump Installer, or Landowner performing the plugging operations must locate and identify the location of the well within a specific grid on a full scale-gridded County map available from the TNRCC/Installers Certification Program. The location of the well should be denoted within the grid by placing a corresponding dot in the grid to the right. The legal description section below is optional.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____

Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section lines or survey lines: _____

N

B. HISTORICAL DATA ON WELL TO BE PLUGGED (if available)

6) Driller Not Known License No. — City —

7) Drilled — 19____; 8) Diameter of hole 2 inches; 9) Total depth of well 47 feet.

C. CURRENT PLUGGING DATA

10) Date well plugged 1-10, 1995.

11) Sketch of well: Using space at right, show method of plugging the well including all casing and cemented intervals.

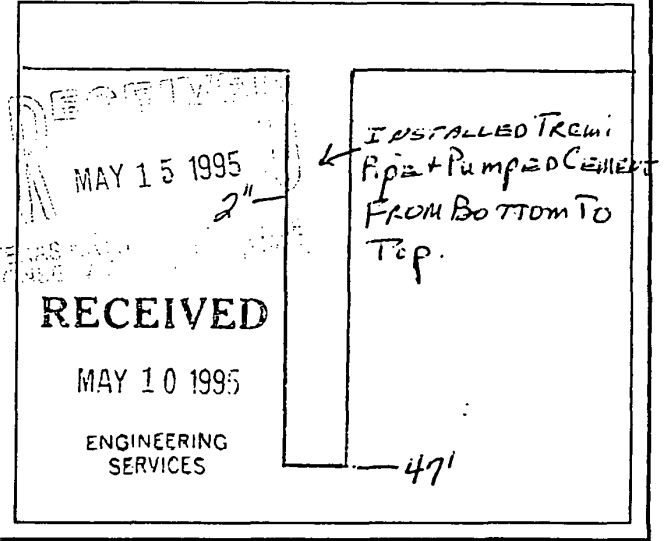
12) Name of Driller/Pump Installer actually performing the plugging operations John Pybiren

License number 843WI

13) Casing and cementing data relative to the plugging operations:

DIAMETER (Inches)	CASING LEFT IN WELL FROM (feet)	CASING LEFT IN WELL TO (feet)
2	0	47

CEMENT PLUG(S) PLACED IN WELL FROM (feet)	TO (feet)	SACK(S) OF CEMENT USED
0	47	8
		1 GEL



D. VALIDATION OF INFORMATION INCLUDED IN FORM

I hereby certify that this well was plugged by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 13 will result in the report(s) being returned for completion and resubmittal.

Company or Individual's Name (type or print) Almeda Water Well Service

Address: Street or RFD P.O. Box 266 City Manvel State Tx Zip 77578

Signature: John A. Pybiren — Licensed Driller/Pump Installer — 1-10-95 Date — Metro/Edward Owner of Well — 5/10/95 Date

Trainee/Apprentice — Date

White - TNRCC Yellow - Well Owner Pink - Licensed Well Driller/Pump Installer

TNRCC-0055 (Rev. 01-12-95)

001382

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 05-14-46
Located on map YCS
Received: 8-23-82

1) OWNER MR. J. D PRICHARD (Name) Address 13514 CARMILENDA (Street or RFD) HOUSTON (City) TEX (State) (Zip)

2) LOCATION OF WELL: County HARRIS APPRX. 15 miles in NORTH (N.E., S.W., etc.) direction from HOUSTON (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ See attached map. NOT ATTACHED

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled 6-22-82

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
6.75	Surface 0	167

From (ft.)	To (ft.)	Description and color of formation material
10	20	TOP SOIL + CLAY
20	27	SAND
27	32	CLAY
32	40	CLAY
40	50	SAND
50	62	CLAY
62	70	SAND
70	94	CLAY
94	114	CLAY
114	134	CLAY
134	142	BROKEN SAND
142	154	CLAY
154	167	SAND

(Use reverse side if necessary)

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other 2 STRING
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	PLASTIC	0	157	
2½	N	WOP	157	167	#12

CEMENTING DATA
Cemented from 0 ft. to 157 ft.
Method used PRESSURE
Cemented by Michael L. McClung (Company or Individual)

9) WATER LEVEL:
Static level 110 ft. below land surface Date 6-23-82
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Depth
K PACKER RUBBER 153'

11) TYPE PUMP: ☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

12) WELL TESTS: NONE
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

RECEIVED
AUG 23 1982
DEPT. OF WATER RESOURCES

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME MICHAEL L. McCLUNG (Type or Print) Water Well Drillers Registration No. 2215

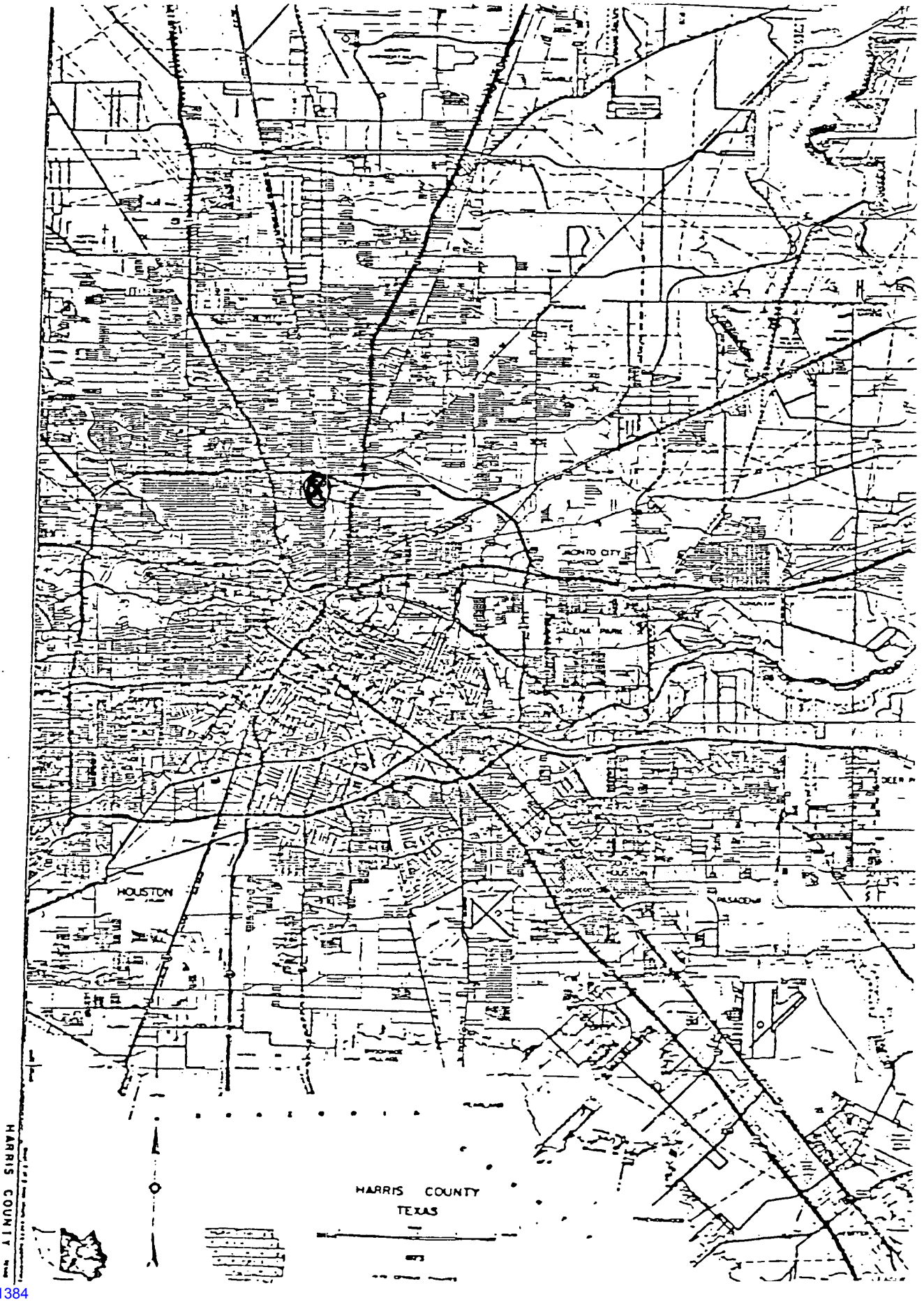
ADDRESS 4602 ELLA BLVD. (Street or RFD) HOUSTON (City) TEXAS (State) 77018 (Zip)

(Signed) Michael L. McClung (Water Well Driller) M+N WELL SERVICE (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79) DEPARTMENT OF WATER RESOURCES COPY

001383



HARRIS COUNTY

WRD Exp. (GW)
April 1966

Well No. J-65-14-405

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

1:24000

Record by W. L. Naftel — Source of data Our Files — Date Aug. 1949 — Map Settegast 1955

State Texas [48] — County (or town) Harris [LJ]

Latitude: 29 48 15 N (deg min sec) — Longitude: 095 20 17 (degrees min sec) — Sequential number: [1]

Lat-long accuracy: [1] T ___ S, R ___ W, Sec ___, ___ ¼, ___ ¼, ___ ¼

Local well number: LJ-65-14-405 — Other number: NORTH EAST #4 (B & M)

Local use: — Owner or name: CITY OF HOUSTON

Owner or name: CITY OF HOUSTON — Address:

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — [M]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P.S., (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other — [P]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. — [W]

DATA AVAILABLE: Well data [ ] — Freq. W/L meas.: 1949: Semi Annual [S] — Field aquifer char. [ ]

Hyd. lab. data: [ ]

Qual. water data; type: [ ]

Freq. sampling: 5-16-49 [A] — Pumpage inventory: yes no, period: [ ]

Aperture cards: yes [ ]

Log data: E log U-23 [E]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD — Depth well: 2080 ft [2080] — Meas. (rept) driller accuracy [6]

Depth cased (first perf.): 1030 ft [1030] — Casing type: S; Diam. 24 x 12 in [24]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other — [G]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other — [H]

Date Drilled: May 1949 [949] — Pump intake setting: ___ ft

Driller: Texas Water Wells, Inc. (name) Houston, Tex. (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other — [T] — Deep Shallow [D]

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. [5] — Trans. or meter no.

Descrip. MP ___ ft above below LSD, Alt. MP 54

Alt. LSD: 50 [50] — Accuracy (source): 5' tape map [3]

Water Level 182.32 ft above below MP; Ft above below LSD [178] — Accuracy: meas. [A]

30 min SL +4.5

Date meas: 5-16-49 [549] — Yield: 2400 gpm [2400] — Method determined [ ]

Drawdown: 62 ft [62] — Accuracy: USGS tape WD [ ] — Pumping period 96 hrs [96]

QUALITY OF WATER DATA: Iron ___ ppm [ ] — Sulfate ___ ppm [ ] — Chloride ___ ppm [ ] — Hard. ___ ppm [ ]

Sp. Conduct ___ K x 10^6 [ ] — Temp. ___ °F [ ] — Date sampled [ ]

Taste, color, etc.

PL 244.67
182.32
62.35

Well No.

Well No. LJ-65-[illegible]-405

Latitude-longitude 29 48 15 S 095 20 17
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: Coastal Plains 0 3 (20–21) Section: _____

F (22) Drainage Basin: _____ 5 1 R (23–25) Subbasin: _____ (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat _____ (27) F

MAJOR AQUIFER: _____ system, _____ series T (28–29) _____ aquifer, formation, group E (30–31)

Lithology: _____ (32–33) Origin: _____ (34) Aquifer Thickness: _____ ft

(35–37) Length of well open to: 405 ft 4 0 5 (38–40) Depth to top of: _____ ft (41–43)

MINOR AQUIFER: _____ system, _____ series (44–45) _____ aquifer, formation, group (46–47)

Lithology: _____ (48–49) Origin: _____ (50) Aquifer Thickness: _____ ft

(51–53) Length of well open to: _____ ft (54–56) Depth to top of: _____ ft (57–59)

* Intervals Screened: 1030 – 2060 SS screen

Depth to consolidated rock: _____ ft (60–63) Source of data: _____ (64)

Depth to basement: _____ ft (65–68) Source of data: _____ (69)

Surficial material: _____ (70–71) Infiltration characteristics: _____ (72)

Coefficient Trans: _____ gpd/ft (73–75) Coefficient Storage: _____ (76–78)

Coefficient Perm: _____ gpd/ft^2; Spec cap: _____ gpm/ft; Number of geologic cards: _____ (79)

* Screen
1030 – 1080
1100 – 1120
1130 – 1160
1320 – 1345
1395 – 1425
1440 – 1480
1695 – 1765
1795 – 1815
1895 – 1915
1960 – 2060

610' of 24" csg.

12" from 510 to 2080

Well No.

GPO 857-700

(11-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
Water Resources Division
Austin, Texas

020977

Latitude ° ' "	Longitude ° ' "	Seq. No.
294815	0952017	01

County code 201 County HARRIS

Well # LJ-65-14-405

Project number 7-4648-01000

Date 2-8-77 Time ____ Temp °C 30.5

Owner City of Houston

Address North East #4

Date drld 5-49 WBF code 121 EVGL

Sample interval: (top) 1030 (bottom) 2060

Water level — Appr Clear Use PS

Collector Peters Yield — GPM

Smpld aftr pmpg ____ Depth 2080

Pt of coll Tap on discharge

Field: Cond ____ pH ____ HCO_3 ____ DO ____

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule ____

Other I

Herbicide ____ Insecticide ____

Remarks:

Type 2 (1) Station identification number 294815095201701 (2–16)

Y M D (17–22) Begin

Time of measurement (29–32)

	Parameter code	Value	Exp.	Rmk
Depth	72008	2080	04	
Yield (GPM)	00059			
Sample interval OP	72015	1030	04	
Sample interval BOTTOM	72016	2060	04	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	3050	02		30.5
pH	00400	8300	01		8.3
Specific conductance	00095	7880	03		788
HCO_3	00440	3560	03		356
CO_3	00445	0000	01		0
Chloride (Cl)	00940	8000	02		80
Sulfate (SO_4)	00945	2800	01		2.8
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31625				
Strep-tococci	31673				
BOD	00310				

001387

Austin, Texas

Latitude ° ' "	Longitude ° ' "	Seq. No.
29 48 15	095 20 17	01

County code 201 County Harris

Well # LJ-65-14-405

Project number 5-4648-01000

Date 2-3-75 Time ____ Temp°C 30.0

Owner City of Houston

Address Northeast # 4

Date drld 5-49 WBF code 121EVGL

Sample interval: (top) 1030 (bottom) 2060

Water level ____ Appr ____ Use PS

Collector Naftel Yield ____ GPM

Smpld aftr pmpg on arr. Depth 2080

Pt of coll tap on pipe

Field: Cond ____ pH ____ HCO_3 ____ DO ____

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I + SO_4

Other ____

Herbicide ____ Insecticide ____

Remarks:

Type 2 (1) Station identification number 29481509520170 1 (2–16)

Y M D Begin (17–22) Time of measurement (29–32)

	Parameter code	Value	Exp.	Rmk
Depth	72008	2080	04	
Yield (GPM)	00059			
Sample interval TOP	72015	1030	04	
Sample interval BOTTOM	72016	2060	04	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	3000	02		30.0
pH	00400	7800	01		7.8
Specific conductance	00095	7820	03		782
HCO_3	00440	3480	03		348
CO_3	00445	0000	01		0
Chloride (Cl)	00940	7900	02		79
Sulfate (SO_4)	00945	4000	01		40
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Strep-tococci	31679				
BOD	00310				

001388

Map 3 # 5
4(2)

OWNER: BAKER, HENRY ADDRESS: HWY 45 GULF BANK CITY: HOUSTON STATE: TX ZIP:
LOCATION OF WELL: County: HARRIS 3 miles in N direction from Houston

AL DESCRIPTION SEE ATTACHED MAP

TYPE OF WORK: NEW WELL 4) PROPOSED USE: DOMESTIC 5) DRILLING METHOD: MUD ROTARY

WELL LOG: 01960

DIAMETER OF HOLE

DIAMETER	FROM	TO
6.5	0	363
4.5	363	378

7) BOREHOLE METHOD:
STRAIGHT WALL
IF GRAVEL... FROM FT. TO FT.
FROM FT. TO FT.

E DRILLED: 02/20/92

LOGICAL DESCRIPTION:

M TO	DESCRIPTION
15	SAND
43	CLAY
71	SAND
86	CLAY
97	SAND
145	CLAY & ROCK
180	SAND
200	CLAY
215	SAND
240	CLAY
249	SAND & CLAY
323	CLAY
353	SAND
356	CLAY
378	SAND
379	ROCK

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

DIA	NEW/USED	DESCRIPTION	FROM	TO	GAGE CASING SCREEN
4	N	PVC	0	363	SCH 40
2.5	N	GALV.	344	365	SCH 40
2.5	N	RBSS	365	375	8 GA
2.5	N	DOWN HOLE ASSEMBLY	375	378	SCH 40

9) CEMENTING DATA:
Cemented from 0 FT. TO 363 FT.
FT. TO FT.
Method used: PRESSURE
Cemented by: WEISINGER WATER WELL

10) SURFACE COMPLETION:
APP. ALTER. PROCD.

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APR 02 1992
TEXAS WATER COMMISSION

11) WATER LEVEL:
STATIC LEVEL : 260 FT. DATE: 02/20/92
ARTESIAN FLOW: GPM. DATE:

12) PACKERS:

TYPE	DEPTH
BP SEAL	344

TYPE PUMP:
SUBMERSIBLE
DEPTH TO PUMP:

14) WELL TEST:
JETTED
YIELD: 10 GPM WITH FT DRAWDOWN AFTER HRS

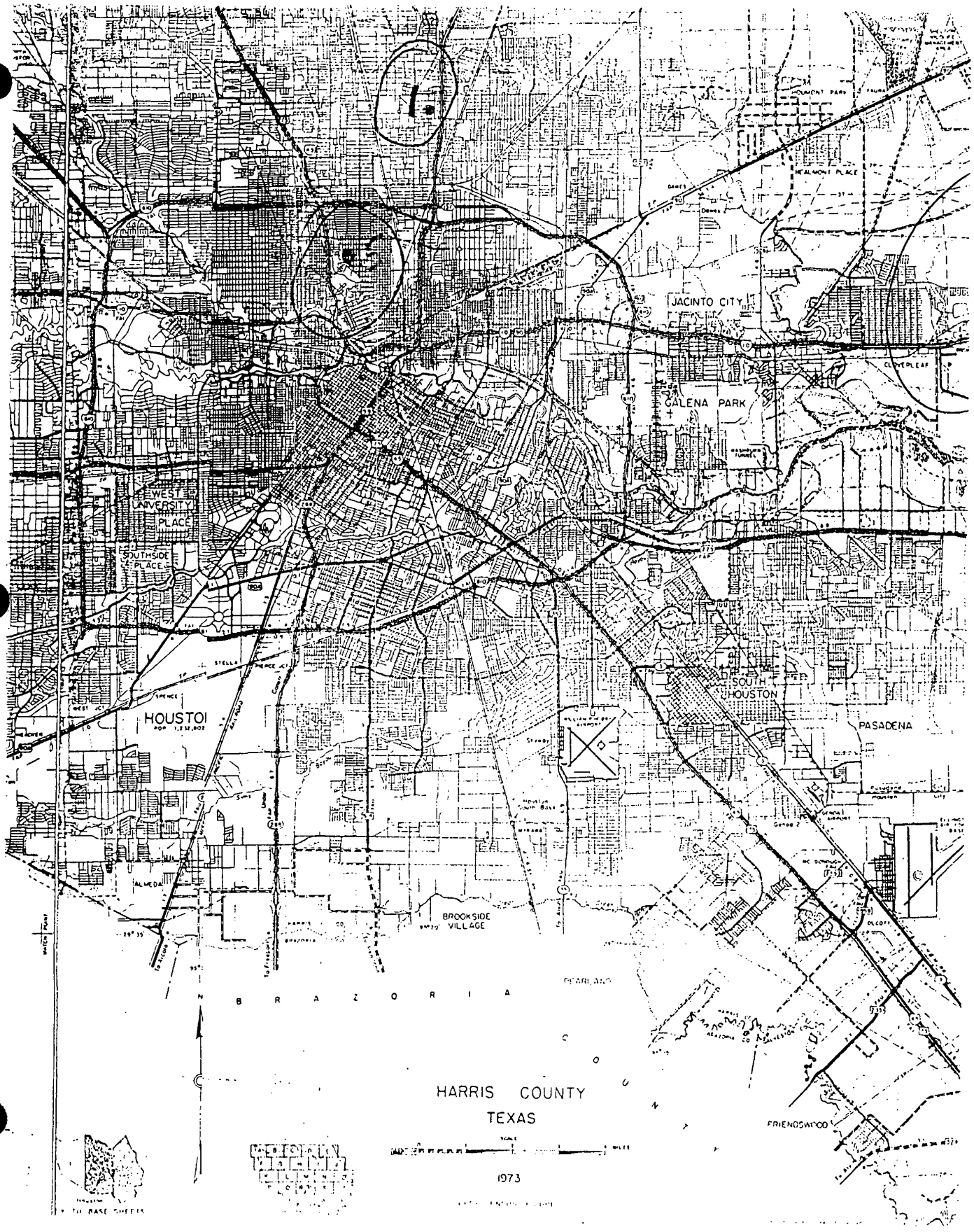
WATER QUALITY:
TYPE OF WATER: EXCELLENT DEPTH OF STRATA: NO CHEMICAL ANALYSIS MADE
NO STRATA OF UNDESIRABLE WATER PENETRATED

