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REMEDIAL INVESTIGATION REPORT
QUANTA RESOURCES SITE
LONG ISLAND CITY, QUEENS, NEW YORK

Prepared for:

Quanta Site Administrative Group

Prepared by:

Golder Associates Inc.
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June 2005

Project No.: 023-6151

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June 20, 2005

Project No.: 023-6151

NY State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233-7016

Attn: Brian Davidson, P.E., - Project Manager

RE: SUBMITTAL OF REMEDIAL INVESTIGATION REPORT
QUANTA RESOURCES SITE – NYSDEC #241005
LONG ISLAND CITY, QUEENS, NEW YORK

Dear Mr. Davidson:

On behalf of the Quanta Site Administrative Group (QSAG), Golder Associates Inc. (Golder) is pleased to submit three copies (one unbound) of the Remedial Investigation (RI) Report for the Quanta Resources Site (Site). A Copy of the RI Report has also been sent to Ms. Stephanie L. Selmer of the New York State Department of Health (NYSDOH) and Mr. Vadim Brevdo of the New York State Department of Environmental Conservation (NYSDEC).

The RI Report is submitted in accordance with the NYSDEC approved Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan), finalized on June 10, 2003, and presents the findings of the Phase I and Phase II RI field investigations conducted in and around the Quanta Resources Site.

Please do not hesitate to contact Pete Zimmermann, the Project Coordinator for QSAG, at (212) 581-8023 should any questions arise from your or your colleagues' review of this document.

Very truly yours,

GOLDER ASSOCIATES INC.

Stuart D. Mitchell, P.G.
Senior Consultant

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NYS Professional Engineer
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SDM/RSW/lrl
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cc: V. Brevdo, NYSDEC
R. Rusinko, NYSDEC (w/out attachment)
S. Selmer, NYSDOH
Quanta Site Administrative Group
J. Walsh, McCusker, Anselmi, Rosen, Carvelli & Walsh
P. Zimmermann, Environmental Liability Management

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EXECUTIVE SUMMARY

Introduction

This Remedial Investigation Report (RI Report) has been prepared by Golder Associates Inc. (Golder Associates), on behalf of the Quanta Site Administrative Group (QSAG), to report the results of the Phase I and Phase II Remedial Investigation (RI) at the Quanta Resources property. This RI report has been prepared pursuant to Section II.A, of the Order On Consent (Consent Order) executed by the New York State Department of Environmental Conservation (NYSDEC), NYSDEC Index No. W2-0915-03-06. The Quanta Resources property, located at 37-80 Review Avenue, Long Island City, New York, is currently listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 2-41-005 with a Classification of “2” pursuant to ECL 27-1305. The overall objectives of the RI are to determine the nature and extent of constituents of potential concern (COPC) and potential impacts to the public health, welfare, or the environment caused by the release or potential release of COPC at or from the Site.

The remedial investigation was conducted in two phases. Phase I focused on investigation of soil, LNAPL, and groundwater on the Quanta Resources property, with some limited off-site investigation on adjacent properties. An additional on- and off-property investigation was conducted during Phase II of the RI.

The following conclusions were reached, based on the results of the Phase I and II remedial investigation:

- The extent of LNAPL impacts has been delineated. The primary suspected source area is the tank farm located in the northeastern portion of the Quanta Resources property. Radial flow of LNAPL from the tank farm appears to be the primary cause of the LNAPL observed upgradient and northeast of Review Avenue. This material may also have migrated to the southeast and northwest, extending to off-site adjacent properties. The removal of primary LNAPL sources, the measured LNAPL viscosities, and the predicted gradients and low velocities at the LNAPL fringes, support the conclusion that no further lateral migration of LNAPL is occurring and downgradient migration of LNAPL is expected to be minimal or non-existent.

- A considerable volume of LNAPL has been delineated at the Quanta Resources property and a large portion of this volume occurs as non-recoverable residual LNAPL. Due to the high LNAPL viscosities, the low LNAPL gradients, the dissipated driving force resulting from source removal and the transient groundwater mound located downgradient of the LNAPL, the majority of the LNAPL mass is stable and is being naturally contained.

- Groundwater beneath the Quanta Resources property does not pose a threat to on- or off-site human or ecological receptors. Groundwater at or in the vicinity of the site is not used for drinking. Groundwater analytical results and solute transport modeling indicate that chemical constituents identified within the smear zone groundwater are not adversely impacting the designated use of Newtown Creek. Based on the data obtained during the RI, it appears that VOC and SVOC concentrations detected in groundwater would not pose soil vapor intrusion issues for current and future commercial/industrial buildings.

- The low solubility of LNAPL constituents and the ongoing natural attenuation of these constituents in groundwater are effectively mitigating potential chemical impacts to groundwater from LNAPL.

- Constituents detected in urban/fill soil do not pose a significant threat to human health or the environment. Analytical results indicate only a minimal potential for leaching of soil constituents to groundwater and given the presence of underlying LNAPL this leaching potential is inconsequential. Institutional and engineering controls will adequately address any potential issues related to the soil vapor intrusion and direct contact exposure pathways.

General Site Description and Environmental Setting

The Quanta Resources property consists of a 1.8-acre parcel of land within a highly industrialized area of Queens, New York. The entire property and surrounding properties have been used for a variety of industrial purposes since the late 19th century. Reportedly, the most prominent use of the Quanta Resources property was for the re-refining of used crankcase oil, which occurred from the 1930s into the 1970s under the name of Triplex Oil. Subsequent used oil and liquid recycling operations were conducted from the 1970s up until 1981 under varying ownerships when operations ceased. Zoning in this area is designated as heavy manufacturing.

The property overlies man-made urban fill material consisting of a mixture of heterogeneous soil intermixed with brick fragments, asphalt, wire, plastic and other debris, ranging in thickness from 3 to 16 feet. Greater urban fill thicknesses have been reported southwest of the site, closer to Newtown Creek. Unconsolidated glacial deposits consisting predominately of interbedded horizons of fine to coarse sand and fine to coarse gravel comprise the youngest natural geologic horizon below the urban fill. The deepest natural geologic unit intercepted as part of the remedial investigation consists of a laterally continuous clay. This clay unit is referred to as the lower clay and has been identified as the Raritan formation. The lower clay is believed to be continuous across the Quanta Resources property and surrounding area. Localized shallow silt and clay horizons of glacial origin have been encountered in the eastern corner of the Quanta Resources property (in the vicinity of well GAL-08) as well as on the northwest border of the South Capasso property (in the vicinity of wells GAL-27 and GAL-28).

The property lies between a local topographic high located northeast of the site (a local groundwater recharge area) and Newtown Creek located southwest of the site (a tidally influenced regional groundwater discharge area). Groundwater generally flows horizontally south-southwest within the glacial deposits towards Newtown Creek. Vertical gradients in the southwestern portion of the Quanta Resources property are generally negligible. Upward vertical gradients within the lower portions of the saturated zone on the South Capasso property are anticipated under natural conditions as groundwater approaches its discharge point to Newtown Creek located 450 feet south-southwest from the property.

A shallow clay horizon identified just south of the Quanta Resources property (on the northwest border of the South Capasso property) is believed responsible for the formation of a seasonally transient groundwater mound. This groundwater mound does not appear to materially influence the overall direction of groundwater flow from the Quanta property to Newtown Creek, however, when the mound is present, it may influence the three-dimensional flow path of groundwater in the immediate vicinity of the mound. The impact of the mound quickly diminishes with depth. Whether the mound is present or not, all groundwater from the Quanta Resources property follows in a nearly straight path and eventually discharges to Newtown Creek. Groundwater within the vicinity of the property is not currently used for potable purposes and likely will not be used in the future as a potable source.

As a result of NYCDEP and NYSDEC Removal Action activities conducted at the Quanta Resources property in the early 1980s, all primary sources were reportedly removed over 23 years ago. Secondary sources are mainly limited to chemical concentrations of oil residuals adsorbed within the urban fill and natural soil and/or oil residuals as LNAPL at the groundwater surface.

Summary of Remedial Investigation Activities

The remedial investigation activities were conducted in accordance with the June 2003 RI/FS Work Plan and additional work plan addenda and other documents, all of which were approved by NYSDEC. Prior to implementing the remedial investigation activities, a 10- to 12-foot high corrugated steel fence was installed in May 2003 around the perimeter of the Quanta Resources property to mitigate trespasser concerns.

The remedial investigation was conducted in two phases. Phase I focused on investigation of soil, LNAPL, and groundwater on the Quanta Resources property, with limited off-property investigation of LNAPL. The Phase I RI field work commenced in October 2003 and was substantially completed in August 2004. The scope of the Phase I RI included the following activities: site preparation and reconnaissance, installation and sampling of eight groundwater monitoring wells and 20 LNAPL monitoring wells installed on- and off-property, completion of 14 soil borings, urban fill/soil sampling and analysis, hydrogeologic testing, LNAPL baildown tests, long-term groundwater monitoring, implementation of a LNAPL pilot study, and topographic, property boundary and soil boring/well survey. A Data Summary Report (DSR) was submitted to NYSDEC on January 28, 2005 summarizing the results of the Phase I RI.