PANY NAME: WEISINGER WATER WELL, INC WATER WELL DRILLER'S LICENSE NO: 1541,1991,&1992
RESS: 2200 EAST DAVIS CITY: CONROE STATE: TX ZIP CODE: 77301

FOR TDWR USE ONLY
WELL NO. 5
LOCATED ON MAP 65.14.4

EREBY CERTIFY THAT THIS WELL WAS DRILLED BY ME (OR UNDER MY SUPERVISION) AND THAT EACH AND ALL OF THE STATEMENTS HEREIN TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF. I UNDERSTAND THAT FAILURE TO COMPLETE ITEMS 1 THRU 12 WILL RESULT IN THE (S) BEING RETURNED FOR COMPLETION AND RESUBMITTAL.

gned) John E. Weisinger (LICENSED WATER WELL DRILLER) (signed) _____ (REGISTERED DRILLER TRAINEE)


JACINTO CITY
GALENA PARK
WEST UNIVERSITY PLACE
SOUTHSIDE PLACE
HOUSTON
SOUTH HOUSTON
PASADENA
BROOKSIDE VILLAGE
HARRIS COUNTY
TEXAS
1973

4(6)

STATE OF TEXAS WATER WELL REPORT

1) OWNER: WONG, KENT ADDRESS: 4500 COCKRAN CITY: HOUSTON STATE: TX ZIP:
2) LOCATION OF WELL: County: HARRIS miles in N direction from HOUSTON

LEGAL DESCRIPTION: SEE ATTACHED MAP: 00139
Section No.: Block No.: Township:
Abstract No.: Survey Name:
Distance and direction from two intersecting section or survey lines:

3) TYPE OF WORK: NEW WELL 4) PROPOSED USE: INDUSTRIAL 5) DRILLING METHOD: MUD ROTARY

6) WELL LOG: 00139

DIAMETER OF HOLE

DIAMETER	FROM	TO
6.5	0	483
4.0	483	502

7) BOREHOLE METHOD:
TWO STRING/B.P. SEAL
IF GRAVEL... FROM FT. TO FT.
FROM FT. TO FT.

DATE DRILLED: 10/25/88

GEOLOGICAL DESCRIPTION:

FROM	TO	DESCRIPTION
0	3	SOIL
3	19	CLAY-WHITE
19	178	CLAY-RED
178	209	SAND-WHITE-.014-.020
209	263	CLAY-RED
263	289	SAND-WHITE-.006-.008
289	389	CLAY-RED
389	400	SAND-WHITE-FINE
400	479	CLAY-RED
479	482	SAND-WHITE-.006-.008
482	484	CLAY-RED
484	499	SAND-WHITE-.010-.012
499	502	BROKEN SAND & CLAY
502		CLAY-RED

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

DIA	NEW/USED	DESCRIPTION	FROM	TO	GAGE	CASING SCREEN
4.0	N	P.V.C. SCH.40	0	483		CASING
2.5	N	STEEL, NEW, GALV.	479	489		LINER
2.5	N	STAINLESS - ROD BASE	489	499		.010
2.5	N	STEEL, NEW, GALV.	499	502		S.T.N.

9) CEMENTING DATA:
Cemented from 0 FT. TO 483 FT.
FT. TO FT.
Method used: PRESSURE-HALIBURTON
Cemented by: ALMEDA WATER WELL

10) SURFACE COMPLETION:
APP. ALTER. PROCD.

11) WATER LEVEL:
STATIC LEVEL : 252 FT. DATE: 10/27/88
ARTESIAN FLOW: GPM. DATE:

RECEIVED
DEC 1 1989
TEXAS WATER COMMISSION

12) PACKERS: TYPE DEPTH

13) TYPE PUMP:
SUBMERSIBLE
DEPTH TO PUMP: 315

14) WELL TEST:
JETTED
YIELD: 45 GPM WITH FT DRAWDOWN AFTER HRS

15) WATER QUALITY:
TYPE OF WATER: GOOD DEPTH OF STRATA: 502 NO CHEMICAL ANALYSIS MADE
NO STRATA OF UNDESIRABLE WATER PENETRATED

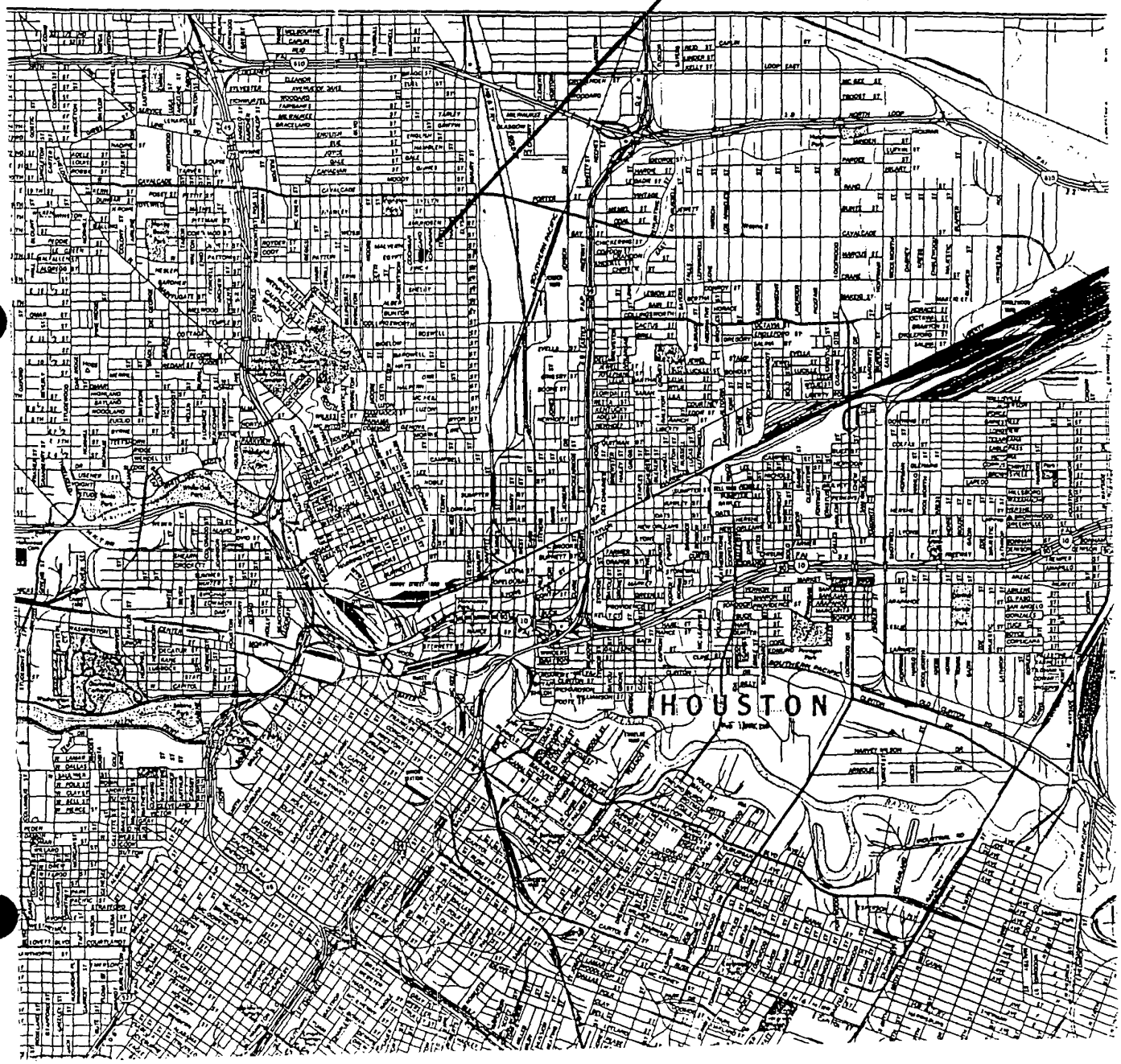
COMPANY NAME: ALMEDA WATER WELL SERVICE WATER WELL DRILLER'S LICENSE NO.: 843,2703,2843
ADDRESS: P. O. BOX 266 CITY: MANVEL STATE: TX ZIP CODE: 77578

FOR TDWR USE ONLY
WELL NO. 65-14-4
LOCATED ON MAP

I HEREBY CERTIFY THAT THIS WELL WAS DRILLED BY ME (OR UNDER MY SUPERVISION) AND THAT EACH AND ALL OF THE STATEMENTS HEREIN ARE TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF. I UNDERSTAND THAT FAILURE TO COMPLETE ITEMS 1 THRU 12 WILL RESULT IN THE LOG(S) BEING RETURNED FOR COMPLETION AND RESUBMITTAL.

(signed) A. S. Johnson III (LICENSED WATER WELL DRILLER) (signed) _____ (REGISTERED DRILLER TRAINEE)

WONG, KENT



65-14-15

Send original copy by certified mail to the Texas Water Development Board P. O. Box 13087 Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 65-14-11
Located on map yes
Received: 78
db

1) OWNER:
Person having well drilled Southwestern Plating Co. (Name) Address 2918 Gano St. (Street or RFD) (City) (State)

Landowner same (Name) Address same (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Harris, _____ miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

see reverse

North

(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.

Labor _____ League _____

Block _____ Survey _____

Abstract No. _____

(NW¼ NE¼ SW¼ SE¼) of Section _____

3) TYPE OF WORK (Check):
New Well X Deepening
Reconditioning Plugging

4) PROPOSED USE (Check):
Domestic Industrial X Municipal
Irrigation Test Well Other

5) TYPE OF WELL (Check):
Rotary X Driven Dug
Cable Jetted Bored

6) WELL LOG:
Diameter of hole 6 3/4 in. Depth drilled 462 ft. Depth of completed well 462 ft. Date drilled 6-21-77

All measurements made from -0- ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	24	clay
24	48	clay
48	72	sand & clay
72	96	clay
96	120	clay & sand
120	144	clay & sand
144	168	clay & sand
168	192	sand & clay
192	216	sand & clay
216	240	sand & clay
240	264	sand & clay

(Use reverse side if necessary)

9) Casing:
Type: Old New X Steel X Plastic Other
Cemented from 0 ft. to 462 ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
4"	0	439	sch 40

10) SCREEN:
Type rodbase
Perforated X Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
2 ½"	447	462	#12

7) COMPLETION (Check):
Straight wall Gravel packed Other
Under XX reamed Open Hole

8) WATER LEVEL:
Static level 272 ft. below land surface Date 6-21-77
Artesian pressure _____ lbs. per square inch Date _____
Depth to pump bowls, cylinder, jet, etc., 356 ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes No X If yes, by whom?
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.
Bailer test _____ gpm with _____ ft. drawdown after _____ hrs.
Artesian flow _____ gpm
Temperature of water _____

12) WATER QUALITY:
Was a chemical analysis made? Yes No X
Did any strata contain undesirable water? Yes No
Type of water? _____ depth of strata _____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R. B. Lowry (Type or Print) Water Well Drillers Registration No. 146

ADDRESS 1327 Aldine-Mail (Street or RFD) Houston (City) TX (State) 77039

(Signed) R B Lowry (Water Well Driller) Lowry Water Wells (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDBE-WD-6

001393

2) LOCATION OF WELL:

The sketch showing the well location must be as accurate as possible, showing landmarks, in sufficient detail so that the well may be plotted on a General Highway Map of the county in which the well is located.

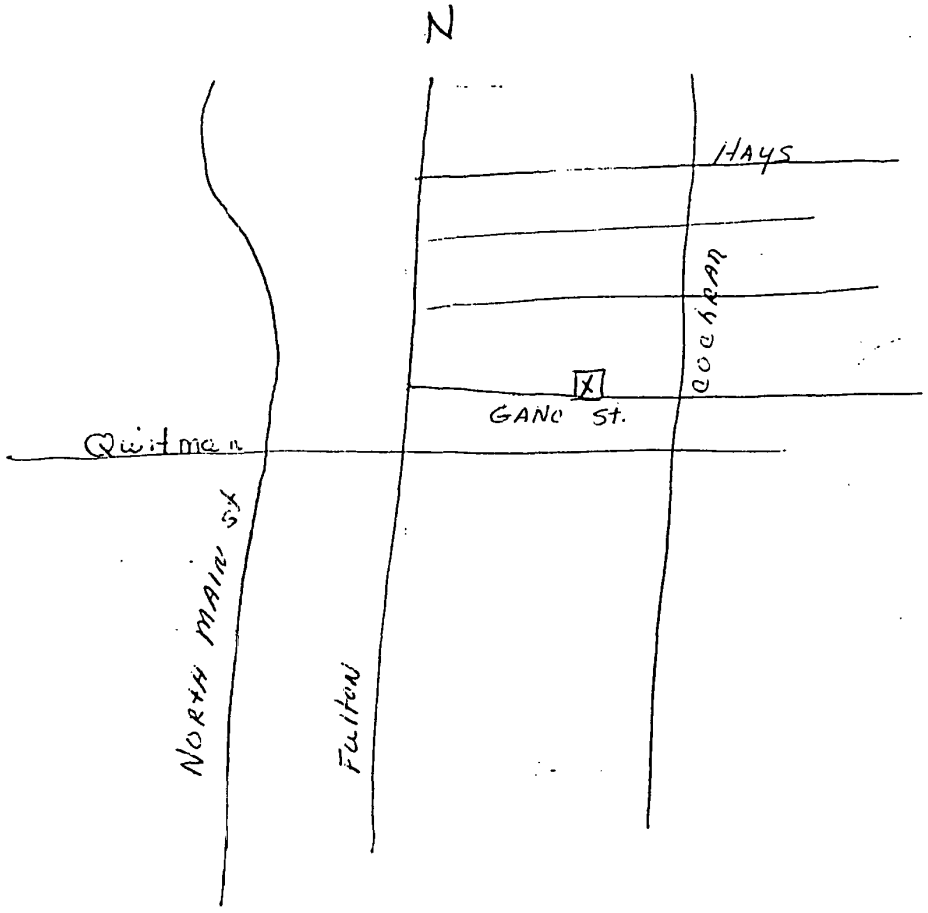
Reference points from which distances are measured and directions given should be of a permanent nature (e.g. highway intersections, center of towns, river and creek bridges, railroad crossings). The distance and direction from the nearest town should always be indicated.

When giving a legal description include a sketch showing location of the well within the described area. e.g. survey abstract.

Information furnished in Section 2) of the TWDBE-GW-53 is very important. Unless the well can be accurately located on a map the value of the other data contained in the Report is greatly reduced.

264	288	sand & clay
288	312	clay
312	336	clay
336	360	clay
360	384	clay
384	408	clay sand rock
408	432	clay
432	456	sand
456	462	sand & clay

RECEIVED
JUL 7 1978
Central Records
Texas Dept. of Water Resources



DEPT. OF
WATER RESOURCES

(2)

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board P. O. Box 13087 Austin, Texas 78711

1) OWNER C. H. Vaughn (Name) Address 5025 Madden (Street or RFD) Houston (City) Tx (State) (Zip)

2) LOCATION OF WELL: County Harris _____ miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☒ See attached map. – not attached

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled 4-12-85

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
	Surface	
6 3/4	0	292

From (ft.)	To (ft.)	Description and color of formation material
0	168	TS + Clay
168	193	Sand. L.W. Level
193	225	Clay
225	292	Sand 12-14

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other 2 String
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	PVC well Casing	0	280	
2 1/2	N	" Screen	280	292	

CEMENTING DATA
Cemented from _____ ft. to 280 ft.
Method used Pressure
Cemented by Plant Oil (Company or Individual)

9) WATER LEVEL:
Static level 180 ft. below land surface Date 4-13-85
Artesian flow _____ gpm. Date _____

10) PACKERS: Type 4X2½ K Packer Depth 275

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(Use reverse side if necessary)

11) TYPE PUMP: ☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., 235 ft.

12) WELL TESTS: ☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

COMPANY NAME All Water W. Wells (Type or Print) Water Well Driller's License No. 1929

ADDRESS 25330 Richard Rd (Street or RFD) Spring (City) Tx (State) 77386 (Zip)

(Signed) O. R. Billings (Licensed Water Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 65-14-41
Located on map yes C.F.S.

TDWR-0392 (Rev. 5-27-82) DEPARTMENT OF WATER RESOURCES COPY

001395

65-144(8)

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Donald Hall (Name) ADDRESS 11806 East Jamel Tomball Tex 77375 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Harris . 40 miles in NW (NE, SW, etc.) direction from Houston (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☒ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling: Started 4-15 19 94 Completed 4-19 19 94

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
6.0	Surface	220

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other Concrete

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	40	Fine Clay And Sand
40	80	Brown Clay White Clay
80	130	Sand Fine Water
130	160	Sand Stone And Sand
160	180	Clay Blue And White
180	200	Sand Ston
200	240	Fine Water Sand And Rock

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4	N	P.V.C Sc 40	0	220	
4	N	P.V.C Screen	220	240	10 GAL

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 0 ft. to 30 ft. No. of Sacks Used 10

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Poured

Cemented by Drilled

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☒ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level 165 ft. below land surface Date 4-19-94

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: ☐ Turbine ☒ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

RECEIVED MAY 23 1994 TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

ereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand at failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