To expedite completion of the remedial investigation process, Golder Associates submitted the *Proposal for Phase II Remedial Investigation* to NYSDEC on December 17, 2004 and the *Proposed On-Property Surface Soil Samples Work Plan* on April 8, 2005. The field activities described in these documents commenced on February 16, 2005 and were substantially completed on April 17, 2005. The scope of the field activities for Phase II included: installation of 10 LNAPL wells on- and off-property, sampling of seven LNAPL wells (LNAPL was not present in three wells); completion of two soil borings, sampling of surficial and subsurface urban fill/soil, groundwater and LNAPL level monitoring, hydrogeologic testing, LNAPL baildown tests, assessment of the sump on the Quanta Resources property and existing off property pre-RI monitoring wells, and surveying of the LNAPL wells, soil borings and off-property pre-RI monitoring wells. In addition to the Phase I and Phase II investigation activities, Golder also completed a NYSDEC-approved LNAPL Recovery Pilot Study on the Quanta Resources property from April through July 2004.

Summary of Remedial Investigation Results

Groundwater

Groundwater characterization generally focused on two portions of the saturated zone beneath the site: the portion of groundwater in contact with the LNAPL smear zone (smear zone groundwater) and the portion of groundwater beneath the LNAPL smear zone and above the lower clay (lower groundwater). Although these two portions comprise the same hydrogeologic unit, they are distinguished by their proximity to the LNAPL smear zone.

Characterization of the smear-zone groundwater utilized available groundwater sample analyses results collected by others prior to the remedial investigation. As many of these pre-remedial investigation groundwater samples were collected through an accumulated LNAPL layer in a monitoring well, these data represent worst-case or near worst-case groundwater conditions within the LNAPL smear zone.

Solute transport modeling was performed to determine whether smear zone groundwater impacts could adversely impact surface water quality within Newtown Creek. Newtown Creek has been substantially degraded by approximately a century of past unpermitted discharges upstream and downstream of the Quanta Resources property and has been given a SD classification (the lowest classification for saline surface waters) by NYSDEC. To be conservative, maximum observed concentrations and an assumption of no retardation (except for benzo(a)pyrene), were used in the evaluation. This evaluation determined that chemicals in the smear zone groundwater on the Quanta Resources property that exceed the designated surface water quality criteria for Newtown Creek (TOGS 1.1.1 SD criteria) would attenuate to concentrations below the SD surface water criteria prior to discharge to Newtown Creek. The low solubility of chemicals detected in the LNAPL and ongoing natural attenuation mechanisms occurring within groundwater, particularly within the groundwater/LNAPL smear zone interface, are effectively mitigating LNAPL chemical impacts to groundwater. Therefore, even without considering other attenuation mechanisms, such as mixing of smear zone groundwater with the lower groundwater, attenuation within Newtown Creek sediments prior to discharge to the creek, or mixing directly with surface water in Newtown Creek, the chemical impacts identified within the smear zone groundwater on the Quanta Resources property do not threaten the designated use of Newtown Creek.

With respect to the lower groundwater, only a small number of VOCs, SVOCs, and metals were detected at concentrations that exceed the TOGS 1.1.1 GA criteria (a drinking water protection criteria) and many of these chemicals can be attributable to upgradient sources. In addition, no site-related VOCs or metals were detected in the lower groundwater at concentrations that exceed the TOGS 1.1.1 Class SD surface water criteria. All SVOCs were below TOGS 1.1.1 Class SD surface water criteria with the exception of benzo(a)pyrene present in one lower groundwater well (GAGW-03).

With respect to the volatilization/vapor intrusion pathway, based on the data obtained during the RI, it appears that VOC or SVOC concentrations detected in groundwater would not pose a soil vapor intrusion concern for current and future commercial/industrial buildings. Consequently, groundwater beneath the Quanta Resources property area does not pose a significant threat to either on-property or off-property human or ecological receptors.

Urban Fill and Soil

Five surface urban fill/soil samples and fifty subsurface urban fill/soil samples were collected from the Quanta Resources property during the remedial investigation and were analyzed for VOCs, SVOCs, PCBs, and metals (along with physical characterization and LNAPL mobility assessment parameters). Except for the detection of three PAHs, two detections of bis-2-ethylhexyl phthalate and one detection of PCBs, all VOCs, SVOCs, and PCBs were either not detected or were detected at concentrations less than the TAGM 4046 soil objective based on residential direct contact exposures (health based criteria). Metals detected in the urban fill and soil were compared to TAGM 4046 soil objectives based on background. Several metals were detected in the urban fill/soil above the TAGM 4046 background objectives. However, these concentrations are consistent with those typically associated with urban fill material. Given the ubiquitous distribution of urban fill across the Quanta Resources and adjacent properties, restoration to background is not believed to be a realistic objective. Several chemicals in the urban fill/soil were detected above TAGM 4046 objectives based on groundwater protection. Given the presence of LNAPL below the urban fill/soil and the minimal impacts to groundwater beneath the Quanta Resources property, the urban fill/soil leaching pathway is considered to be of negligible consequence.

LNAPL

The LNAPL detected on the Quanta Resources property is generally characterized as a viscous, weathered and heterogeneous petroleum material made up predominantly of high boiling point and low solubility petroleum hydrocarbons. The LNAPL gradient is generally low and is toward Newton Creek, i.e. toward the southwest. The low LNAPL gradient combined with high LNAPL viscosities and the dissipated driving forces (sources removed at least 23 years ago) has resulted in low to negligible LNAPL flow velocities at the LNAPL fringes.

Although a number of potential LNAPL source areas existed on the Quanta Resources property throughout its operational history, the primary suspected source area is the tank farm area located in the northeastern portion of the Quanta Resources property. All primary sources of LNAPL on the Quanta Resources property were removed at least 23 years ago when the facility was decommissioned in 1982. Radial flow of LNAPL from the tank farm area appears to be the primary cause of the LNAPL observed upgradient and northeast of Review Avenue, which may also have migrated to the southeast and northwest. The release of LNAPL having more volatile and lower viscosity characteristics is also expected to have occurred on the North Capasso property. Given that the primary LNAPL source(s) have been removed, and based on the measured LNAPL viscosities and the predicted low gradients and low velocities at the LNAPL fringes, further radial extension of LNAPL to the northwest, northeast and southeast is not expected.

Downgradient from the Quanta Resources property, LNAPL was not detected in wells GAL-27 and GAL-28 (installed on the South Capasso property during the remedial investigation) and well MW-9 (a pre-remedial investigation well installed on the Prince Plastics property). Based on these data, the downgradient edge of LNAPL is located between the southern boundaries of the Quanta Resources and North Capasso properties and those three wells on the South Capasso (GAL-27 and GAL-28) and Prince Plastics (MW-9) properties, probably within the LIRR right-of-way (ROW). The transient groundwater mound observed on the South Capasso property, along with the measured LNAPL viscosities, restricts LNAPL migration further to the southwest. The mound may also have caused some limited northwest and southeast lateral extension of the LNAPL distribution. However, based on the measured high viscosity and predicted low velocities of LNAPL observed in the southern portion of the Quanta Resources property, and the transient nature of the mound, any diversion of the LNAPL to the northwest or southeast is not expected to be substantial and is likely confined within the limits of the LIRR ROW.

The area of LNAPL impact has been delineated. A large volume of LNAPL occurs on the Quanta Resources property and a large portion of this volume is non-recoverable residual LNAPL that is trapped within the soil pore spaces. In addition, due to the high viscosities, the low LNAPL gradients, the dissipated driving force (source removed at least 23 years ago) and the transient groundwater mound located downgradient of the LNAPL, the majority of the LNAPL mass is considered to be stable and is being naturally contained. LNAPL migration does not pose a significant threat to Newtown Creek.

A pilot LNAPL passive recovery system was operated at wells GAL-07 and GAL-02 on the Quanta Resources property from April through July 2004. Initial pumping rates were selected based on baildown test analysis and adjusted during the pilot study. The results of the pilot study indicated effective recovery of LNAPL with different viscosities at two locations. LNAPL recovery rates at the end of the pilot study at GAL-07 and GAL-02 were approximately 25 gallons per day (gpd) and 10 gpd, respectively, and these rates would be expected to decrease over time. As an example, the pilot study at GAL-2 was initiated on June 25, 2004 at a pumping rate of 25 gpd, quickly decreased to 15 gpd and, by the third day of the study had decreased further to 10 gpd. The 10 gpd pumping rate continued until the study was ended on July 9, 2004. Both the radius of influence and the recovery rate are expected to vary across the property due to varying conditions such as LNAPL viscosity, LNAPL volume in soil, and hydraulic conductivity.

Conclusions

Based on the results of the Phase I and II investigations, the Remedial Investigation for the Quanta Resources site is complete. The level of information obtained is adequate and sufficient for preparation of the Feasibility Study.

The only pathways of concern associated with groundwater are possible exposures to Newtown Creek surface water to which groundwater from the site may discharge and potential exposures to vapors by volatilization of chemicals from groundwater. Even without considering other attenuation mechanisms, such as mixing of smear zone groundwater with the lower groundwater, attenuation within Newtown Creek sediments prior to discharge to the creek, or mixing directly with surface water in Newtown Creek, the chemical impacts identified within the smear zone groundwater on the Quanta Resources property do not threaten Newtown Creek. With respect to volatilization of groundwater constituents, based on the data obtained during the RI, it appears that VOC or SVOC concentrations detected in groundwater would not pose a soil vapor intrusion concern for current and future commercial/industrial buildings. Consequently, groundwater beneath the Quanta Resources property area does not pose a significant threat to either on-property or off-property human or ecological receptors. While the presence of LNAPL throughout the site may result in potential soil vapor issues, these issues can be mitigated through use of engineering controls, standard construction health and safety practices, and deed restrictions.

The low solubility of chemicals detected in LNAPL, and ongoing natural attenuation mechanisms occurring within groundwater, particularly within the groundwater/LNAPL smear zone interface, are effectively mitigating chemical impacts to groundwater from LNAPL. Based on the contaminant fate and transport evaluations performed, groundwater at the property does not threaten the designated use of Newtown Creek.

As part of eventual redevelopment efforts, the entire Quanta Resources property will be regraded to incorporate a layer of clean fill, paved, and/or covered with buildings and other structures. In addition, because the future use of the property would be limited to commercial/industrial per planned deed restrictions, the only potential future exposure scenario to urban fill and soil vapor would be exposure of a construction/utility worker during soil excavation. This exposure can be mitigated through standard construction health and safety practices. Redevelopment of the Quanta Resources property would also involve addressing the soil vapor intrusion pathway, as needed, either through the use of physical barriers, passive ventilation, and/or active collection and treatment, depending on the identified future use and consequent potential exposures.

Given the presence of LNAPL below the urban fill/soil, and the minimal impacts to groundwater beneath the Quanta Resources property, the urban fill/soil leaching pathway is considered to be of negligible consequence. Therefore, given the minimal leachability of chemicals in the subsurface urban fill/soil, and considering the planned institutional and engineering controls that will address direct contact and vapor intrusion pathways, the chemicals detected in subsurface urban fill/soil do not pose a significant threat to human health and the environment.

Overall the area of LNAPL impact has been delineated. A large portion of the volume of LNAPL on the Quanta Resources property occurs as non-recoverable residual LNAPL that is trapped within the soil pore spaces. In addition, due to the high LNAPL viscosities, the low LNAPL gradients, the dissipated driving force (source removed at least 23 years ago) and the transient groundwater mound located downgradient of the LNAPL, the majority of the LNAPL mass is considered to be stable and is being naturally contained. Consequently, LNAPL migration does not pose a significant threat to Newtown Creek.

1.0 INTRODUCTION

This Remedial Investigation Report (RI Report) has been prepared by Golder Associates Inc. (Golder Associates), on behalf of the Quanta Site Administrative Group (QSAG), to report the results of the Phase I and Phase II Remedial Investigation (RI) at the Quanta Resources Site (Site). The RI Report is submitted in accordance with the New York State Department of Environmental Conservation (NYSDEC) approved Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan), finalized on June 10, 2003, and represents the findings, to date, of the field investigations conducted in and around the Quanta Resources Site. The RI/FS Work Plan was prepared pursuant to Section II.A, of the Order On Consent (Consent Order) executed by the New York State Department of Environmental Conservation (NYSDEC), NYSDEC Index No. W2-0915-03-06. The Quanta Resources property is located at 37-80 Review Avenue, Long Island City, New York and is currently listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 2-41-005 with a Classification of “2” pursuant to ECL 27-1305.

As stated in the RI/FS Work Plan, the overall objectives of the RI/FS for the Quanta Resources property are as follows:

- Determine the nature and extent of constituents of potential concern (COPC) and potential impacts to the public health, welfare, or the environment caused by the release or potential release of COPC at or from the Site by conducting a Remedial Investigation; and,

- Determine and evaluate alternatives for remedial action, if any, to prevent, mitigate, or otherwise respond to or remedy a release or potential release of COPC at or from the Site by conducting a Feasibility Study.

As described in the RI/FS Work Plan, the overall remedial investigation approach was to conduct the investigations in two phases. The first phase (Phase I) would focus on an investigation of soil, LNAPL, and groundwater on the Quanta Resources property. The RI/FS Work Plan specified that, following the Phase I RI, a Data Summary Report (DSR) would be submitted to NYSDEC that compiled the results of the Phase I RI, along with a proposal for further investigation, including an off-property investigation (Phase II RI). The DSR was submitted to NYSDEC on January 28, 2005. A portion of the off-property investigation (originally contemplated as part of the Phase II RI), along with additional on-property LNAPL evaluation and LNAPL recovery pilot study work, was conducted during the Phase I RI, as described below.

Prior to mobilizing for the Phase I RI field implementation, Golder Associates, on behalf of QSAG, prepared the first addendum to the RI/FS Work Plan (Addendum No. 1, dated October 7, 2003). Addendum No. 1 proposed additional LNAPL sampling and analytical procedures and was approved by NYSDEC. The Phase I RI activities, as described in the RI/FS Work Plan and the additional LNAPL investigation work specified in Addendum No. 1 were implemented from October 2003 through January 2004.

Based on information obtained from the initial subsurface on-property investigation, as described in the RI/FS Work Plan and Addendum No. 1, including the observation of free product (LNAPL) in the subsurface along the boundaries of the Quanta Resources property, further investigation of both on-property areas and adjacent off-property areas was proposed (Addendum No. 2, dated February 27, 2004, and Proposed Additional Data Collection under Addendum No. 2 dated June 15, 2004) to enhance the understanding of the distribution, characteristics, and mobility of LNAPL observed on the Quanta Resources property. The off-property LNAPL investigation was also used to begin to assess the possibility of off-property sources of LNAPL and migration of LNAPL amongst the properties. Addendum No. 2 and Proposed Additional Data Collection under Addendum No. 2 were approved by NYSDEC. The work conducted pursuant to Addendum No. 2 included additional soil borings, monitoring wells and sampling and analyses for both on-property and adjacent off-property areas. In addition to the RI/FS Work Plan Addenda, Golder Associates submitted a LNAPL Recovery Pilot Study Proposal (March 28, 2004) to NYSDEC on behalf of QSAG for the purpose of proactively evaluating mobility and potential recoverability of the free product. The LNAPL Recovery Pilot Study Proposal was subsequently approved by NYSDEC.

As indicated above, the results of the activities described in the RI/FS Work Plan, Addenda Nos. 1 and 2, and the LNAPL Recovery Pilot Study Proposal were summarized in the DSR, which was submitted to NYSDEC on January 28, 2005. The DSR also updated the Conceptual Site Model and identified data gaps, based on the review and analysis of the Phase I RI results, and included a proposal to conduct Phase II RI activities to fill the data gaps identified. To expedite the remedial investigation process, Golder Associates, on behalf of QSAG, submitted a proposal to NYSDEC to conduct the Phase II RI (letter dated December 17, 2004) with the intent of obtaining NYSDEC approval for performing the work in early 2005. The Phase II RI Proposal (Addendum No. 3) was approved by NYSDEC on January 19, 2005. As discussed in Section 3.0 of this RI Report, the Phase II RI activities were conducted in February, March and April 2005.

The remainder of this RI Report consists of the following key elements:

- A general description of the Quanta Resources and surrounding properties, including historical operational/environmental activities and an overview of the conceptual site model (CSM) prior to activities described in this RI Report, is presented in Section 2.0;
- A summary of Phase I RI and Phase II RI data acquisition activities for soil, LNAPL and groundwater is presented in Section 3.0;
- A summary of the Phase I RI and Phase II RI geologic and hydrogeologic investigation results is presented in Section 4.0;
- A summary of the Phase I RI and Phase II RI laboratory sample analyses results for soil, LNAPL, and groundwater is presented in Section 5.0;
- A description of the LNAPL Pilot Study and results is presented in Section 6.0;
- A detailed evaluation of LNAPL distribution, volumes, mass and migration potential is presented in Section 7.0;
- An updated Conceptual Site Model based on the results of the Phase I RI and Phase II RI activities reported in this RI Report, is presented in Section 8.0; and,
- References utilized during the preparation of this RI Report are presented in Section 9.0.

2.0 GENERAL SITE DESCRIPTION

2.1 Description of Quanta Resources Property

The Quanta Resources property consists of an approximately 1.8-acre parcel of land within a highly industrialized area of Long Island City, Queens, New York. Figure 1 provides the location of the property on a USGS quadrangle map, and Figure 2 shows an aerial photographic map (January 2004) showing the current development at the Quanta Resources and surrounding properties. Zoning in this area is designated as heavy manufacturing (New York City Department of Planning Commission).

As shown on Figure 2, the Quanta Resources property is bounded on the northeast by Review Avenue and on the southwest by the Southern Line of the Long Island Railroad (LIRR). On the northwest it is bounded by an alley (Preston Street) that runs from Review Avenue to the LIRR tracks. Farther to the northwest, across the alley, is the “North Capasso” property. On the southeast it is bounded by the property currently owned by Phoenix Beverages (an imported beer distributor). Farther to the northeast, across Review Avenue, is Calvary Cemetery, which covers roughly 175 acres and extends approximately 3,000 feet along Review Avenue. Further to the southwest, across the LIRR tracks, is the “South Capasso” property. Newtown Creek (Creek) lies beyond the South Capasso property approximately 450 feet from the southwest boundary of Quanta Resources property. The Quanta Resources property has been vacated and unused for industrial purposes since 1981.

Most of the structures (buildings, tanks, and containment areas), which previously existed on the Quanta Resources property, have been demolished since the property was abandoned in 1981 (see Section 2.2 below). The remaining structures on the property include a multi-story building that houses several empty tanks, and one aboveground tank containment area that includes 15 large empty and decontaminated steel aboveground storage tanks (ASTs). During its operation, most of the property was reportedly covered by asphalt or concrete and large portions of the southern area of the property have since been covered with a variably thick layer of surficial post-operational fill and debris. The northern portion of the property is currently covered by asphalt or concrete pavement. Construction debris, remnants of buildings, steel tanks and boilers, tires, wood pallets, and associated debris, exists in piles at different areas of the property including within the existing AST containment area and along the southeast portion of the property.

On May 24, 2003, the QSAG completed the construction of a 10- to 12-foot high corrugated steel fence which surrounds the property. Locking gates have been installed to allow access during the remedial investigation and other activities. These security measures were installed to mitigate previous trespasser concerns.