OMPANY NAME A.C. Hughes (Type or print) WELL DRILLER'S LICENSE NO. 3248 WLK

DDRESS 12718 Arp St (Street or RFD) Houston (City) Texas (State) 77085 (Zip)

igned) Albert C Hughes (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

ease attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map 65-21-5

WD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

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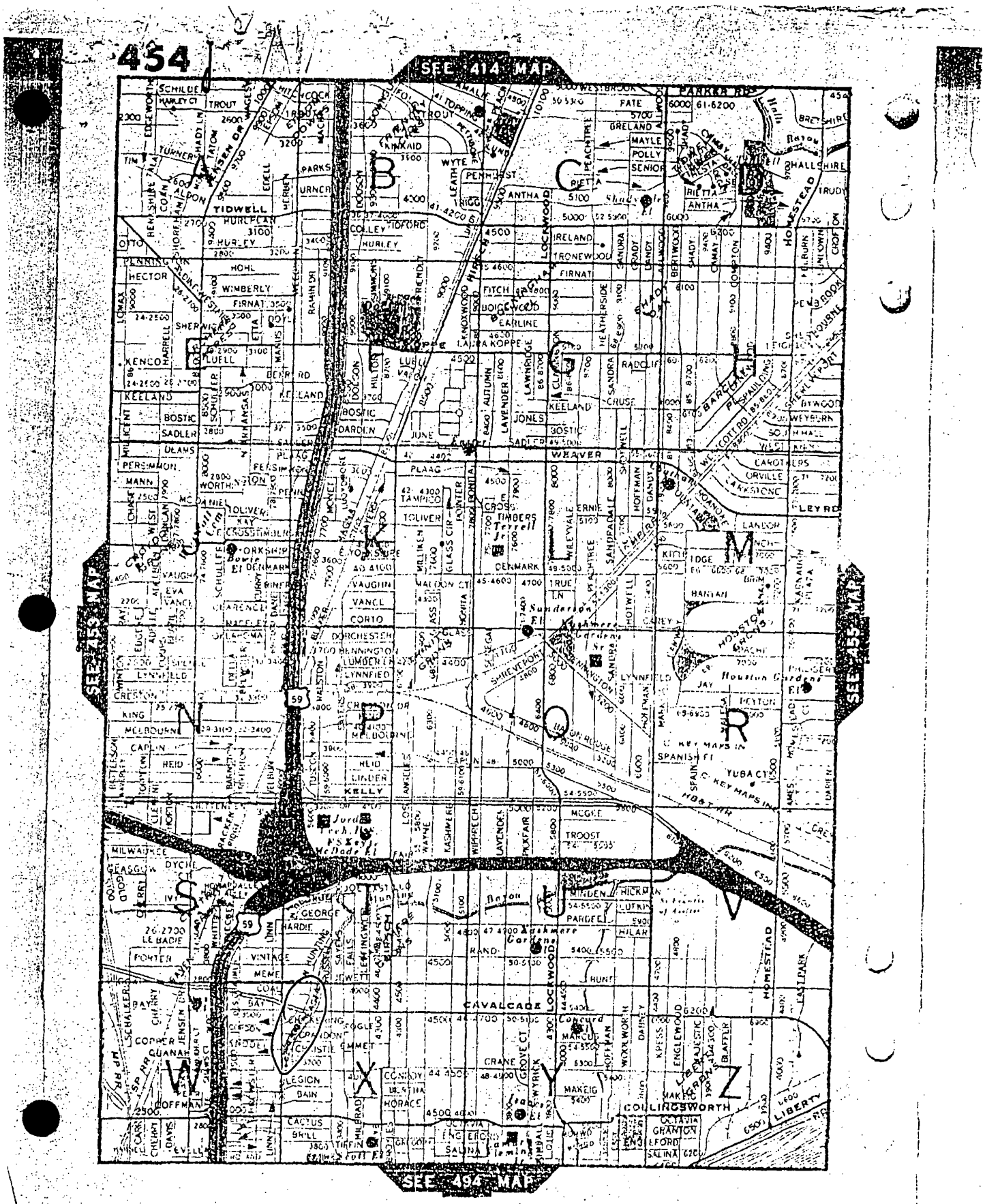
454
SEE 414 MAP
SEE 453 MAP
SEE 455 MAP
SEE 494 MAP
TIDWELL
WEAVER
KELLY
CAVALCADE
COLLINGSWORTH
LIBERTY
HOMESTEAD
LOCKWOOD
PARKER RD
59

4E(1)

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-17-4E
Located on map ✓
Received:

1) OWNER Rainbo Bakery (Name) Address Hwy 59 + Little York (Street or RFD) Houston (City) Tx (State) (Zip)

2) LOCATION OF WELL: County Harris app 35 miles in southeast (N.E., S.W., etc.) direction from Spring (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled 8-12-80

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface 0	345

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other 2 string
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	17	top soil + clay
17	25	sand
25	40	clay
40	50	sand
50	60	clay
60	78	sand
78	165	clay
165	198	sand
198	220	clay
220	240	sand
240	320	hard formation rock + clay
320	330	sand
330	345	hard formation clay + rock

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	To	Gage Casing Screen
4	N	P.V.C. Well casing	0	335	
2 1/2	N	P.V.C. slotted screen	335	345	#6

CEMENTING DATA
Cemented from 0 ft. to 335 ft.
Method used Pressure
Cemented by O. R. Billings (Company or Individual)

9) WATER LEVEL:
Static level 220 ft. below land surface Date 8-13-80
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Depth
4 x 2 1/2 K-Packers - 332

11) TYPE PUMP: None
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

12) WELL TESTS: None
☐ Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

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(Use reverse side if necessary)

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME O. R. Billings (Type or Print) Water Well Drillers Registration No. 1929

ADDRESS 25330 Richard Rd. (Street or RFD) Spring (City) Texas (State) 77373 (Zip)

(Signed) O. R. Billings (Water Well Driller) All Weather Water Well Inc. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79) DEPARTMENT OF WATER RESOURCES COPY

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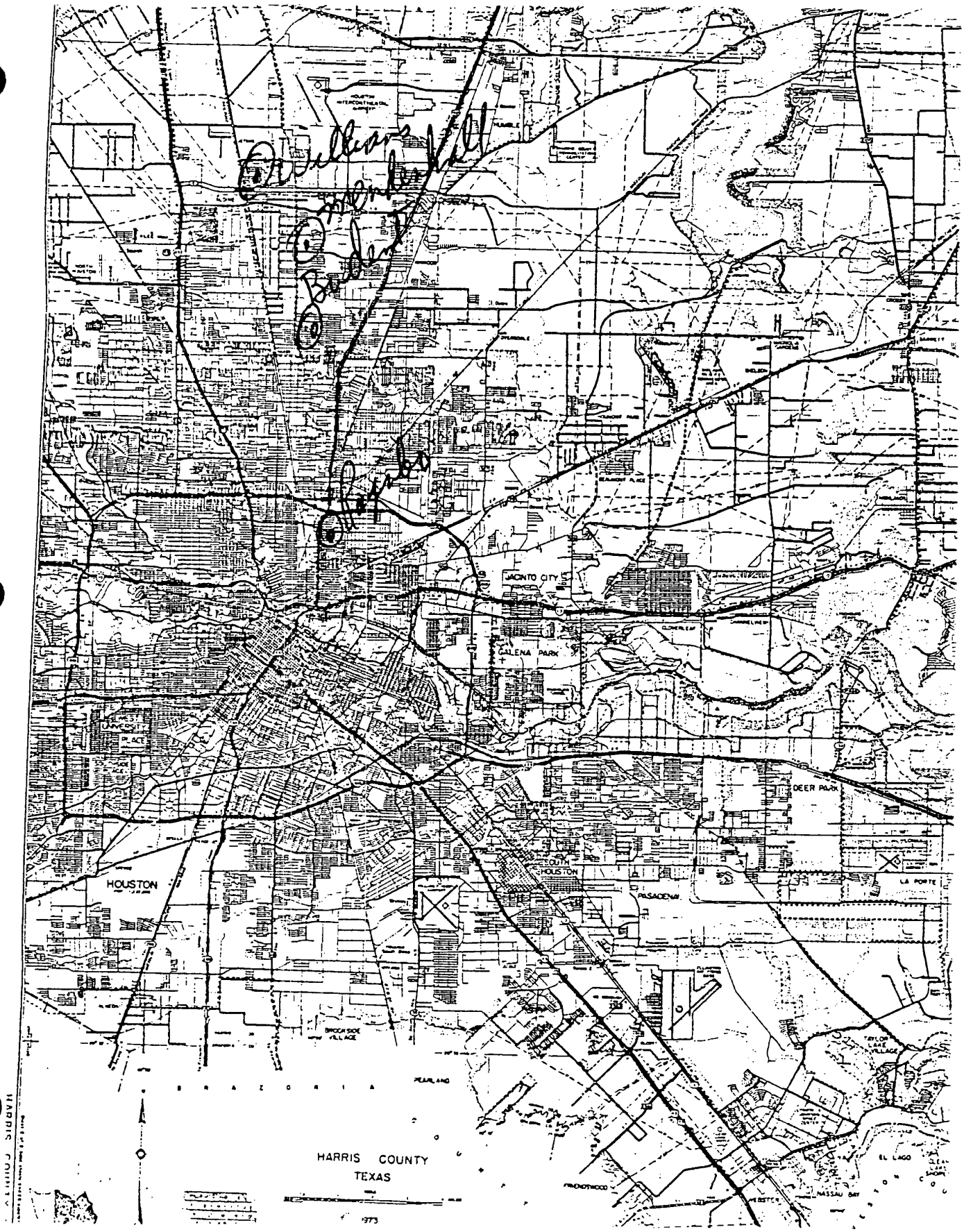
Williams
Menderhall
Bodent
Napoleo
JACINTO CITY
GALENA PARK
DEER PARK
SOUTH HOUSTON
PASADENA
LA PORTE
HOUSTON
BROOKSIDE VILLAGE
PEARLAND
TAYLOR LAKE VILLAGE
EL LAGO
NASSAU BAY
WEBSTER
FRIENDSWOOD
HARRIS COUNTY
TEXAS
1973

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Please use black ink.
Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board P. O. Box 13087 Austin, Texas 78711

1) OWNER Metal Enterprises, Inc (Name) Address 310 North Street (Street or RFD) Houston, Tx. 77002 (City) (State) (Zip)

2) LOCATION OF WELL: County Harris miles in (N.E., S.W., etc.) direction from (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ____ Block No. ____ Township ____
Abstract No. ____ Survey Name ____
Distance and direction from two intersecting section or survey lines ____

☐ See attached map. map on 65-05-5

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Public Supply ☒ Irrigation ☐ Test Well ☐ Other ____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ____

6) WELL LOG:

Date drilled 3-21-86

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
4 3/4	Surface	200'
6 3/4	"	179'

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ____
If Gravel Packed give interval . . . from ____ ft. to ____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	9'	Surface Clay
9'	10'	rock
10'	19'	surface clay
19'	20'	rock
20'	40'	red and yll clay
40'	60'	red and yellow clay
60'	80'	red and yellow clay
80'	100'	red and yellow clay
100'	110'	fine red sand
110'	130'	clay
130'	150'	clay
170'	176'	clay
176'	200'	sand and small gravel

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4"	N	SCH 40 PVC Casing	+24"	179'	
2½	N	Well Supplies, Inc.			
		PVC Screen	200'	180'	14ga.
2½	N	SCH 40 PVC Blank	180'	170'	

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 179 ft. to 60' ft.
____ ft. to ____ ft.
Method used Pressure Cement
Cemented by Raymond Water Wells

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 140 ft. below land surface Date ____
Artesian flow ____ gpm. Date ____

12) PACKERS: Type "K" Depth 170'

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13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☒ Cylinder ☐ Other Windmill
Depth to pump bowls, cylinder, jet, etc., 160' ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☒ Estimated
Yield: 3.5 gpm with 0 ft. drawdown after 3 hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ____ Depth of strata ____
Was a chemical analysis made? ☐ Yes ☒ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Raymond Water Wells (Type or Print) Water Well Driller's License No. 774

ADDRESS 10011 Airline Drive (Street or RFD) Houston, Texas 77037 (City) (State) (Zip)

(Signed) C. A. Raymond, Jr. (Licensed Water Well Driller) (Signed) ____ (Registered Driller Trainee)

For TDWR use only
Well No. 65-14-4
Located on map ____

Please attach electric log, chemical analysis, and other pertinent information, if available.

DEPARTMENT OF WATER RESOURCES COPY

TDWR-0392 (12/29/83)

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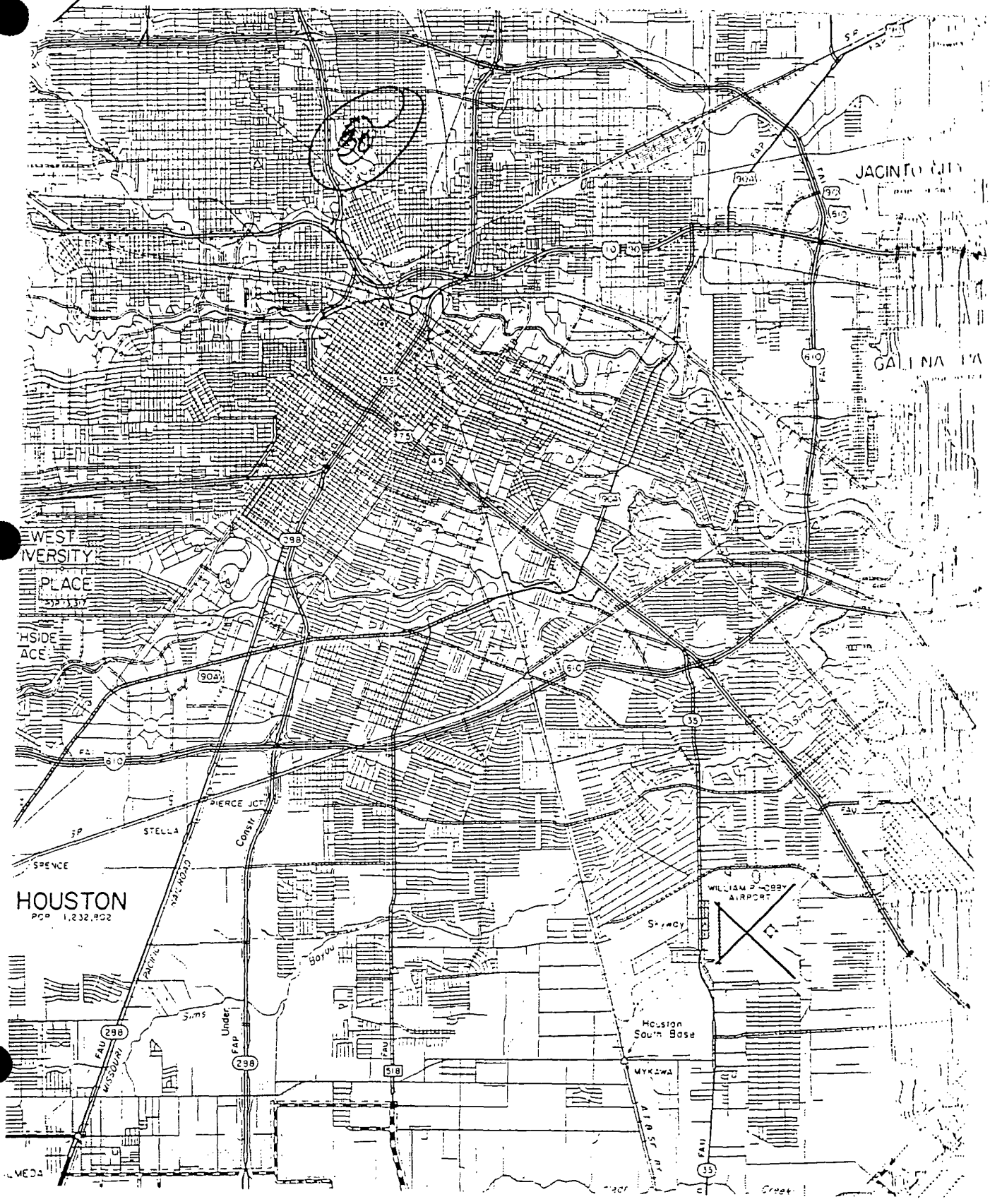

JACINTO CITY
GALENA PA
WEST
IVERSITY
PLACE
HSIDE
ACE
PIERCE JCT
STELLA
SPENCE
HOUSTON
WILLIAM P. HOBBY AIRPORT
Skyway
Houston South Base
MYKAWA
Bayou
Sims
Under
Constr
MISSOURI
PACIFIC
RAILROAD

WRD Exp. (GW)
April 1966

Well No. J-65-14-407

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by S.D. McAdoo F. Follett 1946 Source of date F. Ie Date 1-19-68 Map 1:25000 Sutleeogt 1955

State Texas 48 County (or town) Harris 4 J

Latitude: 29 47 28 N (deg 7 min 9 sec 11) Longitude: 095 20 35 (12 degrees 15 min sec 18) Sequential number: 1

Lat-long accuracy: 1 (20) T. ___ N S, R ___ E W, Sec ___, ___ k, ___ k, ___ k

Local well number: 1 (21) J-65-14-407 (30) Other number: ~~[illegible]~~ B&M 664 -3

Local use: Owner or name: Hunt-Wesson Foods, Inc.

Owner or name: HUNT FOODS Address: Houston, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, (K) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed W

DATA AVAILABLE: Well data 2 Freq. W/L meas.: Continuous 5 Field aquifer char.

Hyd. lab. data:

Qual. water data; type:

Freq. sampling: None Pumpage inventory: yes no, period:

Aperture cards: yes

Log date: E. Log (4-27) E

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 782 ft 782 Meas. rept Driller accuracy 3

Depth cased (first perf.) 464 ft 464 Casing type: S ; Diam. 14-7 in 14

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., screen, (S), (T) sd. pt., (U) shored, (X) open hole, (Z) other S

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: Aug 1946 946 Pump intake setting: ft

Driller: Layne-Texas Co. (name), Houston, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other T Shallow D

Power (type): diesel, elec, nat gas, gasoline, hand, gas, wind; H.P. 50 V Trans. or meter no.

Descrip. MP ft above below LSD, Alt. MP

Alt. LSD: 53 53 Accuracy: (source) Topo 3

Water Level 157 ft above below MP; Ft above below LSD 157 Accuracy: rept. up

Date meas: Aug. 1946 Yield: gpm Method determined

Drawdown: ft Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct K x 10^6 Temp. °F Date sampled

Taste, color, etc.

Well No. J-65-14-407

Well No. LJ-65-14-407

Latitude-longitude 29 47 38 (N) S 095 20 35.1
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: Coastal Plain 0 3 (20–21) Section: [illegible]

[illegible] E (22) Drainage Basin: 5 1 R (22–23) Subbasin: (24)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat (27)

MAJOR AQUIFER: system, series T (28–29) aquifer, formation, group E (30–31)

Lithology: (32–33) Origin: (34) Aquifer Thickness: ft

(35–37) Length of well open to: 115' ft 1 1 5 (38–40) Depth to top of: ft (41–43)

MINOR AQUIFER: system, series Q (44–45) aquifer, formation, group C L (46–47)

Lithology: (48–49) Origin: (50) Aquifer Thickness: ft

(51–53) Length of well open to: ft (54–56) Depth to top of: ft (57–59)

Intervals Screened: 464-501 (37); 502-522 (20); 684-715 (31); 717-734 (17); 757-767 (10).

Depth to consolidated rock: ft (60–63) Source of data: (64)

Depth to basement: ft (65–68) Source of data: (69)

Surficial material: (70–71) Infiltration characteristics: (72)

Coefficient Trans: gpd/ft (73–75) Coefficient Storage: (76–78)

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: (79)

455 of 14" O.D. Pipe
116' Lap of 7" Liner in 14" csg.
340 Top of 7" liner.

P/L = 242'
10 min recovery = 157'.

Well No. LJ-65-14-407

GPO 857-700

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-406

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

-0-

MASTER CARD

Record by R.B.A. (3-10-61) (T. BROWN) Source of data FILES Date 2-20-68 Map 1:24000 Settegast 1955

State Texas 48 County (or town) Harris LJ

Latitude: 294745 N Longitude: 0952010 Sequential number: 1

Lat-long accuracy: 1 T. ___ S, R ___ W, Sec ___, ___ ¼, ___ ¼, ___ ¼ B & M

Local well number: LJ-65-14-406 Other number: NORTHEAST #3

Local use: Owner or name: CITY OF HOUSTON

Owner or name: CITY OF HOUSTON Address:

Ownership: (C) County, (F) Fed Gov't, (H) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist M

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other P

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed W

DATA AVAILABLE: Well data 1 Freq. W/L meas.: 1944 -- Annual A Field aquifer char.

Hyd. lab. data:

Qual. water data; type:

Freq. sampling: 3-22-48 A Pumpage inventory: yes no, period:

Aperture cards: yes

Log data: E-LOG U-25 0-2510 D-LOG E D

WELL-DESCRIPTION CARD

WELL DRILLED TO 2510' & PLUGGED BACK TO 1993

SAME AS ON MASTER CARD Depth well: 1993 ft 1993 Meas. rept Driller accuracy 3

Depth cased (first perf.): 1143 ft 1143 Casing type: S ; Diam. 24-12¾ in 24

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other G

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: 5-15-44 944 Pump intake setting: ft

Driller: LAYNE-TEXAS CO. (name), HOUSTON, TEX. (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other T Deep Shallow D

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. 5 Trans. or meter no.

Descrip. MP ft above below LSD. Alt. MP

Alt. LSD: 50 50 Accuracy (source): Topo 5' 3

Water Level 111.68 ft above below MP; Ft above below LSD Accuracy:

Date meas: 6-21-44 644 Yield: 2525 gpm 2525 Method determined

Drawdown: 68 ft 68 Accuracy: USGS tape WD Pumping period 96 hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct K x 10⁶ Temp. °F Date sampled

Taste, color, etc.