2.2 Former Ownership and Operations at Quanta Resources Property

According to the available information, the earliest recorded owner of the Quanta Resources property was American Agricultural Chemical Company ("American"). American transferred the property to Triplex Oil Refining Company ("Triplex Oil") in 1931; Triplex Oil operated the property for approximately 40 years. From approximately 1972 to 1980, the facility was operated by several different owners, including Pentalic Corporation, Sea Lion Corporation, Ag-Met Oil Service, Inc., Hudson Oil Refining Corp, Portland Holding Corporation, and Quanta Resources. Quanta Resources, which bought the Site from Portland Holding Corporation in July 1980, filed for bankruptcy on October 6, 1981, but still owns the property.

Sanborn maps (The Sanborn Library, LLC) indicate that historical operations included the refining of used crank case oil, since the inception of Triplex Oil in 1931. Select Sanborn maps for the years 1898, 1915, 1950, 1977, and 1993 are presented in Appendix A. Quanta Resources' operations included recycling, processing and/or storing used and unused oils, solvents and miscellaneous waste materials. The property was abandoned in November of 1981 after Quanta Resources filed for bankruptcy. Various waste materials were left behind in tanks and related structures leading to an initial investigation and subsequent Removal Action by New York City Department of Environmental Protection (NYCDEP) beginning in the summer of 1982. Figure 3 shows the approximate layout of the Quanta Resources property prior to the Removal Action.

2.3 Remedial Actions Completed at Quanta Resources Property

After the Quanta Resources property was abandoned, NYCDEP and NYSDEC personnel performed an investigation of materials left behind in tanks, vessels, building containment areas, and other structures. Other investigations indicated that some of the remaining materials were flammable and that some contained solvents, PCBs, and heavy metals. As a result, in 1982, the NYCDEP contracted CH2M Hill, as the oversight engineer, and OH Materials Corp (OHM) as the remedial contractor to perform a Removal Action.

In total, OHM reported that it removed over 500,000 gallons of liquids and approximately 900 cubic yards of solids (from tanks, containment areas, separators, etc.), portions of which it reported were impacted with PCBs, chlorinated solvents, heavy metals and/or cyanide. OHM emphasized that it had searched for hidden or buried storage tanks that had not been previously discovered by NYCDEP personnel. A magnetometer was used to scan for underground tanks. A total of 106 aboveground and underground tanks were evaluated as described below. Following the removal, transportation, and off-site disposal of the liquids and solids, storage tanks (including aboveground and underground tanks), piping, containment areas, and buildings were reported by OHM to have been emptied and decontaminated. A description of the work completed is presented in the report *Engineering Services Report*, *Quanta Resources Site Cleanup* (CH2M Hill, December 29, 1982) and is summarized below.

It was reported by OHM that all tanks on the property, including aboveground and underground tanks, were decontaminated and were certified as “gas free” by a licensed Marine Chemist from Marine Chemists Inc. of Hoboken, New Jersey. In addition, the dike areas and separators were decontaminated following the removal of all aqueous liquids, oils, and accumulated sludge. The cleaning and decontamination of the Site’s extensive piping network and appurtenances lasted throughout the duration of the project. The piping was dismantled into workable sections and thoroughly cleaned with potable water using high pressure water lasers. The cleanup and decontamination of Building A required the cleaning of the 14 tanks within the building, decontamination of the walls, floors, and basement areas of the building which had accumulated approximately 3 feet of aqueous/oil waste and sludge. In addition to the 10 tanks within Building F, the floors and walls were decontaminated. The other buildings reportedly did not contain liquid waste materials.

2.4 Previous Investigations Completed at Quanta Resources Property

At the conclusion of the Removal Action, OHM conducted an environmental investigation on behalf of the NYCDEP and installed four monitoring wells (W1, W2, W3, and W4) on the Quanta Resources property and collected samples of groundwater, light non-aqueous phase liquid (LNAPL), and composite samples of soil/fill. The activities conducted and findings of the study are presented in the report titled *Preliminary Hydrogeologic Assessment*, Quanta Resources, New York City, New York, prepared by OHM, January 7, 1983. The sample collection, handling, and analyses procedures were not well documented and the sampling locations are not fully known.

The firm Lawler, Matusky & Skelly (LMS) conducted a Phase II Investigation from 1988 through 1990 on behalf of NYSDEC (*Engineering Investigations at Inactive Hazardous Waste Site, Phase II Investigation*, Quanta Resources Site No. 241005, May 1990). LMS reported that the soils, LNAPL, and groundwater contained constituents similar to those detected by OHM in the materials removed during the 1982 Removal Action. A summary of the environmental data collected by LMS is presented in the RI/FS Work Plan. The results from the pre-RI groundwater investigations are discussed in Section 5.1.

Other pre-remedial investigation groundwater and/or LNAPL investigations were conducted on and adjacent to the Quanta Resources property as discussed in Sections 5.1, 5.4, and 7.0. These data have also been considered in this RI Report.

2.5 Overview of Historical Operations at Adjacent Properties

The following presents an overview of the development of the Quanta Resources and surrounding properties based on a review of maps from the Sanborn Library, LLC (Sanborn Maps) dated from 1898 to 1993. This historical overview discusses development on the adjacent Phoenix Beverages, South Capasso, and North Capasso properties. Copies of select Sanborn maps are provided in Appendix A.

Phoenix Beverages Property (37-88 Review Avenue)

The earliest Sanborn Map (1898) indicates that development of the Phoenix Beverages property (along with the property farther to the southwest) began in the late 1800's with the Charles Pratt Oil Refinery (see Figure A-1 in Appendix A). According to the 1915 Sanborn map, Standard Oil Company operated the Charles Pratt Works (see Figure A-2 in Appendix A). It is believed that the Standard Oil Company operated the facility as a wax plant, which included several large aboveground tanks and process units adjacent to the Quanta Resources property, until the property was sold and decommissioned. Sometime between 1950 and 1970, the use of the property apparently changed to a motor freight station (see Figure A-2 in Appendix A). From about 1977 to the present, the property appears to have been operated as a beverage and automotive parts distribution warehouse. Beverage distribution remains the primary current use of the property.

South Capasso Property (37-30 Review Avenue)

The earliest Sanborn Map (1898; see Figure A-1 in Appendix A) shows an "Old Oil Refinery" on the South Capasso property. According to the 1915 Sanborn map (see Figure A-2 in Appendix A), The Van Iderstine Company (animal rendering and feed manufacturing) operated on the property through at least to 1977. Various other operations were conducted on the eastern portion of this property including the American Agricultural Chemical Company and the Pocahontas Coal Company. The Van Iderstine Company and the other operations utilized several ASTs, including large ASTs labeled as storing fuel oil (see Figure A-4 in Appendix A). From 1979 to about 1993, the Sanborn maps show continued development of the property with buildings and many large ASTs; however, the owner and operations are not designated (see Figure A-5 in Appendix A). From about 1993 to the present the property is believed to have been used for industrial purposes.

North Capasso Property (37-30 Review Avenue)

The earliest Sanborn map (1898) shows the North Capasso property as part of Eastern Distilling Company. No further development records are provided on the Sanborn maps until 1950 when the property was shown as being utilized by The Van Iderstine Company Poultry Feed Building (see Figure A-3 in Appendix A). The Sanborn maps indicate that from about 1979, various operations (Bekins Trucking and Nanco Contracting) leased the property from the Van Iderstine Company and possibly other owners through about 1993 (see Figure A-5 in Appendix A). From about 1993 to the present, the property is believed to have been used for industrial purposes, including commercial vehicle and heavy equipment maintenance.

2.6 Other Historical Information

A Phase I Environmental Site Assessment (ESA) of both the North Capasso and South Capasso properties was conducted by Environmental Resources Management (ERM) in December 1989 (ERM, 1990). The following summarizes some of the findings of the Phase I ESA report (January 1990):

- The North parcel (believed to be the North Capasso property) housed operations of both Nanco Contracting and Underground Equipment Company and contained two buildings (Administrative and a Shop building), and a four-bay prefabricated garage. Activities included maintenance of vehicles and heavy equipment. Large quantities of hydraulic oil and motor oils and solvents and other chemicals were stored in the Shop building. Hazardous materials generated at the property included waste oil from equipment maintenance and operations and cleaning solvents from parts cleaning.

- The South parcel (believed to be the South Capasso property) housed operations of Review Supplies and contained a large warehouse and a generator shed. The warehouse was used to store gravel, cold patch, and heavy machinery associated with the operation of Review Supplies. Activities included crushing concrete blocks obtained from demolition projects into gravel and transporting the gravel by bulldozers to several locations on the South parcel for storage. The generator shed housed a large oil-burning electric generator and a 100-gallon aboveground tank to supply fuel oil to the generator.

- Three underground storage tanks (USTs) and one underground sump[1] were present on the North parcel. Two USTs (6,000-gallons each) store gasoline and diesel fuel which supplied two gasoline pumps[2] located between the Administrative and Shop buildings. The third UST is a 550-gallon tanks used to store waste oil (located on the east side of the Shop building) and is adjacent to a 5-foot deep concrete trench used for draining motor oil from heavy equipment. Rainwater that accumulated in the concrete trench was pumped into an underground sump, which is adjacent to the waste oil UST. The ESA reported that the USTs were installed in 1985 but that available records did not indicate that the USTs were registered with the State of New York.

- Review of the facilities tank permit issued by the New York City Fire Department indicated the presence of 10 abandoned USTs (size and contents of each UST unknown). The USTs were reported to have been emptied and filled-in with inert materials. The Phase I ESA did not indicate whether the USTs were located on the North or South parcel.