PL 179.18
111.68
67.50

Well No. LJ-65-14-406

001404

Well No. LJ-65-14-406

Latitude-longitude 29 d, 47 m, 45 s (N) S 095 d, 20 m, 10 s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAINS [0 3] (20–21) Section:

[F] (22) Drainage Basin: [5 1 R] (23–25) Subbasin: [ ] (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat [ ] (27)

MAJOR AQUIFER: system, series [T] (28–29) aquifer, formation, group [E] (30–31)

Lithology: [ ] (32–33) Origin: [ ] (34) Aquifer Thickness: ft

[ ] (35–37) Length of well open to: 267 ft [2 6 7] (38–40) Depth to top of: ft [ ] (41–43)

MINOR AQUIFER: system, series [ ] (44–45) aquifer, formation, group [ ] (46–47)

Lithology: [ ] (48–49) Origin: [ ] (50) Aquifer Thickness: ft

[ ] (51–53) Length of well open to: ft [ ] (54–56) Depth to top of: ft [ ] (57–59)

Intervals Screened: 1,142'11" - 1969'6"

Depth to consolidated rock: ft [ ] (60–63) Source of data: [ ] (64)

Depth to basement: ft [ ] (65–68) Source of data: [ ] (69)

Surficial material: [ ] (70–71) Infiltration characteristics: [ ] (72)

Coefficient Trans: ✓ gpd/ft [ ] (73–75) Coefficient Storage: [ ] (76–78)

Coefficient Perm: ✓ gpd/ft^2; Spec cap: ✓ gpm/ft; Number of geologic cards: [ ] (79)

CASING:
558' of 24"
1,554 of 12 3/4"

12 3/4" from 439 to 1993

SURFACE CASING CEMENTED.
HOLE APPARENTLY 24" TO 1995'6" & GRAVEL PACKED.
TOP OF GRAVEL @ 455'
12 SCREENS @
1142'11" - 1146'11"
1149'5" - 1167'6"
1190'11" - 1209'10"
1220'3" - 1238'7"
1241' - 1259'10"
1300'6" - 1319'9"
1340'1" - 1354'7"
1379'10" - 1388'11"
1391'4" - 1409'6"
1514'5" - 1533'3"
1535'9" - 1553'6"
1574'11" - 1583'1"
1779'9" - 1799'
1801'6" - 1818'
1848'6" - 1863'5"
1865'10" - 1878'
1950'5" - 1969'6"

Well No. LJ-65-14-406

GPO 857-700

001405

(11-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
Water Resources Division
Austin, Texas

020978

Latitude ° ' "	Longitude ° ' "	Seq. No.
294745	095201	001

County code 201 County HARRIS

Well # LJ-65-14-406

Project number 7-4648-01000

Date 2-8-77 Time _____ Temp°C 28.5

Owner City of Houston

Address NORTHEAST #3

Date drld 5-15-44 WBF code 121 EVGL

Sample interval: (top) 1142 (bottom) 1969

Water level _____ Appr Clear Use PS

Collector Butler Yield — GPM

Smpld aftr pmpg _____ Depth 1993

Pt of coll top on discharge

Field: Cond _____ pH _____ HCO_3 _____ DO _____

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule _____

Other _____

Herbicide _____ Insecticide _____

Remarks:

Type 2 (1) Station identification number 294745095201001 (2–16)

Y M D (17–22) Begin

Time of measurement (29–32)

	Parameter code	Value	Exp.	Rmk
Depth	72008	1993	04	
Yield (GPM)	00059			
Sample interval ?	72015	1142	04	
Sample interval BOTTOM	72016	1969	04	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	2850	02		28.5
pH	00400	7900	01		7.9
Specific conductance	00095	6630	03		663
HCO_3	00440	3170	03		317
CO_3	00445	0000	01		0
Chloride (Cl)	00940	5700	02		57
Sulfate (SO_4)	00945	2800	01		2.8
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31625				
Streptococci	31673				
BOD	00310				

001406

(11-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
Water Resources Division
Austin, Texas

017564

Latitude ° ' "	Longitude ° ' "	Seq. No.
9 4 7 4 5	0 9 5 2 0	1 0 0 1

County code 201 County Harris

Well # LJ-65-14-406

Project number 4645-01000

Date 2-4-76 Time — Temp°C 29.0

Owner City of Houston

Address North East #3

Date drld — WBF code 121 EVGL

Sample interval: (top) 1142 (bottom) 1969

Water level — Appr Clear Use PS

Collector Moffat Yield — GPM

Smpld aftr pmpg continued Depth —

Pt of coll tap on discharge

Field: Cond ____ pH ____ HCO_3 ____ DO ____

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I

Other

Herbicide Insecticide

Remarks:

Type 2 Station identification number 2 9 4 7 4 5 0 9 5 2 0 1 0 0 1 (1–2, 2–9, 9–16)

Y M D 7 6 0 2 0 4 (17–22) Begin

Time of measurement (29–32)

	Parameter code	Value	Exp.	Rmk
Depth	7 2 0 0 8			
Yield (GPM)	0 0 0 5 9			
Sample interval	7 2 0 1 5	1 1 4 2	0 4	
Sample interval BOTTOM	7 2 0 1 6	1 9 6 9	0 4	
Water level	7 2 0 1 9			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	7 2 0 0 4				
DO (mg/l)	0 0 3 0 0				
DO % Sat.	0 0 3 0 1				
Temp °C	0 0 0 1 0	2 9 0 0	0 2		29.0
pH	0 0 4 0 0	8 1 0 0	0 1		8.1
Specific conductance	0 0 0 9 5	6 9 5 0	0 3		695
HCO_3	0 0 4 4 0	3 2 0 0	0 3		320
CO_3	0 0 4 4 5	0 0 0 0	0 1		0
Chloride (Cl)	0 0 9 4 0	6 3 0 0	0 2		63
Sulfate (SO_4)	0 0 9 4 5	5 2 0 0	0 1		5.2
Color	0 0 0 8 0				
Coliform, membrane filter	3 1 5 0 1				
Coliform, fecal	3 1 6 1 6				
Streptococci	3 1 6 7 9				
BOD	0 0 3 1 0				

Austin, Texas

015135

Latitude ° ' "	Longitude ° ' "	Seq. No.
29 47 45	095 20	001

County code 201 County Harris

Well # LJ-65-14-406

Project number 5-4648-01000

Date 2-3-75 Time ____ Temp°C 29.5

Owner City of Houston

Address Northeast # 3

Date drld 5-15-44 WBF code 121 EVCL

Sample interval: (top) 1142 (bottom) 1969

Water level ____ Appr ____ Use PS

Collector Naftel Yield ____ GPM

Smpld aftr pmpg on acc. Depth 1993

Pt of coll tap on pipe

Field: Cond ____ pH ____ HCO_3 ____ DO ____

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I + SO4

Other ____

Herbicide ____ Insecticide ____

Remarks:

Type 2 (1)

Station identification number 294745095201001 (2–16)

Y	M	D
75	02	03

17 Begin 22

Time of measurement ____ (29–32)

	Parameter code	Value	Exp.	Rmk
Depth	72008	1993	04	
Yield (GPM)	00059			
Sample interval TOP	72015	1142	04	
Sample interval BOTTOM	72016	1969	04	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	2950	02		29.5
pH	00400	7700	01		7.7
Specific conductance	00095	7210	03		721
HCO_3	00440	3290	03		329
CO_3	00445	0000	01		0
Chloride (Cl)	00940	7800	02		78
Sulfate (SO_4)	00945	4000	01		4.0
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Strep-tococci	31679				
BOD	00310				

001408

Water Resources Division
Austin, Texas

Latitude ° ' " | Longitude ° ' " | Seq. No.

29 47 45 | 095 20 10 | 01

County code 101 County Harris

Well # LJ-65-14-406

Project number T-4648-01000

Date 9-9-76 Time — Temp °C 20.0

Owner City of Houston

Address Northeast # 3

Date drld — WBF code 121 Evgl

Sample interval: (top) 1142 (bottom) 1969

Water level — Appr Clear Use PS

Collector King & Bezant Yield — GPM

Smpld aftr pmpg on arrival Depth —

Pt of coll tap on discharge

Field: Cond — pH — HCO_3 — DO —

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

1 chem schedule I

Other

Herbicide Insecticide

Remarks:

Type 2 (1) | Station identification number 294745095201001 (2–16)

Y M D: 76 09 09 (17–22) Begin

Time of measurement (29–32)

	Parameter code	Value	Exp.	Rmk
Depth	72008			
Yield (GPM)	00059			
Sample interval TOP	72015	1142	04	
Sample interval BOTTOM	72016	1969	04	
Water level	72019			

Sampled after pumping	Parameter code	Value	Exp.	Rmk	
	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	2000	02		20.0
pH	00400	7800	01		7.8
Specific conductance	00095	6580	03		658
HCO_3	00440	3190	03		319
CO_3	00445	0000	01		0
Chloride (Cl)	00940	5700	02		57
Sulfate (SO_4)	00945	2800	01		2.8
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Strep-tococci	31679				
BOD	00310				

(3)

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board P. O. Box 13087 Austin, Texas 78711

1) OWNER ASCRETE INC. (Name) Address 412 Hill Rd (Street or RFD) Houston (City) TX (State) 77037 (Zip)

2) LOCATION OF WELL: County Harris miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☒ See attached map. map on 65-14-4J

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

	DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
Date drilled 5-2-85	6 3/4	Surface 0	167

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	13	TS clay
13	32	Sand
32	44	Clay H-Form-
44	130	Clay
130	167	Sand 12-14

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	To	Gage Casing Screen
4	N	PVC Well Casing	0	157	
4	N	" Screen	157	167	

CEMENTING DATA
Cemented from _____ ft. to _____ ft.
Method used _____
Cemented by _____ (Company or Individual)

9) WATER LEVEL:
Static level 115 ft. below land surface Date 5-3-85
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Depth
Rubber 157 - 137 - 20

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(Use reverse side if necessary)

11) TYPE PUMP: ☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., 160 ft.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

12) WELL TESTS: ☐ Type Test: ☐ Pump ☒ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

COMPANY NAME ALLWEATHER W.W. Inc (Type or Print) Water Well Driller's License No. 1929

ADDRESS 25330 Richard Rd (Street or RFD) Spring (City) Tex (State) 77386 (Zip)

(Signed) O.R. Billings (Licensed Water Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 65-14-4K
Located on map yes C.F.S.

TDWR 0392 (Rev. 5-27-82)

DEPARTMENT OF WATER RESOURCES COPY

001410

Please use black ink.
Send original copy by certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER C. C. Kern (Name) Address 3406 Moore St. Houst TX 77009 (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Harris _____ miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

Map 7 ☒ See attached map. ~~Map no. 65-15-4A~~ Not on Map

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled ~~May~~ June 7+8 1983

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6½	Surface	230
3⅜	230	248

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Undereamed ☐ Gravel Packed ☐ Other Dual String
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0 -	5	Red Clay
5 -	24	yellow clay
24 -	28	red sand
28 -	52	red clay
52 -	74	Blue clay
74 -	101	sand
101 -	145	red sand
145 -	162	Blue clay
162 -	188	sand
188 -	210	red clay
210 -	230	Blue clay
230 -	248	sand

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	PVC	+2	230	40
2⅜	N	PVC slotted	228	248	12

9) CEMENTING DATA [Rule 319.44(b)]
Cemented from 230 ft. to ~~228~~ Surface ft.
_____ ft. to _____ ft.
Method used Halliburton
Cemented by Self

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 98 ft. below land surface Date ~~May~~ June 8
Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP:
☐ Turbine ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., 142 ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

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(Use reverse side if necessary)

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☒ No

I here by certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Johnson's Water Well (Type or Print) Water Well Driller's License No. 1807

ADDRESS 8933 Talcott Ln (Street or RFD) Houst (City) TX (State) 77049 (Zip)

(Signed) _____ (Licensed Water Well Driller) (Signed) _____ (Registered Driller Trainee) Dup

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TDWR use only
Well No. 65-14-4K
Located on map Yes DLP

DEPARTMENT OF WATER RESOURCES COPY

TDWR-0392 (12/29/83)

001411

GW 7

Send original copy by certified mail to the Texas Water Development Board P. O. Box 12386 Austin, Texas 78711	State of Texas WATER WELL REPORT	For TWDB use only Well No. 68-14-7C Located on map 6 Received: 6 Form GW 8 Form GW 9

1) OWNER:
Person having well drilled Olds Press & Forge (Name) Address 3303 Carr St. Houston, Tex. (Street or RFD) (City) (State)

Landowner Same (Name) Address (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Harris Labor League Abstract No.

NW¼ NE¼ SW¼ SE¼ of Section Block No. Survey
(Circle as many as are known)

miles in (NE., SW., etc.) direction from (Town).

NORTH

LOCATION OF WELL: 3303 Carr St. Houston, Texas.

Sketch map of well location with distances from adjacent section or survey lines, and to landmarks, roads, and creeks.

3) TYPE OF WORK (Check):
New Well ☒ Deepening ☐
Reconditioning ☐ Plugging ☐

4) PROPOSED USE (Check):
Domestic ☐ Industrial ☒ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

5) TYPE OF WELL (Check):
Rotary ☒ Driven ☐ Dug ☐
Cable ☐ Jetted ☐ Bored ☐

6) WELL LOG:
Diameter of hole 4" in. Depth drilled 302 ft. Depth of completed well 302 ft. Date drilled 5/19/66

All measurements made from 0 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material	From (ft.)	To (ft.)	Description and color of formation material
0	56	Surface & Hard Red Clay	260	262	Sand - Shale
56	64	Fine Broken Red Sand	262	265	Soft Sandy Shale
64	96	Red Clay, Light Sand Breaks	265	272	Sand
96	120	Yellow Clay	272	277	Shale, Sandy
120	154	Yellow Clay, Sand Streaks	277	303	Sand, Good
154	192	Sand, Top Loose			
192	216	Sand & Gravel			
216	260	Red Shale			(Use reverse side if necessary)

7) COMPLETION (Check):
Straight wall ☒ Gravel packed ☐ Other ☐
Under reamed ☐ Open hole ☐

8) WATER LEVEL:
Static level 145 ft. below land surface Date 5/19/66
Artesian pressure lbs. per square inch Date

9) CASING:
Type: old ☐ New ☒ Steel ☒ Plastic ☐ Other ☐
Cemented from 0 ft. to 279 ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
4"	0	277	9½ #

10) SCREEN:
Type Stainless
Perforated ☒ Slotted ☐

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot size
2½"	282	302	.011

11) WELL TESTS:
Was a pump test made? ☐ Yes ☐ No If yes by whom?
Yes with air
Yield: gpm with ft. drawdown after hrs
Bailer test gpm with ft. drawdown after hrs
Artesian flow gpm Date
Temperature of water
Was a chemical analysis made? ☐ Yes ☒ No
Did any strata contain undesirable water? ☐ Yes ☐ No
Type of water? depth of strata

12) PUMP DATA:
Manufacturer's Name McDonald Mfg. Co
Type Submersible H.P. 2 HP
Designed pumping rate gpm ☐ gph ☐
Type power unit Electric
Depth to bowls, cylinder, jet, etc., 210' ft. below land surface.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R. B. Lowry (Type or Print) Water Well Drillers Registration No. 146

Address 4012 Fulton Street (Street or RFD) Houston (City) Texas (State)

(Signed) R B Lowry (Water Well Driller) LOWRY WATER WELLS (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

001412

Send original copy by certified mail to the Texas Water Development Board P. O. Box 13087 Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 25-14-7F
Located on map yes
Received: 75
dlr

1) OWNER:
Person having well drilled Olds Press and Forge (Name) Address 3303 Carr St. Houston, TX (Street or RFD) (City) (State)

Landowner Same (Name) Address Same (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Harris, _____ miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

SEE REVERSE SIDE

North

(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.

Labor _____ League _____

Block _____ Survey _____

Abstract No. _____

(NW¼ NE¼ SW¼ SE¼) of Section _____

3) TYPE OF WORK (Check): New Well X, Deepening, Reconditioning, Plugging

4) PROPOSED USE (Check): Domestic, Industrial X, Municipal, Irrigation, Test Well, Other

5) TYPE OF WELL (Check): Rotary X, Driven, Dug, Cable, Jetted, Bored

6) WELL LOG:
Diameter of hole 4 in. Depth drilled 302 ft. Depth of completed well 302 ft. Date drilled 12-20-74

All measurements made from 0 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	24	Surface Clay
24	48	Clay
48	72	Clay and Sand
72	96	Clay
96	120	Clay and Sand Streaks
120	144	Sand and Gravel
144	168	Sand and Clay
168	192	Sand and Gravel
192	216	Sand and Clay
216	240	Clay and Sand
240	264	Sand and Shell
264	302	Sand

(Use reverse side if necessary)

9) Casing:
Type: Old, New, Steel X, Plastic, Other

Cemented from _____ ft. to _____ ft.

Diameter (inches)	Setting From (ft.)	To (ft.)	Gage

10) SCREEN:
Type Stainless steel rod base

Perforated X, Slotted

Diameter (inches)	Setting From (ft.)	To (ft.)	Slot Size
#12 guage	292	302	
2½" Blank	278	292	

7) COMPLETION (Check):
Straight wall X, Gravel packed, Other, Under reamed, Open Hole

8) WATER LEVEL:
Static level 152 ft. below land surface Date 12-20-74

Artesian pressure _____ lbs. per square inch Date _____

Depth to pump bowls, cylinder, jet, etc., 283 ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes, No X If yes, by whom?

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

Bailer test _____ gpm with _____ ft. drawdown after _____ hrs.

Artesian flow _____ gpm

Temperature of water _____

12) WATER QUALITY:
Was a chemical analysis made? Yes, No X

Did any strata contain undesirable water? Yes, No

Type of water? _____ depth of strata _____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME R. B. Lowry (Type or Print) Water Well Drillers Registration No. 146

ADDRESS 4012 Fulton; P. O. Box 8707; Houston, TX 77009 (Street or RFD) (City) (State)

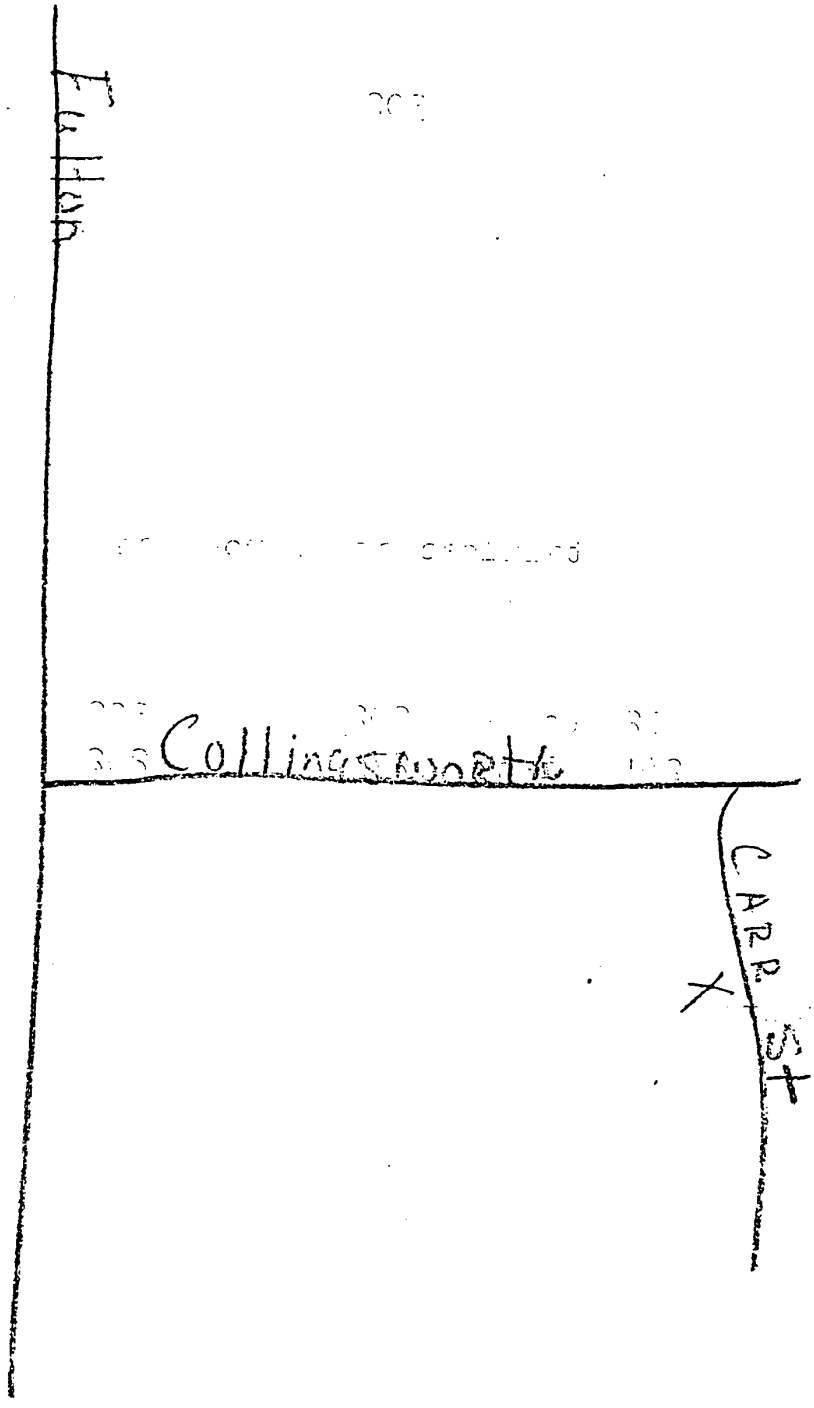
(Signed) R B Lowry (Water Well Driller) LOWRY WATER WELLS (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDBE-WD-8

001413



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MAY 13 1975
Central Records
Texas Water Development

DEVELOPMENT BOARD

DUP

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-14-7J
Located on map YES
Received: TH

1) OWNER Harris-Galveston Coastal Subsidence District (Name) Address P. O. Box 58847 (Street or RFD) Houston (City) Texas (State) 77058 (Zip)

2) LOCATION OF WELL: County Harris 5 miles in N.E. (N.E., S.W., etc.) direction from Houston (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☒ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG: #4
Date drilled 2-29-80

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
7-7/8	Surface	487

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
		See Attached

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½	N	Steel	+2	467	.237
2½	N	Steel	457	472	
2½	N	SST Screen	472	482	
2½	N	Steel	482	487	

CEMENTING DATA
Cemented from 0 ft. to 467 ft.
Method used Pressure
Cemented by Halliburton (Company or Individual)

9) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Lead Depth 457

11) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

(Use reverse side if necessary)

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☒ Yes ☐ No

12) WELL TESTS: ☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME James O'Connor (Type or Print) Water Well Drillers Registration No. 999

ADDRESS 5931 Brittmoore (Street or RFD) Houston (City) Texas (State) 77041 (Zip)

(Signed) James O'Connor (Water Well Driller) LAYNE-WESTERN COMPANY, INC. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79) DEPARTMENT OF WATER RESOURCES COPY

001415

EXHIBIT C

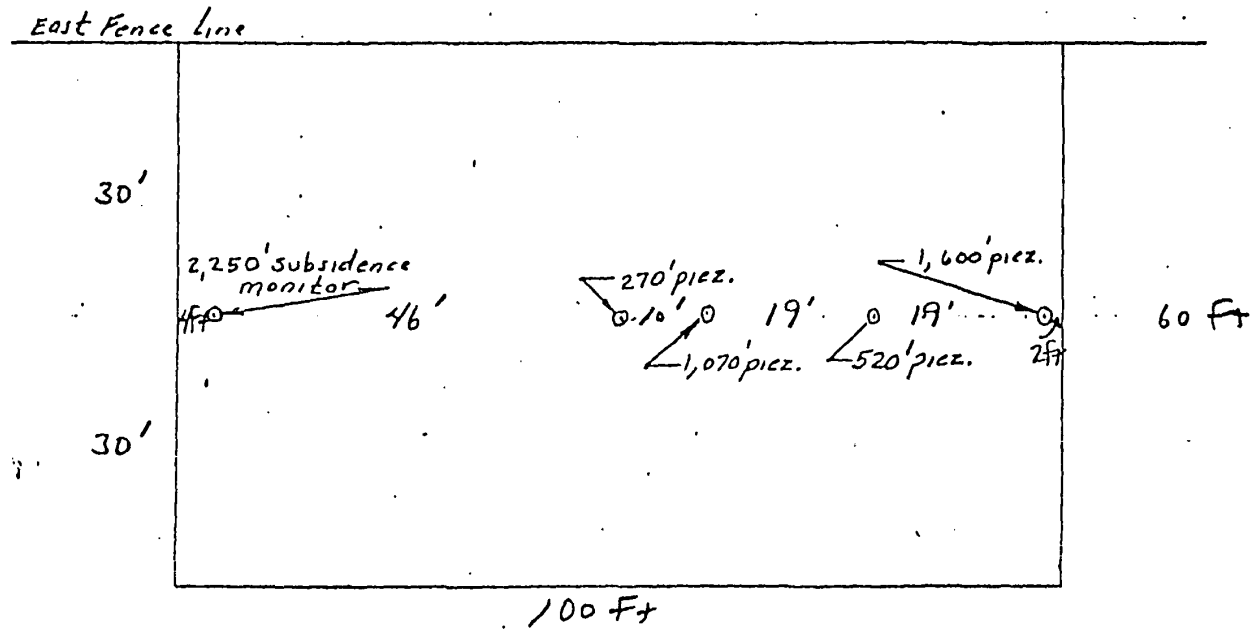
SUBSIDENCE MONITOR/PIEZOMETERS

WELL SYSTEM CONSTRUCTION SITE

NORTHEAST

The construction site is located adjacent to the easterly boundary of the City of Houston Northeast Well Field Plant Yard; said Plant Yard being a tract of land located in the J. S. Collins Survey, Abstract 15, bounded on the north side by Brill Street, on the east side by Tuffly Park, and on the west side by Linn Street.

001416



Northeast site
Layout of piezometers and subsidence monitor
scale: 1" = 20 feet

Layne-Western Company, Inc. A Marley Company
P.O. Box 79009 · Houston, Texas 77079 · 713/466-5001

L O G - WELL #4 NORTHEAST PLANT SITE

0	3	Top Soil
3	15	Clay
15	20	Sand
20	35	Clay
35	40	Sand
40	130	Clay
130	140	Sand
140	169	Clay
169	175	Sand
175	180	Clay
180	243	Sand
243	270	Clay
270	301	Sand
301	360	Clay
360	379	Sand
379	385	Clay
385	401	Sand
401	415	Clay
415	430	Sand
430	445	Clay
445	488	Sand
488	490	Clay

HOUSTON
WEST UNIVERSITY PLACE

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Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT
ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-14-7J
Located on map YES
Received: TH

1) OWNER Harris-Galveston Coastal Subsidence District (Name) Address P. O. Box 58847 (Street or RFD) Houston (City) Texas (State) 77041 (Zip)

2) LOCATION OF WELL: County Harris 5 miles in N.E. (N.E., S.W., etc.) direction from Houston (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☒ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG: #3
Date drilled 2-15-80

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
7-7/8	Surface	1033

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
See Attached		

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½	N	Steel	+2	1013	.237
2½	N	Steel	1003	1018	
2½	N	SST Screen	1018	1028	
2½	N	Steel	1028	1033	

CEMENTING DATA
Cemented from 0 ft. to 1013 ft.
Method used Pressure
Cemented by Halliburton (Company or Individual)

9) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Lead Depth 1003

11) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

(Use reverse side if necessary)

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☒ Yes ☐ No

12) WELL TESTS: ☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME James O'Connor (Type or Print) Water Well Drillers Registration No. 222

ADDRESS 5931 Brittmoore (Street or RFD) Houston (City) Texas (State) 77041 (Zip)

(Signed) James O'Connor (Water Well Driller) LAYNE-WESTERN COMPANY, INC. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

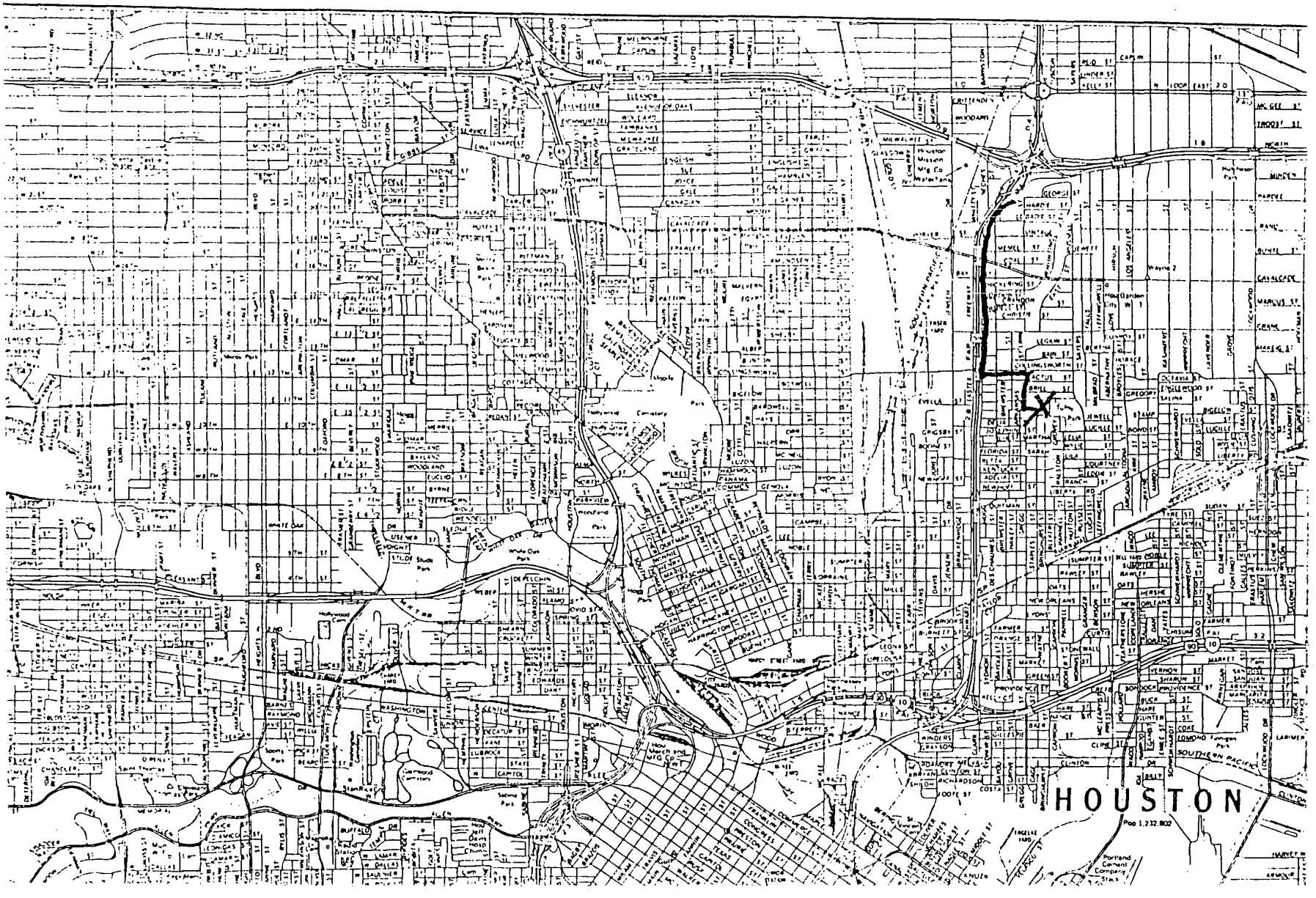
TDWR-0392 (Rev. 1-12-79) DEPARTMENT OF WATER RESOURCES COPY

001420

Layne-Western Company, Inc. A Marley Company
P.O. Box 79009 · Houston, Texas 77079 · 713/466-5001

L O G - WELL #3 NORTHEAST PLANT SITE

0	3	Top Soil
3	60	Clay
60	80	Sand
80	100	Clay
100	140	Sand
140	170	Clay
170	175	Sand
175	182	Clay
182	245	Sand
245	270	Clay
270	300	Sand
300	360	Clay
360	380	Sand
380	385	Clay
385	400	Sand
400	415	Clay
415	430	Sand
430	445	Clay
445	490	Sand
490	530	Clay
530	540	Sand
540	575	Clay
575	600	Sand
600	620	Clay
620	660	Sand
660	715	Clay
715	730	Sand
730	775	Clay
775	780	Sand
780	815	Clay
815	850	Sand
850	895	Clay
895	910	Sand
910	935	Clay
935	970	Sand
970	1009	Clay
1009	1036	Sand


HOUSTON

24.

P/216

Please use black ink.
Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

Texas Water Well Drillers Board
P. O. Box 13087
Austin, Texas 78711

1) OWNER Houston International Teleport, Inc. (Name) Address 3003 Moffett (Street or RFD) Houston, Tx. (City) (State) (Zip)

2) LOCATION OF WELL: County Harris miles in (N.E., S.W., etc.) direction from (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. Block No. Township
Abstract No. Survey Name
Distance and direction from two intersecting section or survey lines

☒ See attached map. No Map

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☒ Industrial ☒ Public Supply ☐ Irrigation ☐ Test Well ☐ Other

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other

6) WELL LOG:

Date drilled 4-11-85

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
4 3/4	Surface	80'
10"	"	60'

From (ft.)	To (ft.)	Description and color of formation material
0	20	top soil & black Clay
20	40	gray clay
40	60	gray clay
60	80	sand 12 ga.

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☒ Other Two-String
If Gravel Packed give interval . . . from ft. to ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
6"	N	Class 200 PVC Casing +24"		60	
4"	N	Well Supplies, Inc.			
		Screen	80'	60'	12ga
4"	N	PVC Blank Liner	60'	64'	

9) CEMENTING DATA (Rule 319.44(b)]
Cemented from 60 ft. to Surface ft.
ft. to ft.
Method used Pressure cement
Cemented by Raymond Water Wells

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 319.44(c)]
☐ Pitless Adapter Used [Rule 319.44(d)]
☐ Approved Alternative Procedure Used [Rule 319.71]

11) WATER LEVEL:
Static level 30' ft. below land surface Date
Artesian flow gpm. Date

12) PACKERS: Type Depth

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(Use reverse side if necessary)

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other
Depth to pump bowls, cylinder, jet, etc., 60' ft.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☒ No

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☒ Estimated
Yield: 27 gpm with 5 ft. drawdown after 4 hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 12 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Raymond Water Wells (Type or Print) Water Well Driller's License No. 774

ADDRESS 10011 Airline Dr. (Street or RFD) Houston, Tx. 77037 (City) (State) (Zip)

(Signed) C. A. Raymond Jr. (Licensed Water Well Driller) (Signed) (Registered Driller Trainee)

For TDWR use only
Well No. 65-14-7N
Located on map Yes DLF

Please attach electric log, chemical analysis, and other pertinent information, if available.

DEPARTMENT OF WATER RESOURCES COPY

TDWR-0392 (12/29/83)

001423

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-735

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by RS SONENSHEIN Source of data DRILLER & OBS Date 2-11-80 Map SETTEGAST, TX 1967 1:24,000

State TEXAS 48 County (or town) HARRIS LJ

Latitude: 2947 28 N Longitude: 0952001 Sequential number: 2

Lat-long accuracy: 1 T ___ S, R ___ W, Sec ___

Local well number: LJ-65-14-735 Other number: NORTHEAST No. 2 B & M

Local use: Owner or name: HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT

Owner or name: HGCSD Address: 1730 NASA RD 1

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist 5

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other U

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. Ø

DATA AVAILABLE: Well data 2 Freq. W/L meas.: MONTHLY M Field aquifer char. T

Hyd. lab. data:

Qual. water data; type: partial P

Freq. sampling: ORIGINAL Ø Pumpage inventory: yes no period:

Aperture cards: yes

Log data: DRILLER'S log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 1596 ft 1596 Meas. rept accuracy 3

Depth cased (first perf.) 1567 ft 1567 Casing type: steel ; Diam. 4½-2½ in 4

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other S

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: FEB 1980 980 Pump intake setting: NONE ft

Driller: O'DAY DRLG CO. (name), PEARLAND, TX (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other N Deep Shallow

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. —— Trans. or meter no.

Descrip. MP top of casing +2.0 ft above below LSD, Alt. MP

Alt. LSD: 49 49 Accuracy (source): 5' TOPO 3

Water Level 397.55 ft above below MP; Ft above below LSD 398 Accuracy: steel tape A

Date meas: 4-24-80 480 Yield: 15 gpm 15 Method determined 1

Drawdown: ft Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron ppm Sulfate pH 8.8 ppm 9 Chloride ppm HCO3 Hard. 390 ppm 7

Sp. Conduct 980 K x 10^6 4 Temp. 77.5 °F 78 Date sampled 2-8-80 280

Taste, color, etc.

Well No.

001424

Well No. LJ-65-14-235

Latitude-longitude N S d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAIN 0 3 (20–21) Section: WEST GULF

F (22) Drainage Basin: 5 1 R (23–25) Subbasin: (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat — (27) F

MAJOR AQUIFER: system, series T F (28–29) EVANGELINE aquifer, formation, group E (30–31)

Lithology: 5 (32–33) Origin: 3 (34) Aquifer Thickness: 42 ft

4 2 (35–37) Length of well open to: 10 ft 1 0 (38–40) Depth to top of: 1540 ft A 5 4 (41–43)

MINOR AQUIFER: system, series (44–45) aquifer, formation, group (46–47)

Lithology: (48–49) Origin: (50) Aquifer Thickness: ft

(51–53) Length of well open to: ft (54–56) Depth to top of: ft (57–59)

Intervals Screened: 1567-1577 SS WW NO. 10 GAUGE 2½" OD

Depth to consolidated rock: ft (60–63) Source of data: (64)

Depth to basement: ft (65–68) Source of data: (69)

Surficial material: (70–71) Infiltration characteristics: (72)

Coefficient Trans: 21 gpd/ft 2 0 0 (73–75) Coefficient Storage: (76–78)

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: (79)

sample for water quality obtained by jetting with air

Well No.

GPO 857-700

001425

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-738

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by RS SONENSHEIN Source of data DRILLER & OBS Date 2-13-80 Map SETTEGAST, TX 1967 1:24,000

State TEXAS [4 8] County (or town) HARRIS [L J]

Latitude: 2 9 4 7 2 8 N (deg, min, sec) Longitude: 0 9 5 2 0 0 1 (degrees, min, sec) Sequential number: 3

Lat-long accuracy: 1 T ___ S, R ___ W, Sec ___, ___ ¼, ___ ¼, ___ ¼

Local well number: LJ-65-14-738 Other number: NORTHEAST No 4 (B & M)

Local use: ___ Owner or name: HARRIS - GALVESTON COASTAL SUBSIDENCE DISTRICT

Owner or name: HGCSD Address: 1730 NASA RD 1

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist [S]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other [U]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. [Ø]

DATA AVAILABLE: Well data [2] Freq. W/L meas.: MONTHLY [M] Field aquifer char. [T]

Hyd. lab. data: ___

Qual. water data; type: partial [P]

Freq. sampling: ORIGINAL [Ø] Pumpage inventory: yes (no) period: ___

Aperture cards: ___ yes

Log data: DRILLER'S [D]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 487 ft [4 8 7] Meas. rept accuracy [3]

Depth cased (first perf.): 472 ft [4 7 2] Casing type: steel; Diam. 4½-2½ in [4]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other [S]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other [H]

Date Drilled: FEB 1980 [9 8 0] Pump intake setting: NONE ft

Driller: O'DAY DRLG CO (name), PEARLAND, TX (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other [N] Deep Shallow

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. — Trans. or meter no. —

Descrip. MP top of casing +2.0 ft above/below LSD, Alt. MP ___

Alt. LSD: 49 [4 9] Accuracy (source): 5' TOPO [3]

Water Level 264.69 ft above/below MP; Ft above/below LSD [2 6 5] Accuracy: steel tape [A]

Date meas: 3-18-80 [3 8 0] Yield: 7.5 gpm [8] Method determined [1]

Drawdown: ___ ft Accuracy: ___ Pumping period ___ hrs

QUALITY OF WATER DATA: Iron ___ ppm ~~Sulfate~~ pH 8.7 ppm [9] Chloride ___ ppm ~~Hard.~~ HCO3 200 ppm [5]

Sp. Conduct 500 K x 10^6 [3] Temp. 73.5 °F [7 3] Date sampled 2-15-80 [2 8 0]

Taste, color, etc.

Well No.