A reconnaissance of the North and South parcels was conducted by ERM as part of the ESA. Based on this reconnaissance ERM noted the following:

- The majority of the North parcel surface was paved with asphalt. Surface staining was prevalent across the North parcel. The surface of the South parcel consisted of permeable fill material and only minor staining was noted on the ground surface; and,

- Stained soil was identified on an area south of the North parcel along the Long Island Railroad right-of-way. The oil stain was traced to a concrete block retaining wall adjacent to the waste oil UST. Gravel packed surface overlying the waste oil UST was stained in several locations. At one location, gravel pore spaces were saturated with oil. The depth of the oil saturation was greater than one foot. ERM did not know the source of the staining and oil but suspected that they were caused by poor housekeeping practices, past disposal practices, or leakage from the underground sump or storage tank.

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[1] A manhole sump was identified on the North Capasso property during the RI activities as shown on Figure 4, which is believed to be may be the same sump referred to in the ERM report.

[2] A fuel dispensing pad was identified on the North Capasso property during the RI activities as shown on Figure 4. It is believed the two gasoline pumps and USTs referred to in the ERM report are those shown on Figure 4 adjacent to GAL-13.

3.0 SUMMARY OF REMEDIAL INVESTIGATION DATA ACQUISITION ACTIVITIES

3.1 Summary of Phase I RI Data Acquisition

The Phase I RI field work consisted of the work included in the RI/FS Work Plan, Addenda Nos. 1 and 2, and the LNAPL Recovery Pilot Study. Field activities commenced in October 2003 and were substantially completed in August 2004. In summary, the Phase I RI field work included the following:

- Quanta Resources property preparation and reconnaissance;
- Monitoring well and soil boring utility clearance;
- Installation of one shallow groundwater monitoring well (GAGW-06I) and seven deep groundwater monitoring wells (GAGW-01, GAGW-02, GAGW-03, GAGW-04D, GAGW-05, GAGW-07 and GAGW-08);
- Installation of 20 LNAPL monitoring wells: GAL-01, GAL-01R, GAL-02 through GAL-18, and GAGW-04;
- Installation of two LNAPL observation wells (OW-1 and OW-2);
- Completion of 14 soil borings (SB-01 through SB-07 and SB-09 through SB-15) in addition to the borings completed for monitoring well installation;
- Hydrogeologic testing (slug tests);
- LNAPL baildown tests;
- LNAPL sampling and analysis;
- Groundwater sampling and analysis, including monitored natural attenuation parameters;
- Urban fill/soil sampling and analysis;
- Long-term groundwater level monitoring;
- Several synoptic rounds of LNAPL thickness and groundwater level measurements.
- Implementation of a LNAPL pilot study at on-property wells GAL-02 and GAL-07; and,
- Topographic, property boundary and soil boring/well survey.

Figure 4 shows the location of all soil borings and monitoring wells completed as part of the Phase I RI as well as monitoring points that existed prior to the Phase I RI. Figure 5 shows the Phase I RI and existing monitoring points on a larger scale vicinity plan.

Drilling and well installation services were provided by New York licensed drillers from Aquifer Drilling and Testing (ADT) of New Hyde Park, New York and AmeriDrill of Levittown, Pennsylvania. Laboratory services were provided by: STL of Edison, New Jersey; CompuChem Laboratories, Inc. of Chapel Hill, North Carolina; and, Southern Petroleum Laboratories of Houston, Texas. Surveying services were provided by GEOD Corporation of Newfoundland, New Jersey. Panther Technologies Inc. (Panther) of Medford, New Jersey provided services for Site preparation and the construction of the LNAPL pilot study system.

3.2 Field Activities

The following sections describe the field activities that were completed as part of the Phase I RI. In general, all field activities were completed in a manner consistent with the approved RI/FS Work Plan and subsequent approved addenda.

3.2.1 Site Preparation

Phase I RI activities commenced on October 6, 2003 with the preparation of the Quanta Resources property for the Phase I RI field work. Site preparation included the following activities:

- Site reconnaissance of all on property soil boring and monitoring well locations to assess accessibility with a drill rig;
- Inspection of debris piles located near monitoring well/soil boring locations for potential hazardous items and the removal of those items;
- Grading and removal of debris material;
- Construction of fill ramps to improve access across structures such as the remnant former aboveground storage tank containment area in the central portion of the property; and,
- On-property and off-property reconnaissance for the presence of existing monitoring wells installed during previous investigations.

Inspection of debris piles located near monitoring well/soil boring locations located a total of six cylinders (one oxygen/nitrogen and five acetylene) near locations SB-05 and SB-09. The cylinders were inspected and prepared for transportation by a gas specialist (MG Industries) subcontracted by Panther. MG Industries transported the cylinders to their facility located in Malvern, Pennsylvania. Appendix B provides the Hazardous Materials Manifest and cylinder reutilization certificates for these six cylinders. Other material found within the debris piles included fire extinguishers, 25 empty metal automotive gasoline tanks, and three empty plastic automotive gasoline tanks. These materials have been staged on-property for subsequent disposal.

The reconnaissance for existing monitoring wells on-property and along Review Avenue identified the following wells: MW-11 and GW-1 located on-property and four wells located along Review Avenue (MW-14S, MW-14D, MW-15 and MW-16). The wells located along Review Avenue were subsequently identified as wells installed as part of the investigation of the Roher Chemical Site located approximately 900 feet north of the Quanta Resources property. Subsequent reconnaissance on the North Capasso property identified the presence of four wells, MW-1, MW-2, MW-4R, and MW-10. The locations of these existing wells have been surveyed and are shown on Figures 4 and 5.

3.2.2 Soil Boring and Monitoring Well Clearance

A soft drilling technique (removal of material by vacuum) was used to clear the first 5 feet of each borehole from the potential presence of underground utilities. Soil characterization of the first 5 feet of each borehole was therefore based on visual description of the material removed during the soft drilling process. Once a boring was cleared, the boring was then completed using either hollow stem auger or wash rotary drilling techniques.

3.2.3 Groundwater and LNAPL Well Installation

Figure 4 illustrates the location of the groundwater and LNAPL monitoring wells installed during the Phase I RI. Table 1 provides a summary of the well construction details. Appendix C includes boring and well installation logs. Figure 6 provides well construction schematic diagrams for typical LNAPL, shallow groundwater and deep groundwater monitoring wells. The following briefly summarizes the procedures used to drill, install and develop the groundwater and LNAPL monitoring wells.

Drilling Program

The drill rig, augers and drill stem and rig tools were thoroughly steam-cleaned upon arrival on-site, between each borehole and prior to leaving the property. The monitoring well casing and screen were thoroughly steam-cleaned prior to installation. Potable water obtained from a public water main located along Review Avenue was used for decontamination. A temporary decontamination pad was constructed to contain water generated from the steam cleaning operations. Water and solids generated from steam cleaning was contained in DOT approved 55-gallon drums for subsequent off-site disposal. Cuttings/mud generated from drilling were also contained in DOT approved 55-gallon drums and staged on property for storage and subsequent off-site disposal.

Shallow soil borings and LNAPL monitoring wells were drilled using hollow stem auger drilling techniques. Deep and shallow groundwater monitoring wells were installed using rotary wash techniques.

During all drilling activities, soil samples collected in each split-spoon sampler were screened with a photoionization detector (PID). In addition, air monitoring with a PID was conducted at the top of the borehole, in worker breathing space and along the perimeter of the drilling location. At no time during the drilling activities were there any readings recorded above background along the perimeter and within the worker breathing space. PID readings from soil samples collected are shown on each boring log presented in Appendix C.

On June 22, 2004 there was a small vapor combustion “flash” at location GAGW-07. This occurred during the welding of the outer protective casing at GAGW-07. There were no injuries or property damage. Work was immediately ceased and the incident evaluated. Based on this evaluation, it was decided that all future drilling would require additional air monitoring with a combustible gas meter and, where necessary, drilling would utilize drilling mud to mitigate buildup of vapors in the borehole. Procedures were immediately established and incorporated as a revision to the Site Health and Safety Plan. This document is provided in Appendix D. The procedures in this document dated July 1, 2004 were provided to the NYSDEC, NYSDOH, and NYCDEP on July 7, 2004, and were immediately implemented in the field. The Phase I RI continued with no further incident.

LNAPL Monitoring Wells

A total of 20 LNAPL monitoring wells were installed on and off-property. These wells include:

- 11 LNAPL wells on the Quanta Resources property: GAL-01, GAL-01R[3], GAL-02 through GAL-09, and GAL-16;
- one LNAPL well along Review Avenue: GAGW-04[4];
- five LNAPL wells on the North Capasso property: GAL-10, GAL-11, GAL-12, GAL-13, and GAL-18; and,
- three LNAPL wells on the Phoenix Beverages property: GAL-14, GAL-15, and GAL-17.

The drilling and installation of the LNAPL monitoring wells were completed using hollow stem auger (HSA) drilling techniques in general conformance with the procedures described in the approved RI/FS Work Plan. Beginning at 5 feet below ground surface (bgs) continuous soil samples were collected at each location using 3-inch outside diameter (OD) split-spoons. The larger diameter size split-spoon sampler was used to allow for the collection of sufficient volume of material for laboratory analysis.

Each LNAPL monitoring well was completed with 4-inch diameter Schedule 40 PVC with 0.020 slot screen. The length of the well screen varied between 10 feet and 20 feet depending on the conditions encountered at each location (i.e., extent of smear zone). At all locations, the wells are screened across the air/LNAPL interface and the LNAPL/water interface. The results of remedial investigation LNAPL sample analyses are presented in Section 5.4.