Well No. LJ-65-14-738

Latitude-longitude ____ N/S ____ d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAIN (20–21) 03 Section: WEST GULF

(22) F Drainage Basin: (23–25) 51R Subbasin: ____ (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ____ (27) F

MAJOR AQUIFER: ____ system, ____ series (28–29) Q ____ aquifer, formation, group Chicot (30–31) C

Lithology: ____ (32–33) S Origin: ____ (34) 3 Aquifer Thickness: 66 ft

(35–37) 66 Length of well open to: 70 ft (38–40) 10 Depth to top of: 476 ft (41–43) 476

MINOR AQUIFER: ____ system, ____ series (44–45) ____ aquifer, formation, group ____ (46–47)

Lithology: ____ (48–49) Origin: ____ (50) Aquifer Thickness: ____ ft

(51–53) Length of well open to: ____ ft (54–56) Depth to top of: ____ ft (57–59)

Intervals Screened: 472-482 SSWW No 10 ga 2½" OD

Depth to consolidated rock: ____ ft (60–63) Source of data: ____ (64)

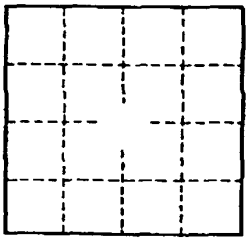
Depth to basement: ____ ft (65–68) Source of data: ____ (69)

Surficial material: ____ (70–71) Infiltration characteristics: ____ (72)

Coefficient Trans: 157 gpd/ft (73–75) 161 Coefficient Storage: ____ (76–78)

Coefficient Perm: ____ gpd/ft^2; Spec cap: ____ gpm/ft; Number of geologic cards: ____ (79)

sample for water quality obtained by jetting with air



Well No.

GPO 857-700

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-742

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by RS SONENSHEIN Source of data DRILLER & OBS Date 2-21-80 Map SETTEGAST, TX 1967 1:24,000

State TEXAS 48 County (or town) HARRIS LJ

Latitude: 29 47 28 N (deg, min, sec) Longitude: 095 20 01 (degrees, min, sec) Sequential number: 4

Lat-long accuracy: 1 T ___ N S, R ___ E W, Sec ___, ___ ¼, ___ ¼, ___ ¼ ___

Local well number: LJ-65-14-742 Other number: NORTHEAST NO. 3 B & M

Local use: Owner or name: HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT

Owner or name: HGCSD Address: 1730 NASA RD 1

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — 67 S

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other — 68 U

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (Ø) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. — 69 Ø

DATA AVAILABLE: Well data 2 Freq. W/L meas.: MONTHLY M Field aquifer char. 72 T

Hyd. lab. data: 73

Qual. water data; type: partial 74 P

Freq. sampling: ORIGINAL Ø Pumpage inventory: yes (no) period: 76

Aperture cards: yes 77

Log data: DRILLER'S log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 1035 ft 1035 Meas. rept accuracy 24 3

Depth cased: (first perf.) 1020 ft 1020 Casing type: STEEL ; Diam. 4½-2½ in 4

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (Ø) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other — 31 S

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other — 32 H

Date Drilled: Feb 1980 980 Pump intake setting: NONE ft

Driller: O'DAY DRLG Co (name), PEARLAND, TX (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple, (cent.) (M) multiple, (turb.) (N) hand, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other N Deep Shallow

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. — Trans. or meter no. —

Descrip. MP top of csng +2.0 ft above/below LSD, Alt. MP

Alt. LSD: 49 49 Accuracy: (source) 5' TOPO 47 3

Water Level 326.10 ft above/below MP; Ft above/below LSD 326 Accuracy: steel tape 52 A

Date meas: 4-24-80 480 Yield: 8.5 gpm 9 Method determined 1

Drawdown: ft Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron ppm Sulfate 8.7 ppm 9 Chloride ppm HCO3 Hard. 200 ppm

Sp. Conduct 500 K x 10^6 3 Temp. 76 °F 76 Date sampled 2-23-80 280

Taste, color, etc.

Well No.

Well No. LJ-65-14-242

Latitude-longitude ___ d ___ m ___ s N S ___ d ___ m ___ s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAIN [0 3] (20–21) Section: WEST GULF

[F] (22) Drainage Basin: [5 1 R] (23–25) Subbasin: [ ] (26)

Topo of well site: (D) depression, (C) stream channel, (B) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat [F] (27)

MAJOR AQUIFER: ___ system, ___ series [T F] (28–29) EVANGELINE aquifer, formation, group [E] (30–31)

Lithology: [S] (32–33) Origin: [3] (34) Aquifer Thickness: 39 ft

[3 9] (35–37) Length of well open to: 10 ft [1 0] (38–40) Depth to top of: 1010 ft [A 0 1] (41–43)

MINOR AQUIFER: ___ system, ___ series [ ] (44–45) ___ aquifer, formation, group [ ] (46–47)

Lithology: [ ] (48–49) Origin: [ ] (50) Aquifer Thickness: ___ ft

[ ] (51–53) Length of well open to: ___ ft [ ] (54–56) Depth to top of: ___ ft [ ] (57–59)

Intervals Screened: 1020 - 1030 SSWW No. 10 ga 2½" OD

Depth to consolidated rock: ___ ft [ ] (60–63) Source of data: ___ (64)

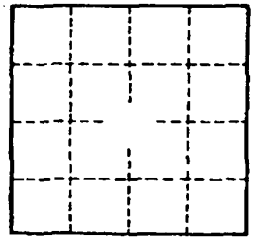
Depth to basement: ___ ft [ ] (65–68) Source of data: ___ (69)

Surficial material: [ ] (70–71) Infiltration characteristics: ___ (72)

Coefficient Trans: 326 gpd/ft [3 2 1] (73–75) Coefficient Storage: [ ] (76–78)

Coefficient Perm: ___ gpd/ft^2; Spec cap: ___ gpm/ft; Number of geologic cards: [ ] (79)

sample for water quality obtained by jetting with air



Well No.

GPO 857-700

WRD Exp. (IW)
April 1966

Well No. LJ-65-14-745

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by RS SAWENSKIN Source of data DRILLER & OBS Date 2-26-80 Map 1:24,000 SETTEGAST, TEX 1967

State TEXAS 48 County (or town) HARRIS LJ

Latitude: 29 47 28 N Longitude: 095 20 01 Sequential number: 5

Lat-long accuracy: 1 T___ S, R___ W, Sec___, ___ ¼, ___ ¼, ___ ¼ B & M

Local well number: LJ-65-14-745 Other number: NORTHEAST NO. 5

Local use: Owner or name: HARRIS-GALVESTON COASTAL SUBS. DENCE DISTRICT

Owner or name: HGCSD Address: 173- NASA RD 1

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — S

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other — U

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (Ø) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. — Ø

DATA AVAILABLE: Well data 2 Freq. W/L meas.: MONTHLY M Field aquifer char. T

Hyd. lab. data:

Qual. water data; type: partial P

Freq. sampling: ORIGINAL Ø Pumpage inventory: yes (no) period:

Aperture cards: yes

Log data: DRILLER'S log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 298 ft 298 Meas. rept 3

Depth cased (first perf.): 283 ft 283 Casing type: steel; Diam. 4½-2½ in accuracy 4

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (Ø) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other — S

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other — H

Date Drilled: Feb 1980 980 Pump intake setting: NONE ft

Driller: O'DAY DRLG Co (name), PEARLAND, TX (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple, (cent.) (M) multiple, (turb.) (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other — N Deep Shallow

Power (type): diesel, elec, nat gas, gasoline, hand, gas, wind; LP H.P. — Trans. or meter no. —

Descrip. MP Top of casing +2.0 ft above (below) LSD, Alt. MP

Alt. LSD: 49 49 Accuracy (source): 5' TOPO 3

Water Level 163.40 ft above (below) MP; Ft above (below) LSD 163 Accuracy: steel tape A

Date meas: 4-24-80 480 Yield: 9 gpm 9 Method determined I

Drawdown: ft Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron ppm pH 8.4 8 Chloride ppm HCO_3 Hard. 240 ppm 6

Sp. Conduct 500 K x 10^6 3 Temp. 71 °F 71 Date sampled 2-27-80 280

Taste, color, etc.

Well No.

001430

Well No. LJ-65-14-745

Latitude-longitude ___ d ___ m ___ s N/S ___ d ___ m ___ s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAIN (20–21) 03 Section: WEST GULF

(22) F Drainage Basin: (23–25) 51R Subbasin: (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (R) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat (27) F

MAJOR AQUIFER: system, series (28–29) Q, aquifer, formation, group Chicot (30–31) C

Lithology: (32–33) S Origin: (34) 3 Aquifer Thickness: 37 ft

(35–37) 37 Length of well open to: 10 ft (38–40) 10 Depth to top of: 277 ft (41–43) 277

MINOR AQUIFER: system, series (44–45), aquifer, formation, group (46–47)

Lithology: (48–49) Origin: (50) Aquifer Thickness: ft

(51–53) Length of well open to: 10 ft (54–56) Depth to top of: ft (57–59)

Intervals Screened: 283 - 293 SSWW No. 10 ga 2½" OD

Depth to consolidated rock: ft (60–63) Source of data: (64)

Depth to basement: ft (65–68) Source of data: (69)

Surficial material: (70–71) Infiltration characteristics: (72)

Coefficient Trans: 53 gpd/ft (73–75) 500 Coefficient Storage: (76–78)

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: (79)

sample for water quality obtained by jetting with air

Well No.

GPO 857-700

Layne-Western Company, Inc. A Marley Company
P.O. Box 79009 · Houston, Texas 77079 · 713/466-5001

L O G - WELL #5 NORTHEAST PLANT SITE

0	3	Top Soil
3	60	Clay
60	80	Sand
80	100	Clay
100	140	Sand
140	170	Clay
170	175	Sand
175	182	Clay
182	247	Sand
247	286	Clay
286	302	Sand

Layne

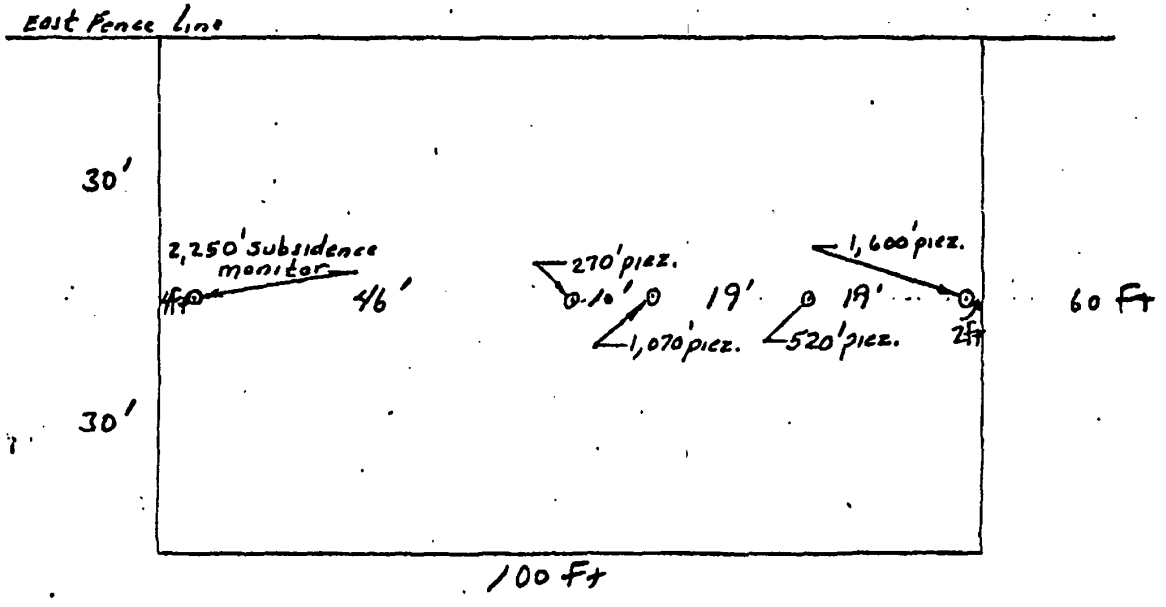
EXHIBIT C

SUBSIDENCE MONITOR/PIEZOMETERS
WELL SYSTEM CONSTRUCTION SITE

NORTHEAST

The construction site is located adjacent to the easterly boundary of the City of Houston Northeast Well Field Plant Yard; said Plant Yard being a tract of land located in the J. S. Collins Survey, Abstract 15, bounded on the north side by Brill Street, on the east side by Tuffly Park, and on the west side by Linn Street.

001433



Northeast site
Layout of piezometers and subsidence monitor
scale: 1" = 20 feet

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-746

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

1:24,000

Record by: SONENSHEIN — Source of data: OBS & DRILLER — Date: 4-28-80 — Map: SETTEGAST, TX 1967

State: TEXAS [48] — County (or town): HARRIS [LJ]

Latitude: 29 47 28 N (deg, min, sec) — Longitude: 095 20 01 (degrees, min, sec) — Sequential number: 6

Lat-long accuracy: [ ] T ___ N S, R ___ E W, Sec ___, ___ ¼, ___ ¼, ___ ¼ B & M

Local well number: LJ-65-14-746 — Other number: NORTHEAST NO. 1 EXTENSOMETER

Local use: [ ] — Owner or name: HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT

Owner or name: HGCSD — Address: 1730 NASA RD 1

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — 67 [S]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other — 68 [U]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. — 69 [Ø]

DATA AVAILABLE: Well data [2] — Freq. W/L meas.: MONTHLY [M] — Field aquifer char. — 72 [T]

Hyd. lab. data: — 73 [ ]

Qual. water-data; type: partial — 74 [ ]

Freq. sampling: ORIGINAL [Ø] — Pumpage inventory: yes (no) period: — 76 [ ]

Aperture cards: yes — 77 [ ]

Log data: DRILLER'S, CALIPER, INDUCTION & MICRO ELECTRIC, SONIC, GAMMA, NEUTRON DENSITY — [Y S]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD — Depth well: 2170 ft [2170] — Meas. rept accuracy — 24 [4]

Depth cased (first perf.): 2099 ft [2099] — Casing type: steel; Diam. 5½ in [5]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other — 31 [S]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other — 32 [H]

Date Drilled: APR 1980 [980] — Pump intake setting: NONE ft — 34 [ ] 36

Driller: LAYNE-TEXAS Co. (name), HOUSTON, TX (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other — 39 [N] — Deep Shallow — 40 [—]

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. — [ ] 41 — Trans. or meter no. —

Descrip. MP: Plug in 5" CSNG + 2.0 ft above/below LSD, Alt. MP

Alt. LSD: 49 [49] — Accuracy (source): 5' TOPO — 47 [3]

Water Level: 394.43 ft above/below MP; Ft above/below LSD [394] — Accuracy: steel tape — 52 [A]

Date meas.: 5-27-80 [580] — Yield: 18.5 gpm [19] — Method determined [1]

Drawdown: ___ ft [ ] — Accuracy: [ ] — Pumping period ___ hrs [ ]

QUALITY OF WATER DATA: Iron ___ ppm [ ] — Sulfate 9.0 ppm [9] — Chloride ___ ppm [ ] — Hard. HCO3 ppm [ ]

Sp. Conduct ___ K x 10^6 [ ] — Temp. 79 °F [79] — Date sampled 4-25-80 [480]

Taste, color, etc.

Well No.

001435

Well No. E-65-14-746

Latitude-longitude N S d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (19) Physiographic Province: 03 (20 21) Section:

F (22) Drainage Basin: 51R (23 24) Subbasin: (26)

Topo of well site: (D) depression, (C) stream channel, (H) dunes, (F) flat, (R) hilltop, (K) sink, (L) swamp, (Q) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat F (27)

MAJOR AQUIFER: system, series TF (38 39) EVANGELINE aquifer, formation, group E (30 31)

Lithology: S (32 33) Origin: 3 (34) Aquifer Thickness: 61 ft

61 (35 37) Length of well open to: 20 ft 20 (38 40) Depth to top of: 2085 ft 309 (41 43)

MINOR AQUIFER: system, series (44 45) aquifer, formation, group (46 47)

Lithology: (48 49) Origin: (50) Aquifer Thickness: ft

(51 53) Length of well open to: ft (54 56) Depth to top of: ft (57 59)

Intervals Screened: 2099-2119 SSWW No. 12 GAUGE 5½" OD

Depth to consolidated rock: ft (60 63) Source of data: (64)

Depth to basement: ft (65 68) Source of data: (69)

Surficial material: (70 71) Infiltration characteristics: (72)

Coefficient Trans: 74 gpd/ft 740 (73 75) Coefficient Storage: (76 78)

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: (79)

sample for water quality obtained by jetting with air

initial hole drilled to 2250 - filled in bottom hole with cement plug to 2170

5½" csng to 2170 with slip joint from 2141 to 2149.5 ft

Well No.

GPO 857-700

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-14-7J
Located on map YES
Received: 7/7

1) OWNER Harris-Galveston Coastal Subsidence District (Name) Address P. O. Box 58847 (Street or RFD) Houston (City) Texas (State) 77058 (Zip)

2) LOCATION OF WELL: County Harris 5 miles in N.E. (N.E., S.W., etc.) direction from Houston (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ See attached map.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☒ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG: #5
Date drilled 3-10-80

DIAMETER OF HOLE Dia. (in.)	From (ft.)	To (ft.)
7-7/8	Surface	299

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
		See Attached

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4½	N	Steel	+2	279	.237
2½	N	Steel	269	284	
2½	N	SST Screen	284	294	
2½	N	Steel	294	299	

CEMENTING DATA
Cemented from 0 ft. to 279 ft.
Method used Pressure
Cemented by O'Day Drilling (Company or Individual)

9) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Lead Depth 269

11) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

(Use reverse side if necessary)

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☒ Yes ☐ No

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME James O'Connor (Type or Print) Water Well Drillers Registration No. 999

ADDRESS 6931 Brittmoore (Street or RFD) Houston, (City) Texas (State) 77041 (Zip)

(Signed) James O'Connor (Water Well Driller) LAYNE-WESTERN COMPANY, INC. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

65-14-746

TDWR-0392 (Rev. 1-12-79) DEPARTMENT OF WATER RESOURCES COPY

001437

WRD Exp. (GW)
April 1966

Well No. LJ-65-14-759

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD (T. BROWN) (7-1941)

Record by N.A.R. & W.F.G. Source of data FILES Date 2-20-68 Map Settegast 1955 1:24000

State Texas [48] County (or town) Harris [LJ]

Latitude: 29 47 28 N (deg, min, sec) Longitude: 095 20 01 (degrees, min, sec) Sequential number: [1]

Lat-long accuracy: [1] T. ___ S, R ___ W, Sec ___, ___ ¼, ___ ¼, ___ ¼

Local well number: LJ-65-14-759 Other number: WELL # 2 · 1885 in 559-c (B & M)

Local use: Owner or name: CITY OF HOUSTON

Owner or name: CITY OF HOUSTON Address: NORTHEAST PLANT

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist [M]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other abd. 1964. [U]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed [U]

DATA AVAILABLE: Well data [1] Freq. W/L meas.: Semiannual 1938-1967; 1972 [S] Field aquifer char.

Hyd. lab. data:

Qual. water data; type:

Freq. sampling: 8-17-38-63 [I] Pumpage inventory: yes no. period:

Aperture cards: yes

Log data: E-LOG U-28 [E]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 1291 ft [1291] Meas. rept. accuracy Driller [3]

Depth cased: (first perf.) 461 ft [461] Casing type: STEEL; Diam 21⅛-12¾ in [21]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other [G]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other [H]

Date Drilled: 1938 [938] Pump intake setting: ft

Driller: LAYNE-TEXAS CO. (name), HOUSTON, TEX. (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other [N] Deep Shallow

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. FORMERLY 150 HP T-E Trans. or meter no.

Descrip. MP ft above below LSD. Alt. MP

Alt. LSD: 49' [49] Accuracy: (source) 5' TOPO [3]

Water Level ft above below MP; Ft above below LSD Accuracy:

Date meas: Jan. 1942 Yield: 2010 gpm Method determined

Drawdown: ft Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct K x 10⁶ Temp. °F Date sampled

Taste, color, etc.

Well No. LJ-65-14-759

001438

Well No. LJ-65-14-759

Latitude-longitude 29 47 28 N S 095 20 01
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) Physiographic Province: COASTAL PLAIN [0 3] (20–21) Section: _____

[F] (22) Drainage Basin: _____ [5 1 R] (23–25) Subbasin: _____ [ ] (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat _____ (27) [ ]

MAJOR AQUIFER: _____ system, _____ series [T] (28–29) _____ aquifer, formation, group [E] (30–31)

Lithology: _____ [ ] (32–33) Origin: _____ [ ] (34) Aquifer Thickness: _____ ft

[ ] (35–37) Length of well open to: 404 ft [4 0 4] (38–40) Depth to top of: _____ ft [ ] (41–43)

MINOR AQUIFER: _____ system, _____ series [Q] (44–45) _____ aquifer, formation, group [C L] (46–47)

Lithology: _____ [ ] (48–49) Origin: _____ [ ] (50) Aquifer Thickness: _____ ft

[ ] (51–53) Length of well open to: _____ ft [ ] (54–56) Depth to top of: _____ ft [ ] (57–59)

Intervals Screened: 461-534, 623-884, 1015-1036, 1114-1135, 1245-1279 (73, 255, 21, 21, 24)

Depth to consolidated rock: _____ ft [ ] (60–63) Source of data: _____ (64) [ ]

Depth to basement: _____ ft [ ] (65–68) Source of data: _____ (69) [ ]

Surficial material: _____ [ ] (70–71) Infiltration characteristics: _____ (72) [ ]

Coefficient Trans: ✓ _____ gpd/ft [ ] (73–75) Coefficient Storage: _____ [ ] (76–78)

Coefficient Perm: ✓ _____ gpd/ft^2; Spec cap: ✓ _____ gpm/ft; Number of geologic cards: _____ [ ] (79)

375 ft. of 21½" csg
and 916 ft. 12¾ inch
Gravel wall

Well No. LJ-65-14-759

GPO 857-700

001439

Send original copy by certified mail to the Texas Department of Water Resources P. O. Box 13087 Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 65-14-4F
Located on map YES
Received: KLW

1) OWNER Carol Harbin (Name) Address 5013 Vanderbilt (Street or RFD) Houston (City) Tx (State) 77093 (Zip)

2) LOCATION OF WELL: County Harris 8 miles in NE (N.E., S.W., etc.) direction from Houston (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☑ Legal description:
Section No. _____ Block No. _____ Township _____
Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☑ See attached map.

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☑ Domestic ☐ Industrial ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Other _____

5) DRILLING METHOD (Check): ☑ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other _____

6) WELL LOG:

Date drilled 5-30-81

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
4	Surface	82

7) BOREHOLE COMPLETION: ☐ Open Hole ☑ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	22	White Clay
22	50	Red Clay
50	61	" Sand
61	69	Red Clay
69	82	White Sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2		Plastic	76	82	10

CEMENTING DATA
Cemented from _____ ft. to _____ ft.
Method used _____
Cemented by _____ (Company or Individual)

9) WATER LEVEL:
Static level 48 ft. below land surface Date 6-1-81
Artesian flow _____ gpm. Date _____

10) PACKERS: Type Rubber Depth 62-65-68
3

11) TYPE PUMP: ☐ Turbine ☑ Jet ☐ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., 60 ft.

12) WELL TESTS: ☐ Type Test: ☑ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: 5 gpm with 0 ft. drawdown after 2 hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☑ Yes ☐ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME L.F. HULL (Type or Print) Water Well Drillers Registration No. 2044

ADDRESS 4933 Hartwick (Street or RFD) Houston (City) TEX. (State) 77093 (Zip)

(Signed) L.F. Hull (Water Well Driller) L.F. HULL (Company Name)

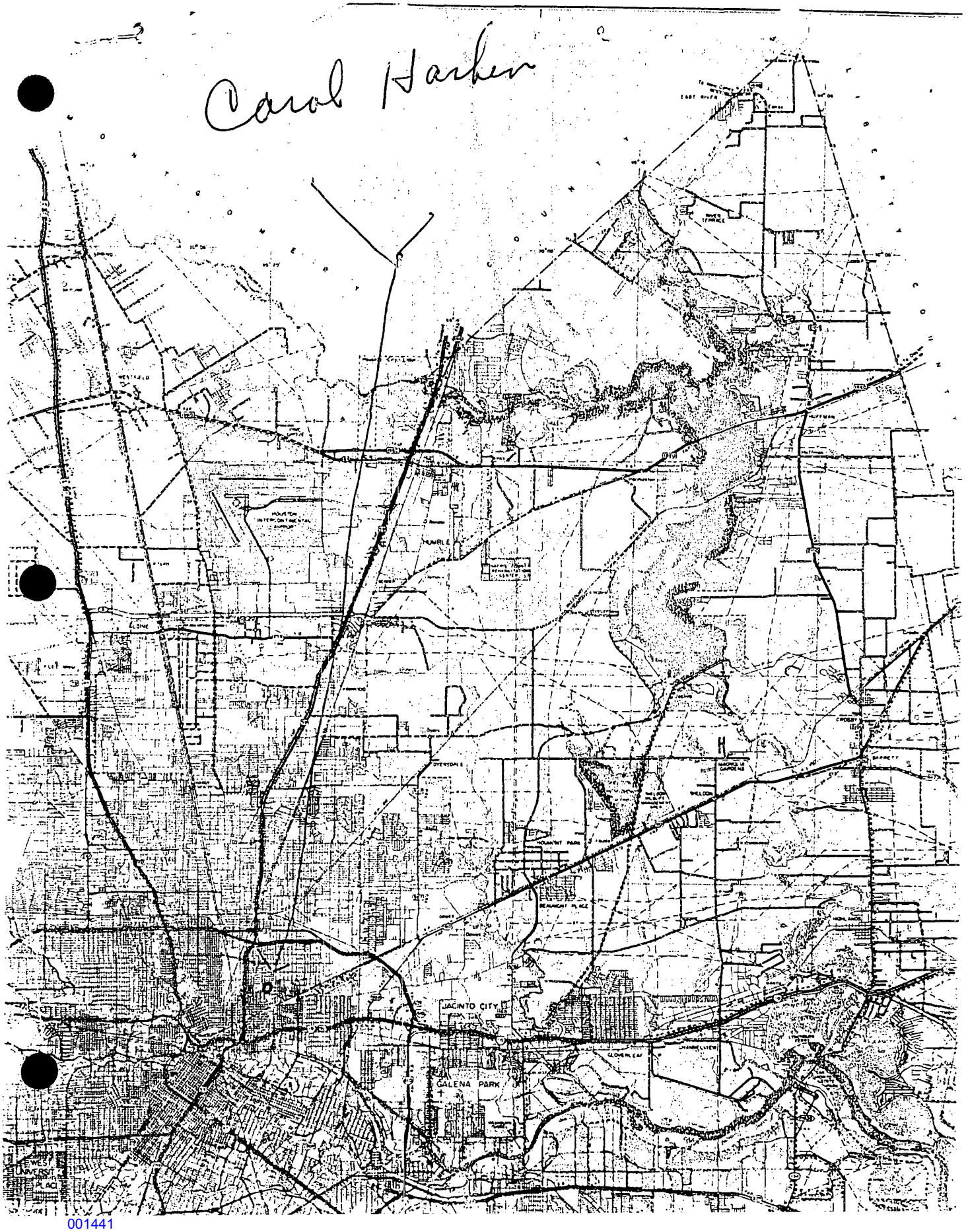
Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79)

DEPARTMENT OF WATER RESOURCES COPY

001440

Carol Harber



SINGLE-FAMILY RESIDENTIAL - TYPE USERS 01, 02, 03 WATER/WASTEWATER PASSED 3/24/96

WATER RATE - 2.95 MINIMUM FOR 3,000 GAL OR LESS CONSUMPTION. $12.82 MINIMUM FOR 4,000 GAL CONSUMPTION
$15.13 MINIMUM FOR 5,000 GAL. $ 18.11 MINIMUM FOR 6,000 CONSUMPTION
$2.36 PER EA ADDITIONAL 1,000 GALLONS USED FOR 7,000 TO 12,000 GALLONS CONSUMPTION
$4.30 PER EA ADDITIONAL 1,000 GALLONS USED IN EXCESS OF 12,000 GALLONS CONSUMPTION

SEWER - $3.07 PER THOUSAND GALLONS. $5.55 FIXED RATE FOR 3,000 GAL OR LESS USAGE
$11.80 FIXED RATE FOR 4,000 GAL. UASGE. 14.75 FIXED RATE FOR 5,000 GAL. USAGE.
$18.42 FIXED RATE FOR 6,000 GAL USAGE

MTR SIZE	5/8 IN	1 IN	1.5 IN	2 IN	3 IN	4 IN	6 IN	8 IN	SEWER	
MINIMUM	3,000	3,000	3,000	3,000	6,000	6,000	6,000	6,000	$5.55 UNDER	
CHARGE	$2.95	$2.95	$2.95	$2.95	$18.11	$48.20	$81.35	$109.40	$3.07 OVER	
1	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	5.55	1
2	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	5.55	2
3	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	5.55	3
4	12.82	12.82	12.82	12.82	12.82	12.82	12.82	12.82	11.80	4
5	15.13	15.13	15.13	15.13	15.13	15.13	15.13	15.13	14.75	5
6	18.11	18.11	18.11	18.11	18.11	48.20	81.35	109.40	18.42	6
7	20.47	20.47	20.47	20.47	20.47	50.56	83.71	111.76	21.49	7
8	22.83	22.83	22.83	22.83	22.83	52.92	86.07	114.12	24.56	8
9	25.19	25.19	25.19	25.19	25.19	55.28	88.43	116.48	27.63	9
10	27.55	27.55	27.55	27.55	27.55	57.64	90.79	118.84	30.70	10
11	29.91	29.91	29.91	29.91	29.91	60.00	93.15	121.20	33.77	11
12	32.27	32.27	32.27	32.27	32.27	62.36	95.51	123.56	36.84	12
13	36.57	36.57	36.57	36.57	36.57	66.66	99.81	127.86	39.91	13
14	40.87	40.87	40.87	40.87	40.87	70.96	104.11	132.16	42.98	14
15	45.17	45.17	45.17	45.17	45.17	75.26	108.41	136.46	46.05	15
16	49.47	49.47	49.47	49.47	49.47	79.56	112.71	140.76	49.12	16
17	53.77	53.77	53.77	53.77	53.77	83.86	117.01	145.06	52.19	17
18	58.07	58.07	58.07	58.07	58.07	88.16	121.31	149.36	55.26	18
19	62.37	62.37	62.37	62.37	62.37	92.46	125.61	153.66	58.33	19
20	66.67	66.67	66.67	66.67	66.67	96.76	129.91	157.96	61.40	20
21	70.97	70.97	70.97	70.97	70.97	101.06	134.21	162.26	64.47	21
22	75.27	75.27	75.27	75.27	75.27	105.36	138.51	166.56	67.54	22
23	79.57	79.57	79.57	79.57	79.57	109.66	142.81	170.86	70.61	23
24	83.87	83.87	83.87	83.87	83.87	113.96	147.11	175.16	73.68	24
25	88.17	88.17	88.17	88.17	88.17	118.26	151.41	179.46	76.75	25
26	92.47	92.47	92.47	92.47	92.47	122.58	155.71	183.76	79.82	26
27	96.77	96.77	96.77	96.77	96.77	126.86	160.01	188.06	82.89	27
28	101.07	101.07	101.07	101.07	101.07	131.16	164.31	192.36	85.96	28
29	105.37	105.37	105.37	105.37	105.37	135.46	168.61	196.66	89.03	29
30	109.67	109.67	109.67	109.67	109.57	139.76	172.91	200.96	92.10	30
31	113.97	113.97	113.97	113.97	113.97	144.06	177.21	205.26	95.17	31
32	118.27	118.27	118.27	118.27	118.27	148.36	181.51	209.56	98.24	32
33	122.57	122.57	122.57	122.57	122.57	152.66	185.81	213.86	101.31	33
34	126.87	126.87	126.87	126.87	126.87	156.96	190.11	218.16	104.38	34
35	131.17	131.17	131.17	131.17	131.17	161.26	194.41	222.46	107.45	35
36	135.47	135.47	135.47	135.47	135.47	165.56	198.71	226.76	110.52	36
37	139.77	139.77	139.77	139.77	139.77	169.86	203.01	231.06	113.59	37
38	144.07	144.07	144.07	144.07	144.07	174.16	207.31	235.36	116.66	38
39	148.37	148.37	148.37	148.37	148.37	178.46	211.61	239.66	119.73	39
40	152.67	152.67	152.67	152.67	152.67	182.76	215.91	243.96	122.80	40
41	156.97	156.97	156.97	156.97	156.97	187.06	220.21	248.26	125.87	41
42	161.27	161.27	161.27	161.27	161.27	191.36	224.51	252.56	128.94	42
43	165.57	165.57	165.57	165.57	165.57	195.66	228.81	256.86	132.01	43
44	169.87	169.87	169.87	169.87	169.87	199.96	233.11	261.16	135.08	44
45	174.17	174.17	174.17	174.17	174.17	204.26	237.41	265.46	138.15	45
46	178.47	178.47	178.47	178.47	178.47	208.56	241.71	269.76	141.22	46
47	182.77	182.77	182.77	182.77	182.77	212.86	246.01	274.06	144.29	47
48	187.07	187.07	187.07	187.07	187.07	217.16	250.31	278.36	147.36	48
49	191.37	191.37	191.37	191.37	191.37	221.46	254.61	282.66	150.43	49
50	195.67	195.67	195.67	195.67	195.67	225.76	258.91	286.96	153.50	50

PRINT DATE 04/28/93

COMMERCIAL - TYPE USERS 21 THRU 59 METER SIZES 1 INCH. AND GREATER WATER, WASTEWATER PASSED 03/24/93

WATER RATE - ALL OVER MINIMUM IS $2.22 PER 1,000 GALLONS.

SEWER RATE - $7.92 FOR 2,000 GALLONS OR LESS/OVER 2,000 GALLONS IS $3.96 PER 1000 GALLONS.

MTR SIZE	1 IN.	1.5 IN.	2 IN.	3 IN.	4 IN.	6 IN.	8 IN.	S E W E R	
MINIMUM	3,000	10,000	16,000	35,000	60,000	125,000	180,000	$7.92	UNDER
CHARGE	$11.63	$30.74	$47.12	$98.39	$167.24	$344.69	$494.84	$3.96	OVER
51	118.19	121.76	124.82	134.91	167.24	344.69	494.84	201.96	51
52	120.41	123.98	127.04	136.73	167.24	344.69	494.84	205.92	52
53	122.63	126.20	129.26	138.95	167.24	344.69	494.84	209.88	53
54	124.85	128.42	131.48	141.17	167.24	344.69	494.84	213.84	54
55	127.07	130.64	133.70	143.39	167.24	344.69	494.84	217.80	55
56	129.29	132.86	135.92	145.61	167.24	344.69	494.84	221.76	56
57	131.51	135.08	138.14	147.83	167.24	344.69	494.84	225.72	57
58	133.73	137.30	140.36	150.05	167.24	344.69	494.84	229.68	58
59	135.95	139.52	142.58	152.27	167.24	344.69	494.84	233.64	59
60	138.17	141.74	144.80	154.49	167.24	344.69	494.84	237.60	60
61	140.39	143.96	147.02	156.71	169.46	344.69	494.84	241.56	61
62	142.61	146.18	149.24	158.93	171.68	344.69	494.84	245.52	62
63	144.83	148.40	151.46	161.15	173.90	344.69	494.84	249.48	63
64	147.05	150.62	153.68	163.37	176.12	344.69	494.84	253.44	64
65	149.27	152.84	155.90	165.59	178.34	344.69	494.84	257.40	65
66	151.49	155.06	158.12	167.81	180.56	344.69	494.84	261.36	66
67	153.71	157.28	160.34	170.03	182.78	344.69	494.84	265.32	67
68	155.93	159.50	162.56	172.25	185.00	344.69	494.84	269.28	68
69	158.15	161.72	164.78	174.47	187.22	344.69	494.84	273.24	69
70	160.37	163.94	167.00	176.69	189.44	344.69	494.84	277.20	70
71	162.59	166.16	169.22	178.91	191.66	344.69	494.84	281.16	71
72	164.81	168.38	171.44	181.13	193.88	344.69	494.84	285.12	72
73	167.03	170.60	173.66	183.35	196.10	344.69	494.84	289.08	73
74	169.25	172.82	175.88	185.57	198.32	344.69	494.84	293.04	74
75	171.47	175.04	178.10	187.79	200.54	344.69	494.84	297.00	75
76	173.69	177.26	180.32	190.01	202.76	344.69	494.84	300.96	76
77	175.91	179.48	182.54	192.23	204.98	344.69	494.84	304.92	77
78	178.13	181.70	184.76	194.45	207.20	344.69	494.84	308.88	78
79	180.35	183.92	186.98	196.67	209.42	344.69	494.84	312.84	79
80	182.57	186.14	189.20	198.89	211.64	344.69	494.84	316.80	80
81	184.79	188.36	191.42	201.11	213.86	344.69	494.84	320.76	81
82	187.01	190.58	193.64	203.33	216.08	344.69	494.84	324.72	82
83	189.23	192.80	195.86	205.55	218.30	344.69	494.84	328.68	83
84	191.45	195.02	198.08	207.77	220.52	344.69	494.84	332.64	84
85	193.67	197.24	200.30	209.99	222.74	344.69	494.84	336.60	85
86	195.89	199.46	202.52	212.21	224.96	344.69	494.84	340.56	86
87	198.11	201.68	204.74	214.43	227.18	344.69	494.84	344.52	87
88	200.33	203.90	206.96	216.65	229.40	344.69	494.84	348.48	88
89	202.55	206.12	209.18	218.87	231.62	344.69	494.84	352.44	89
90	204.77	208.34	211.40	221.09	233.84	344.69	494.84	356.40	90
91	206.99	210.56	213.62	223.31	236.06	344.69	494.84	360.36	91
92	209.21	212.78	215.84	225.53	238.28	344.69	494.84	364.32	92
93	211.43	215.00	218.06	227.75	240.50	344.69	494.84	368.28	93
94	213.65	217.22	220.28	229.97	242.72	344.69	494.84	372.24	94
95	215.87	219.44	222.50	232.19	244.94	344.69	494.84	376.20	95
96	218.09	221.66	224.72	234.41	247.16	344.69	494.84	380.16	96
97	220.31	223.88	226.94	236.63	249.38	344.69	494.84	384.12	97
98	222.53	226.10	229.16	238.85	251.60	344.69	494.84	388.08	98
99	224.75	228.32	231.38	241.07	253.82	344.69	494.84	392.04	99
100	226.97	230.54	233.60	243.29	256.04	344.69	494.84	396.00	100

MULTI-FAMILY (AVERAGE 10,000 GALLONS OR LESS/UNIT) TYPE USERS 14 THRU 19 WATER, WASTEWATER PASSED 03/24/93

WATER RATE - AVERAGE PER UNIT IS MINIMUM BILL BY METER SIZE. OVER MINIMUM, RATE IS $1.92 PER 1,000 GALLONS.

SEWER RATE - $6.14 FOR 2,000 GALLONS OR LESS/OVER 2,000 GALLONS IS $3.07 PER 1000 GALLONS.