Groundwater Monitoring Wells

A total of eight groundwater monitoring wells were installed on and off-property. These wells include:

- four deep wells (GAGW-01, GAGW-02, GAGW-03, and GAGW-05) and one shallow well (GAGW-06I) on the Quanta Resources property;
- one deep background well (GAGW-04D) located along Review Avenue; and,
- two deep wells (GAGW-07 and GAGW-08) located on the North Capasso property.

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[3] Following the completion of GAL-01, anomalous LNAPL thickness readings were obtained that were not believed to be representative of field conditions. Therefore, monitoring well GAL-01R was installed adjacent to GAL-01 as a replacement well.

[4] Well GAGW-04 was originally proposed as a background groundwater monitoring well. Upon completion of this well, LNAPL was observed to be present. Therefore, this well is used as a LNAPL well and well GAGW-04D was installed adjacent to this well, double-screened through the LNAPL smear zone, to provide background groundwater quality data.

The drilling and installation of the deep groundwater monitoring wells were completed in general conformance with the procedures described in the approved RI/FS Work Plan. For each of the deep groundwater monitoring wells, hollow stem augers (with standard split spoon samplers) were used to first complete a pilot borehole to determine the vertical depth of the LNAPL smear zone based on visual observation (little to no staining) and PID readings (readings no more than several ppm above background). Once the approximate limits of the LNAPL smear zone were defined, wash rotary drilling was used to clean out the borehole to install a 4-inch diameter outer protective steel casing to a depth of approximately 5 feet below the smear zone which was then grouted in place. This protective casing effectively isolated LNAPL from groundwater within the well to allow for the collection of representative groundwater samples. Prior to installation, a cap was placed on the bottom of each outer casing to prevent LNAPL from entering the outer protective casing prior to the well screen and casing being installed. Once the grout had sufficient time to set (minimum of 24-hours) the borehole was completed using wash rotary drilling. Subsurface material below the outer protective casing was visually logged from drill cuttings at locations GAGW-01, GAGW-02, GAGW-03, and GAGW-05, which were drilled by ADT. At locations GAGW-04D, GAGW-07 and GAGW-08, which were drilled by AmeriDrill, continuous split spoon samples were collected to the bottom of the boring.

Each deep monitoring well was completed with 2-inch diameter Schedule 40 PVC with 0.010 slot screen. The length of each well screen is 10 feet and the top of the well screen is approximately 3 to 5 feet below the bottom of the outer protective steel casing or at approximately 8 to 10 feet below the LNAPL smear zone as specified in the approved RI/FS Work Plan.

A shallow groundwater monitoring well, GAGW-06I, was installed within the LNAPL smear zone to obtain groundwater quality data representative of groundwater in contact with the LNAPL smear zone. The LNAPL smear zone is estimated to extend to approximately 38 feet bgs based on visual impacts and soil total petroleum hydrocarbon data. The outer protective casing was set to 30 feet bgs and the GAGW-06I well screen was set from 31 to 41 feet bgs.

Following installation, each groundwater monitoring well was developed using a submersible pump. Development of each well continued until the water was relatively turbid free and the pH, temperature and specific conductivity stabilized. At location GAGW-06I the water quality meter malfunctioned. Development at this location continued until the water was relatively turbid free. Well development forms for each well are provided in Appendix E. Development water was contained in DOT approved 55-gallon drums and staged on-property for subsequent off-site disposal. All collected investigative derived waste is currently containerized and awaiting off-site disposal.

3.2.4 Urban Fill and Soil Sampling and Analyses

A total of 13 soil borings were completed as part of the fill/soil investigation as defined in Section 6.3.1 of the approved RI/FS Work Plan. These soil borings include SB-01 (GAL-01), SB-02 (GAL-02), SB-03 (GAL-03), SB-04 (GAGW-04), SB-05, SB-06, SB-07, SB-09, SB-10, SB-11, SB-12, SB-13 (GAL-04) and SB-14[5]. Soil boring SB-04 (GAGW-04) is located off-property along Review Avenue and provides background soil quality data. An additional 14th boring, SB-15, was completed off-property adjacent to well MW-4R. The purpose of this boring was to provide grain size and TPH saturation profile data.

Each boring was drilled using hollow stem augers and continuous split-spoon samples were collected beginning at 5 feet bgs. Upon completion of each boring, the boring was abandoned by tremie grouting the borehole with a cement/bentonite grout.

At each boring location (except for SB-15), fill/soil samples were collected at approximate 5-foot intervals and analyzed in the laboratory for target compound list (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOC), polychlorinated biphenyl (PCBs), and Target Analyte List (TAL) metals and cyanide. Select samples were analyzed for Total Organic Carbon (TOC), grain size and total petroleum hydrocarbon (TPH) analyses. In order to provide TPH saturation profiles, several fill/soil samples were collected within the LNAPL smear zone at each boring for additional TPH (Method 418.1) analyses. Additional fill/soil sampling and analyses at select borings/wells were completed as follows:

- at location SB-15 select fill/soil samples were analyzed only for TPH (Method 418.1) and grain size;
- select samples for VOC analysis were also collected at locations GAGW-07 and GAL-15;
- select fill/soil samples were also analyzed for speciated TPH (modified Method 8015); and,
- select fill/soil samples collected within the LNAPL smear zone were analyzed for mineralogy.

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[5] Soil boring SB-08 could not be completed due to subsurface obstructions within the urban fill material which precluded the advancement of the boring deeper than 7 feet bgs. Three unsuccessful attempts were made to complete this boring.

A Sampling and Analysis Summary is provided in Table 2a and sampling locations are shown on Figures 4 and 5.

The following summarizes the total number of analyses completed on primary fill/soil samples collected during the Phase I RI:

- VOCs – 51 samples
- SVOCs- 48 samples
- PCBs – 48 samples
- TAL Metals and Cyanide – 48 samples
- Total Organic Carbon – 10 samples
- TPH by method 418.1 – 352 samples
- Speciated TPH by modified method 8015 – 18 samples
- Grain Size Analysis – 71 samples
- Mineralogy – 3 samples

Numerous QA/QC samples including field and rinsate blanks, MS/MSD and duplicate samples were also collected and analyzed.

3.2.5 Groundwater Sampling and Analyses

Groundwater samples were collected in January 2004 from wells GAGW-01, GAGW-02, GAGW-03, and GAGW-05 and in August 2004 from wells GAGW-04D, GAGW-06I, GAGW-07 and GAGW-08. Samples were analyzed for TCL VOCs, SVOCs, PCBs, TAL metals, and monitored natural attenuation (MNA) parameters. The MNA parameters were included to evaluate subsurface conditions that may be conducive to the natural bio-attenuation of organic constituents in groundwater. A Sampling and Analysis Summary is provided in Table 2b and sampling locations are shown on Figures 4 and 5.

Well purging and sampling utilized low flow purge and sampling techniques consistent with the RI/FS Work Plan. Water was purged from each well prior to sampling using a stainless steel Grundfos Redi-Flo 2 submersible pump. Prior to purging and sampling each well, the submersible pump was decontaminated. Dedicated Teflon lined polyethylene tubing was installed in each monitoring well. The pump was carefully lowered down each well to the approximate mid-point of the screened interval. The discharge tubing was connected to a flow-through cell into which the portable water quality meter probes were placed for monitoring field parameters (dissolved oxygen, oxidation/reductive potential, temperature, pH, specific conductance, and turbidity).

The submersible pump was used to purge and sample groundwater from the well at low flow rates (approximately 200-500 ml/min. depending on the well yield). Field parameters were monitored continuously during pumping. In addition, water levels were continuously monitored. No changes in groundwater levels of more than 0.2 feet were noted. Once the field parameters stabilized to within ±10% (over a minimum of three consecutive readings), the water level had stabilized, and a minimum of one volume of the tubing had been removed, the well was considered adequately purged and ready to be sampled. The tubing was then disconnected from the flow-through cell and the samples were collected directly from the dedicated tubing. A summary of the field parameters measured (final stabilized result) is presented in Table 3 and groundwater sampling purge forms are provided in Appendix F. All water generated during purging was collected and contained in DOT approved 55-gallon drums for subsequent off-site disposal.

3.2.6 LNAPL Sampling

LNAPL samples were collected in November 2003 from on-property wells GAL-01 through GAL-08 and existing well MW-11 and off-property well GAGW-04 located along Review Avenue. To assess potential vertical stratification, two samples were collected from GAL-07 (from the surface of the LNAPL and about 3.5 feet below the surface) and three samples were collected from 10 feet, 27 feet, and 44 feet below the LNAPL surface at the Quanta Resources property sump[6], which appeared to be an 10-inch iron casing with an unknown origin extending to about 47 feet below ground. Samples were analyzed for TCL VOCs, SVOCs, and PCBs, TAL metals, gasoline, diesel and mineral range organics (DRO/GRO/MRO), GC Fingerprint and physiochemical parameters (TOX, %sulfur, %sediment, flash point, BTU, density, viscosity, surface tension and interfacial tension). Contact angle analysis was completed on samples collected from GAL-04 through GAL-08 and GAGW-04. A Sampling and Analysis Summary is provided in Table 2c and sampling locations are shown on Figures 4 and 5. All samples were collected in general conformance with the procedures specified in the approved RI/FS Work Plan.

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[6] During the Phase I RI drilling on the Quanta Resources property an 8-inch diameter vertical pipe ("sump") was found (refer to Figures 4 and 5). The sump is approximately 47 feet deep and contains LNAPL from about 8 feet bgs to the bottom of the Sump.