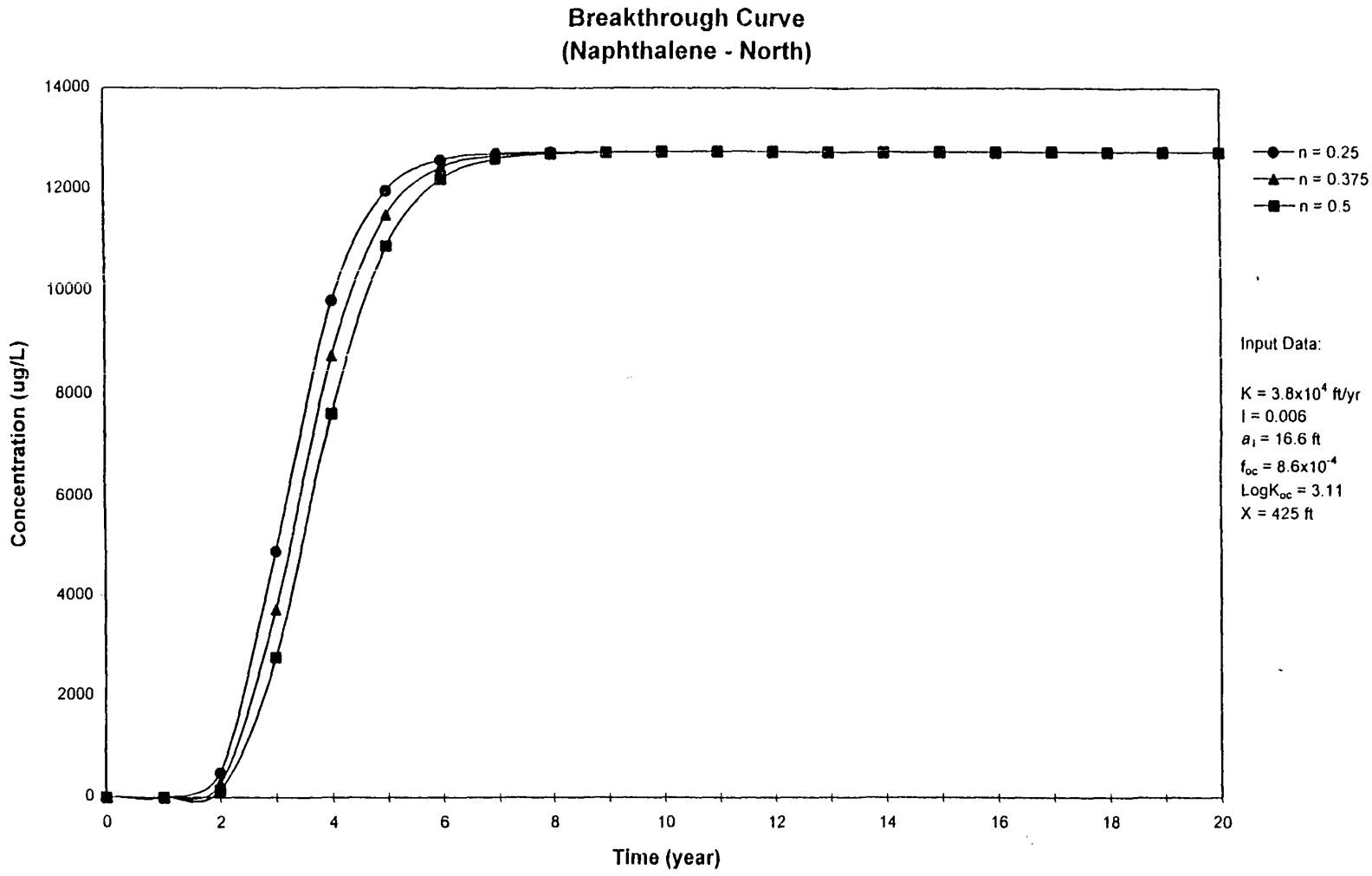
MTR SIZE	5/8 IN.	1 IN.	1.5 IN.	2 IN.	3 IN.	4 IN.	6 IN.	8 IN.	S E W E R	
MINIMUM	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	$6.14	UNDER
CHARGE	$8.30	$8.30	$8.30	$8.30	$8.30	$37.88	$71.03	$99.08	$3.07	OVER
1	8.30	8.30	8.30	8.30	8.30	37.88	71.03	99.08	6.14	1
2	8.30	8.30	8.30	8.30	8.30	37.88	71.03	99.08	6.14	2
3	10.22	10.22	10.22	10.22	10.22	39.80	72.95	101.00	9.21	3
4	12.14	12.14	12.14	12.14	12.14	41.72	74.87	102.92	12.28	4
5	14.06	14.06	14.06	14.06	14.06	43.64	76.79	104.84	15.35	5
6	15.98	15.98	15.98	15.98	15.98	45.56	78.71	106.76	18.42	6
7	17.90	17.90	17.90	17.90	17.90	47.48	80.63	108.68	21.49	7
8	19.82	19.82	19.82	19.82	19.82	49.40	82.55	110.60	24.56	8
9	21.74	21.74	21.74	21.74	21.74	51.32	84.47	112.52	27.63	9
10	23.66	23.66	23.66	23.66	23.66	53.24	86.39	114.44	30.70	10
11	25.58	25.58	25.58	25.58	25.58	55.16	88.31	116.36	33.77	11
12	27.50	27.50	27.50	27.50	27.50	57.08	90.23	118.28	36.84	12
13	29.42	29.42	29.42	29.42	29.42	59.00	92.15	120.20	39.91	13
14	31.34	31.34	31.34	31.34	31.34	60.92	94.07	122.12	42.98	14
15	33.26	33.26	33.26	33.26	33.26	62.84	95.99	124.04	46.05	15
16	35.18	35.18	35.18	35.18	35.18	64.76	97.91	125.96	49.12	16
17	37.10	37.10	37.10	37.10	37.10	66.68	99.83	127.88	52.19	17
18	39.02	39.02	39.02	39.02	39.02	68.60	101.75	129.80	55.26	18
19	40.94	40.94	40.94	40.94	40.94	70.52	103.67	131.72	58.33	19
20	42.86	42.86	42.86	42.86	42.86	72.44	105.59	133.64	61.40	20
21	44.78	44.78	44.78	44.78	44.78	74.36	107.51	135.56	64.47	21
22	46.70	46.70	46.70	46.70	46.70	76.28	109.43	137.48	67.54	22
23	48.62	48.62	48.62	48.62	48.62	78.20	111.35	139.40	70.61	23
24	50.54	50.54	50.54	50.54	50.54	80.12	113.27	141.32	73.68	24
25	52.46	52.46	52.46	52.46	52.46	82.04	115.19	143.24	76.75	25
26	54.38	54.38	54.38	54.38	54.38	83.96	117.11	145.16	79.82	26
27	56.30	56.30	56.30	56.30	56.30	85.88	119.03	147.08	82.89	27
28	58.22	58.22	58.22	58.22	58.22	87.80	120.95	149.00	85.96	28
29	60.14	60.14	60.14	60.14	60.14	89.72	122.87	150.92	89.03	29
30	62.06	62.06	62.06	62.06	62.06	91.64	124.79	152.84	92.10	30
31	63.98	63.98	63.98	63.98	63.98	93.56	126.71	154.76	95.17	31
32	65.90	65.90	65.90	65.90	65.90	95.48	128.63	156.68	98.24	32
33	67.82	67.82	67.82	67.82	67.82	97.40	130.55	158.60	101.31	33
34	69.74	69.74	69.74	69.74	69.74	99.32	132.47	160.52	104.38	34
35	71.66	71.66	71.66	71.66	71.66	101.24	134.39	162.44	107.45	35
36	73.58	73.58	73.58	73.58	73.58	103.16	136.31	164.36	110.52	36
37	75.50	75.50	75.50	75.50	75.50	105.08	138.23	166.28	113.59	37
38	77.42	77.42	77.42	77.42	77.42	107.00	140.15	168.20	116.66	38
39	79.34	79.34	79.34	79.34	79.34	108.92	142.07	170.12	119.73	39
40	81.26	81.26	81.26	81.26	81.26	110.84	143.99	172.04	122.80	40
41	83.18	83.18	83.18	83.18	83.18	112.76	145.91	173.96	125.87	41
42	85.10	85.10	85.10	85.10	85.10	114.68	147.83	175.88	128.94	42
43	87.02	87.02	87.02	87.02	87.02	116.60	149.75	177.80	132.01	43
44	88.94	88.94	88.94	88.94	88.94	118.52	151.67	179.72	135.08	44
45	90.86	90.86	90.86	90.86	90.86	120.44	153.59	181.64	138.15	45
46	92.78	92.78	92.78	92.78	92.78	122.36	155.51	183.56	141.22	46
47	94.70	94.70	94.70	94.70	94.70	124.28	157.43	185.48	144.29	47
48	96.62	96.62	96.62	96.62	96.62	126.20	159.35	187.40	147.36	

APPENDIX H
STATISTICAL CALCULATIONS

TABLE
CONFIDENCE INTERVAL CALCULATIONS
VERIFICATION OF GROUNDWATER FATE AND TRANSPORT EVALUATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

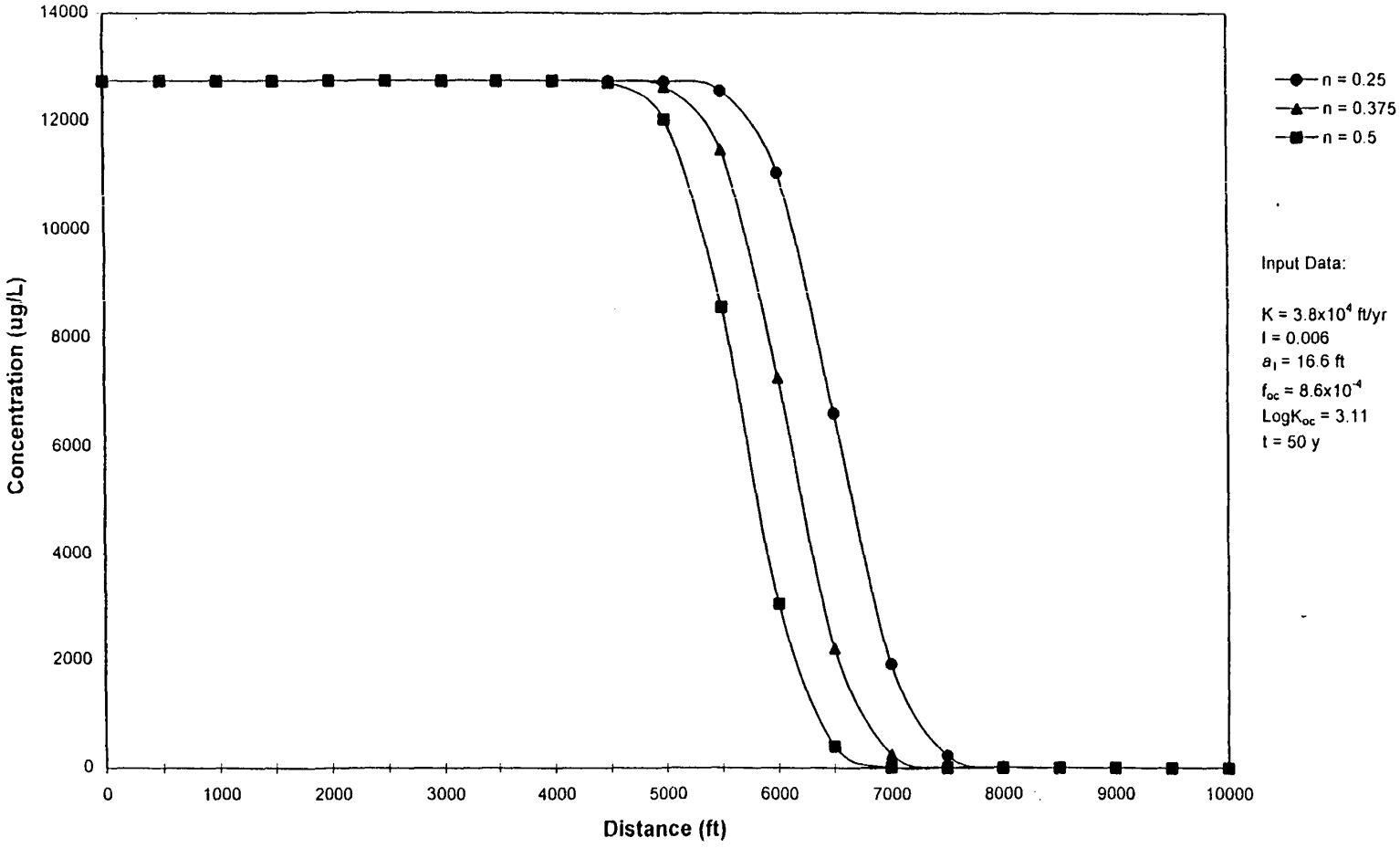
Verification of Modeling Assumptions -- Statistics	Porosity (%)	Bulk Density (g/cc)	Product Abs. Viscosity @ 22 degrees C	Product Interfacial Tension (dynes/cm)	Product Specific Gravity @ 22 degrees C	Northern Area foc (mg/mg)	Southern Area foc (mg/mg)
	0.36	1.68	13.15	43.5	1.0819	0.00112	0.0013
	0.29	1.86	15.39	41.0	1.0527	0.000379	0.000453
	0.31	1.79	21.23	41.5	1.0692	0.00123	0.00107
	0.27	1.89	19.04	42.5	1.0788	0.00186	0.000921
	0.33	1.75					
	0.36	1.66					
	0.30	1.85					
	0.33	1.74					
Mean	0.32	1.78	17.20	42.1	1.0707	0.00115	0.00094
Standard Deviation	3.23E-02	8.48E-02	3.62E+00	1.1E+00	1.3131E-02	6.07E-04	3.6E-04
Skewness	-2.07E-02	-7.94E-02	-1.37E-02	4.8E-01	-1.1252E+00	-2.70E-01	-9.0E-01
95% Confidence Interval	2.24E-02	5.88E-02	3.55E+00	1.1E+00	1.2867E-02	5.95E-04	3.5E-04
Upper Confidence Limit	0.34	1.84	20.75	43.2	1.0835	0.00174	0.0013
Lower Confidence Limit	0.30	1.72	13.66	41.0	1.0578	0.000552	0.00059

APPENDIX I
APPLICABLE OUTPUT FROM GFTER



c:\jrh\socav\118-11n.nnn

Breakthrough Curve
(Naphthalene - North)



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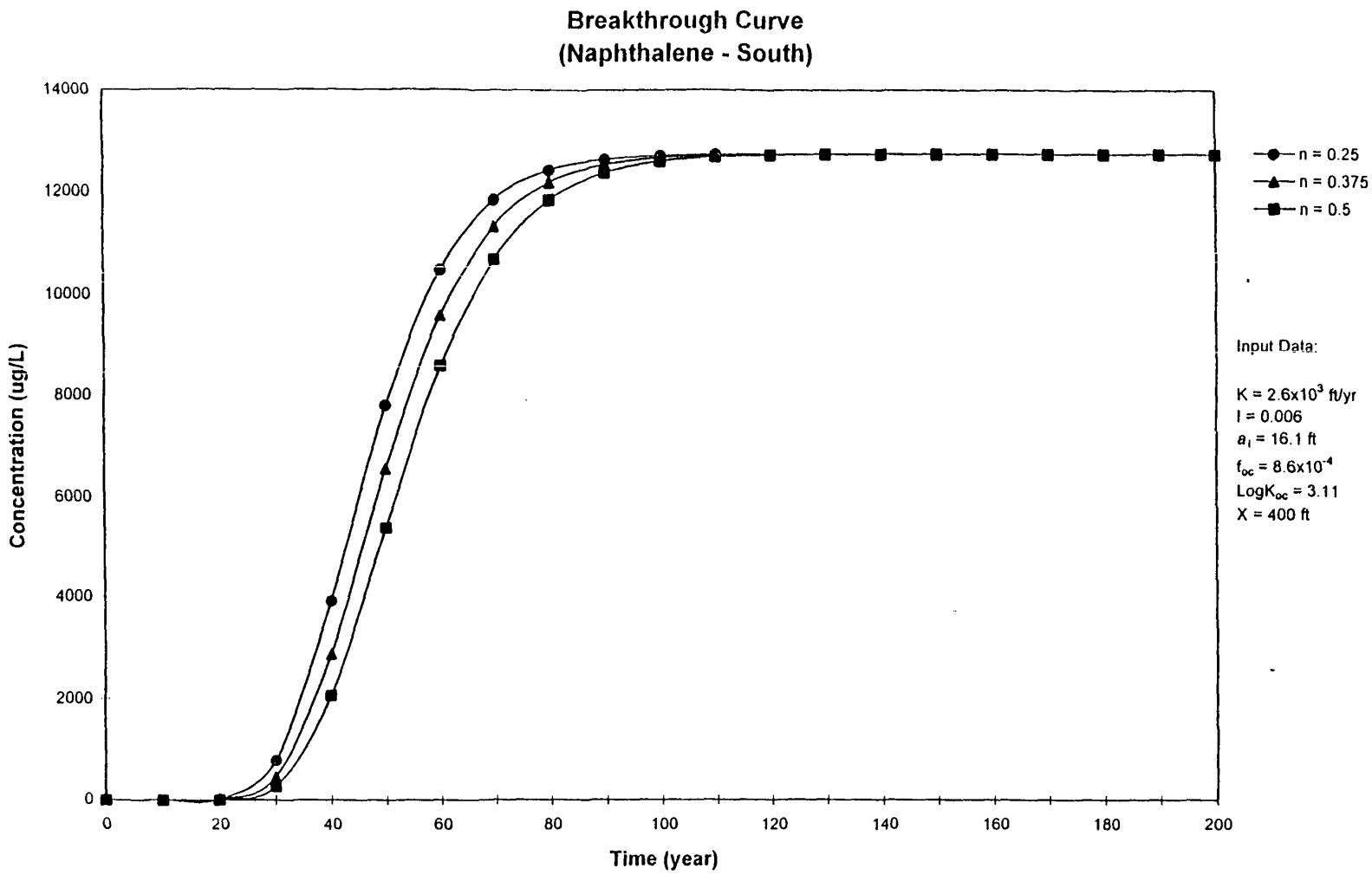

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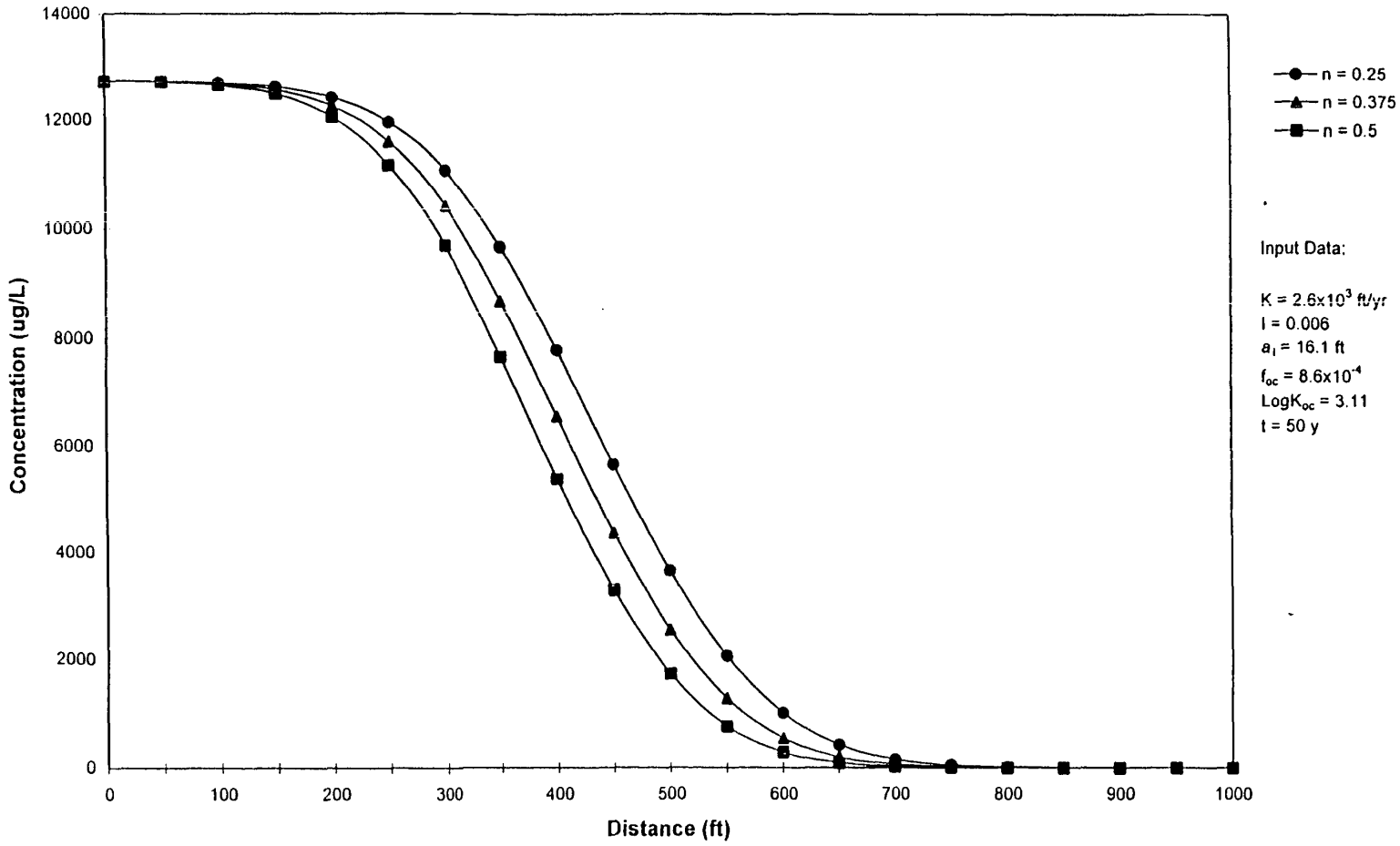
Breakthrough Curve
(Naphthalene - South)



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