In August 2004 a second round of LNAPL samples was collected. This LNAPL sampling program was expanded to include additional LNAPL wells that were installed in 2004 and existing wells that were installed by others prior to the Phase I RI. It was the intention of this second round of LNAPL sampling and analyses to provide a complete round of samples that would be analyzed for essentially the same parameters using uniform methods. The following wells were sampled in August 2004:

- Quanta Resources Property: GAL-02 through GAL-08, existing well MW-11, and the Sump (1 sample) were resampled for TCL VOC+10, SVOC+15, GRO/DRO/MRO, and GC Fingerprint and newly installed wells GAL-01R, GAL-09, and GAL-16 were sampled for VOC+10, SVOC+15, PCBs, TAL metals, GRO/DRO/MRO, GC Fingerprint and physiochemical parameters (TOX, %sulfur, %sediment, flash point, BTU, density, viscosity, surface tension and interfacial tension);

- North Capasso property: GAL-10 through GAL-13, GAL-18, Manhole Sump[7] and existing wells MW-4R and MW-10 were sampled for TCL VOC+10, SVOC+15, and PCBs TAL metals, GRO/DRO/MRO, GC Fingerprint and physiochemical parameters;

- Review Avenue: GAGW-04 and existing well MW-15 were sampled for TCL VOC+10, SVOC+15, and PCBs TAL metals, GRO/DRO/MRO, GC Fingerprint and physiochemical parameters; and,

- Phoenix Beverages property: GAL-14 and GAL-17 and existing well MW-8 were sampled for TCL VOC+10, SVOC+15, and PCBs TAL metals, GRO/DRO/MRO, GC Fingerprint and physiochemical parameters.

It should be noted that during LNAPL sampling, no LNAPL was detected in the following wells: existing well MW-2, located on the North Capasso property; existing wells MW-14S, MW-14D, and MW-16, located along Review Avenue; and well GAL-15, located on the Phoenix Beverages property.

3.2.7 Groundwater and LNAPL Level Monitoring

Numerous rounds of synoptic groundwater and LNAPL level monitoring were conducted throughout the Phase I RI field work. The data from the last two rounds of groundwater and LNAPL level monitoring collected on July 24 and August 31, 2004 are provided in Tables 4 and 5. These data were used to construct the groundwater elevation contour maps as discussed in Section 4.2.2.

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[7] As previously reported to NYSDEC, a manhole with sump is located approximately 25 feet north of well GAL-12 on the North Capasso property. LNAPL was measured in this sump at a depth of 3.9 feet below the top of the manhole cover and water was measured at a depth of 5.57 feet. The sump is approximately 14 feet deep.

Continuous long-term groundwater level measurements were collected from GAGW-01 and GAGW-03 using In-Situ TROLL® pressure transducers and data loggers. The pressure transducers and data loggers were field decontaminated and installed below the water table. The depth to water was manually confirmed at each location with an electronic water level meter before installing and removing the logging equipment. The results from the continuous water level measurements for wells GAGW-01 and GAGW-03 are discussed in Section 4.2.1.

3.2.8 Hydrogeologic Testing

Slug tests (rising head test) were performed on deep groundwater monitoring wells GAGW-01, GAGW-02, GAGW-03, GAGW-05, GAGW-07, and GAGW-08 in August 2004. The purpose of the slug test was to collect data to determine the hydraulic conductivity of the glacial deposits. In general, the test at each well included the instantaneous removal of a slug of water from each well using a compressed gas (nitrogen) which resulted in a head change ranging from approximately 4 feet (GAGW-03) to over 13 feet (GAGW-01). Prior to the slug test, the water level was measured and recorded (initial depth to water). The instantaneous change in head and groundwater level recovery was monitored continuously with a pressure transducer and datalogger. The results from the slug testing are discussed in Section 4.2.4.

3.2.9 LNAPL Baildown Testing

Baildown tests were performed on LNAPL wells GAL-01, GAL-01R, GAL-02 through GAL-13, GAL-16 and GAL-18 to collect data that would allow for empirical and quantitative evaluation of the mobility and recoverability of LNAPL in the formation. In general, the test at each well included the instantaneous removal of product from each well using a dedicated bailer. In order to remove as much LNAPL as possible in a short duration several bailers were tied together to maximize the volume of LNAPL removed. Prior to each test, the air/LNAPL and LNAPL/water interface was measured with an oil/water interface probe. Once a sufficient volume of product was removed, the air/LNAPL and LNAPL/water interface was measured throughout the recovery period.

Data collected during the baildown tests were interpreted using the Gruszcenski graphical method (Gruszcenski, 1992) and the Huntley model (Huntley, 2000). The baildown test model results were then used to determine the LNAPL transmissivity and conductivity. A summary of the results is provided in Table 6 and the analysis and data collected are provided in Appendix G.

3.2.10 Surveying

The following survey work was completed during the Phase I RI:

- Control Survey – A control survey was performed using NAD 1983 as the horizontal datum and NAVD 1988 as the vertical datum;
- Photogrammetric Topography Survey – New aerial photography of the Quanta Resources property and immediate surrounding area was conducted. A topographic map with 1-foot contours was produced using the new aerial photography supplemented with ground control;
- Survey of Environmental Points – All newly installed wells and borings were surveyed including existing wells located on the Quanta Resources property (GW-1 and MW-11), North Capasso property (MW-1, MW-2, MW-4R and MW-10), Review Avenue (MW-14S, MW-14D, MW-15, and MW-16) and Phoenix Beverages property (MW-8); and,
- Quanta Resources Property Survey – A survey of the Quanta Resources property was performed.

3.3 Phase II Field Activities

The Phase II RI field work consisted of the activities described in the Proposal for Phase II Remedial Investigation submitted to NYSDEC on December 17, 2004 and approved by NYSDEC on January 19, 2005 and the Proposed On-Property Surface Soil Samples Work Plan submitted to NYSDEC on April 8, 2005 and approved by NYSDEC. Field activities commenced on February 16, 2005 and were substantially completed on April 17, 2005. In summary, the Phase II RI field work included the following:

- Monitoring well and soil boring utility clearance;
- Installation of 10 LNAPL monitoring wells: GAL-19 through GAL-28;
- Completion of 2 soil borings (SB-16 (GAL-19) and SB-17 (GAL-20));
- Hydrogeologic testing (slug tests);
- LNAPL baildown tests;
- LNAPL sampling and analysis;
- Urban fill/soil sampling and analysis;
- Surficial Fill sampling and analysis;

- Several synoptic rounds of LNAPL thickness and groundwater level measurements;
- Assessment of the sump located on the Quanta Resources property;
- Assessment of monitoring wells installed prior to the remedial investigation; and,
- LNAPL monitoring well survey.

The following sections describe the field activities that were completed as part of the Phase II RI. In general, all field activities were completed in a manner consistent with the approved RI/FS Work Plan and subsequent approved Work Plans for the Phase II RI.

3.3.1 Soil Boring and Monitoring Well Clearance

A soft drilling technique (removal of material by vacuum) was used to clear the first 5 feet of each borehole from the potential presence of underground utilities. Soil characterization of the first 5 feet of each borehole was therefore based on visual description of the material removed during the soft drilling process. Once a boring was cleared, the boring was then completed using either hollow stem auger or wash rotary drilling techniques.

3.3.2 LNAPL Well Installation

Figures 4 and 5 illustrates the location of the groundwater and LNAPL monitoring wells installed during Phases I and II. Table 1 provides a summary of the well construction details. Appendix C includes boring and well installation logs. Figure 6 provides well construction schematic diagrams for typical LNAPL monitoring wells. The following briefly summarizes the procedures used to drill, install and develop the LNAPL monitoring wells during the Phase II RI.

Drilling Program

The drill rig, augers and drill stem and rig tools were thoroughly steam-cleaned upon arrival on-site, between each borehole and prior to leaving the property. The monitoring well casing and screen were thoroughly steam-cleaned prior to installation. Potable water obtained from a public water main located along Review Avenue was used for decontamination. A temporary decontamination pad was constructed to contain water generated from the steam cleaning operations. Water and solids generated from steam cleaning were contained in DOT approved 55-gallon drums for subsequent off-site disposal. Cuttings generated from drilling were also contained in DOT approved 55-gallon drums and staged on property for storage and subsequent off-site disposal.

LNAPL monitoring wells were drilled using hollow stem auger drilling techniques with the exception of GAL-19 and GAL-20 which were installed using air rotary and Geoprobe methods, respectively. GAL-19 required air rotary drilling methods to facilitate drilling through a thick concrete slab and fill material.

During all drilling activities, soil samples collected in each split-spoon sampler were screened with a PID. In addition, air monitoring with a PID was conducted at the top of the borehole, in worker breathing space and along the perimeter of the drilling location. At no time during the drilling activities were there any readings recorded above background along the perimeter and within the worker breathing space. PID readings from soil samples collected are shown on each boring log presented in Appendix C.

LNAPL Monitoring Wells

A total of 10 LNAPL monitoring wells were installed on and off-property. These wells include:

- Two LNAPL wells on the Quanta Resources property: GAL GAL-19 and GAL-20;
- Four LNAPL wells on the North Capasso property: GAL-21 through GAL-24;
- Two LNAPL wells on the Phoenix Beverages property: GAL-25 and GAL-26; and
- Two LNAPL wells on South Capasso property: GAL-27 and GAL-28.

The drilling and installation of the LNAPL monitoring wells were completed using HSA drilling techniques in general conformance with the procedures described in the approved RI/FS Work Plan, with exception of well GAL-19 and GAL-20, as described above. During HSA drilling and beginning at 5 feet bgs continuous soil samples were collected at each location using 2-inch OD split-spoons. The larger diameter size split-spoon sampler was used to allow for the collection of sufficient volume of material for laboratory analysis.

Each LNAPL monitoring well was completed with 4-inch diameter Schedule 40 PVC with 0.020 slot screen with the exception of GAL-19 and GAL-20. These wells were completed with 2-inch diameter Schedule 40 PVC with 0.020 slot screen. The length of the well screen varied between 10 feet and 20 feet depending on the conditions encountered at each location (i.e., extent of smear zone). At all locations, the wells are screened across the air/LNAPL interface and the LNAPL/water interface. The results of Phase II LNAPL sample analyses are presented in Section 5.4.

3.3.3 Urban Fill and Soil Sampling and Analyses

A total of two soil borings were completed as part of the fill/soil investigation as specified in the Phase II RI Work Plan (December 2004). These soil borings include SB-16 (GAL-19) and SB-17 (GAL-20).

At each boring location, urban fill/soil samples were collected at approximate 5-foot intervals[8] and analyzed in the laboratory for target compound list (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOC), polychlorinated biphenyl (PCBs), and Target Analyte List (TAL) metals and cyanide. Select samples were analyzed for grain size and total petroleum hydrocarbon (TPH) analyses. In order to provide TPH saturation profiles, several fill/soil samples were collected within the LNAPL smear zone at each boring for additional TPH (Method 418.1) analyses.

A Sampling and Analysis Summary is provided in Table 2a and sampling locations are shown on Figures 4 and 5.

The following summarizes the total number of analyses completed on primary urban fill/soil samples collected during the Phase II RI:

- VOCs – two samples
- SVOCs – two samples
- PCBs – two samples
- TAL Metals and Cyanide – two samples
- TPH by method 418.1 – 86 samples
- Grain Size Analysis – 17 samples

Numerous QA/QC samples including field and rinsate blanks, MS/MSD and duplicate samples were also collected and analyzed.

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[8] Due to the presence of fill material and a concrete slab, subsurface material could not be collected until 15 feet bgs at SB-16 (GAL-19) and 14 feet bgs at SB-17 (GAL-20).

3.3.4 Surficial Urban Fill/Soil Sampling and Analyses

On April 9, 2005 five surface urban fill/soil samples (SS-01 through SS-05) were collected at the locations shown on Figure 4. Each surface urban fill/soil sample was collected from 0-2 inches below existing grade and were analyzed for Target Compound List (TCL) polycyclic aromatic hydrocarbons and PCB’s and Target Analyte List metals. In addition, QA/QC samples were collected which included one rinsate blank and one field duplicate.

3.3.5 LNAPL Sampling

In April 2005 LNAPL was sampled from wells GAL-19, GAL-20, GAL-21, GAL-22, GAL-23, GAL-24, and GAL-26 and analyzed for TCL VOC+10, SVOC+15, PCBs, TAL metals, GRO/DRO/MRO, GC Fingerprint and physiochemical parameters (TOX, %sulfur, %sediment, flash point, BTU, density, viscosity, surface tension and interfacial tension). It should be noted that LNAPL was not present at wells GAL-25, GAL-27, and GAL-28.

3.3.6 Groundwater and LNAPL Level Monitoring

Numerous rounds of synoptic groundwater and LNAPL level monitoring were conducted throughout the Phase II RI field work. The data from the last two rounds of groundwater and LNAPL level monitoring collected on April 4 and April 19, 2005 (Quanta Resources property, North Capasso property, and Review Avenue wells) and on April 9 and April 17, 2005 (Phoenix Beverage property wells) and are provided in Tables 4 and 5. The groundwater level data were used to construct the groundwater elevation contour maps as discussed in Section 4.2.2.

3.3.7 Hydrogeologic Testing

In accordance with the Phase II RI Work Plan, slug tests (rising head test and falling head test) were performed on monitoring wells GAGW-06I and GAGW-04D in April 2005. In addition, a slug test was also performed on monitoring wells GAGW-01 and GAGW-03 to confirm the results obtained during the Phase I RI. The purpose of the slug test was to collect data to estimate the hydraulic conductivity of the glacial deposits. Prior to the slug test, the water level was measured and recorded (initial depth to water). The instantaneous change in head and groundwater level recovery was monitored continuously with a pressure transducer and datalogger. The results from the slug testing are discussed in Section 4.2.4

3.3.8 LNAPL Baildown Testing

Baildown tests were performed on LNAPL wells GAL-20 through GAL-24[9] to collect data that would allow for empirical and quantitative evaluation of LNAPL mobility. In general, the test at each well included the instantaneous removal of product from each well using a dedicated bailer. In order to remove as much LNAPL as possible in a short duration several bailers were tied together to maximize the volume of LNAPL removed. Prior to each test, the air/LNAPL and LNAPL/water interface was measured with an oil/water interface probe. Once a sufficient volume of product was removed, the air/LNAPL and LNAPL/groundwater interface was measured throughout the recovery period.

Data collected during the baildown tests were interpreted using the Gruszcenski graphical method (Gruszcenski, 1992) and the Huntley model (Huntley, 2000). The baildown test model results were then used to determine the LNAPL transmissivity and conductivity. A summary of the results is provided in Table 6 and the analysis and data collected are provided in Appendix G.

3.3.9 Surveying

All newly installed Phase II RI wells and Pre-remedial investigation well MW-7R were surveyed.

3.3.10 Assessment of Quanta Sump

An assessment of the sump located on the Quanta Resources property located near GAL-05 was completed to obtain information on its construction. The assessment began on February 17, 2005. The sump is a 10-inch diameter iron vertical pipe with a LNAPL level of 7.65 feet from the top of the pipe or casing (TOC). The total depth of the sump was sounded to be approximately 46.5 feet TOC.

A whaler pump with polyethylene Teflon tubing was first used to purge the LNAPL from the sump. Due to the high viscosity of the LNAPL, little volume was removed after several hours. Subsequently, three Teflon bailers were tied together and approximately 35 gallons of LNAPL were manually removed and placed into secure 55 gallon drums. After the bailing was completed, the product level was measured at 19.45 feet TOC. On February 23, 2005 the sump

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[9] A baildown test could not be completed at GAL-19 because an accurate reading on the LNAPL/groundwater interface could not be obtained during the test. At GAL-24 there was not sufficient thickness of LNAPL to perform a baildown test.

product level was measured at 18.81 feet TOC. Bailing resumed on February 23, 2005 and approximately 55 gallons of LNAPL was removed. The depth to LNAPL after bailing was measured at 31.55 feet TOC.

On February 24, 2005 the LNAPL level at the sump location was measured at 20.50 feet TOC and depth to water was measured at 33.90 feet. On March 2, 2005 an additional 50 gallons of LNAPL was removed. Prior to the bailing the LNAPL level was measured at 19.20 feet TOC and the water level was at measured at 32.50 feet TOC. A down-hole camera was lowered down the sump in order to determine if a screen was present within the sump. The camera was lowered to approximately 32.50 feet which was the top of the LNAPL. During the lowering of the downhole camera Golder Associates did not observe any apparent visual signs of holes, cracks, or voids in the concrete riser. In addition, a screen was not observed. On April 19, 2005 the top of LNAPL was measured at 20.13 feet TOC and the water level at 22.03 feet TOC, which is a product thickness of 1.9.

In summary, approximately a total of 140 gallons of LNAPL was removed from the sump which is approximately the amount of LNAPL that was stored in the sump prior to purging of the sump (LNAPL thickness of 38.85 feet). If there is some type of well screen in the sump it is deeper than 32.5 feet TOC. The water level measured on April 19, 2005 is approximately the same depth as the water level measured in LNAPL well GAL-05 which is located adjacent to the sump.

3.3.11 Assessment of Monitoring Wells

An evaluation of existing monitoring wells MW-1 and MW-2 on the North Capasso property and existing monitoring wells MW-7 and MW-7R on the South Capasso property was completed to assess the suitability of these wells for effectively monitoring LNAPL on the water table. Well MW-3R located on the South Capasso property could not be located and Golder Associates was not able to obtain access from the property owner where MW-9 is located (Prince Plastics property).

On March 31, 2005 well MW-7R was located. The well appeared in good condition. No LNAPL was found in the well and the water level was measured at 8.44 feet TOC. The well is a 2-inch diameter PVC well and the bottom was sounded at 16.82 feet TOC. A downhole camera was lowered and confirmed a screen at approximately 4.5 to 5 feet TOC which is above the water level measured in the well.

A downhole camera survey was conducted in a well found at the apparent location of MW-1 on the North Capasso property in the sidewalk in front of the Preston access road. This well is a 2-inch diameter PVC well. According to the MW-1 well installation log, this well should be a 4-inch diameter PVC well and screened from 15 to 35 feet bgs. The well was sounded at 29.35 feet TOC and the groundwater level was measured at 21 feet bgs. The downhole camera was lowered to the top of the groundwater. Golder Associates did not observe the presence of a well screen. Based on these observations, it is believed that this monitoring well is not MW-1 and could be one of the original monitoring wells installed in 1982 by OHM.

A downhole camera survey was completed at MW-2 which confirmed that this well is screened across the groundwater.

3.4 Laboratory Analysis and Validation

Data Usability Summary Reports (DUSR) were prepared that present the findings of the data quality review and data validation performed on the analysis of environmental samples collected during the Phase I and Phase II RIs. The DUSRs were prepared in a manner consistent with the NYSDEC Guidance Memorandum for Data Usability Summary Reports (NYSDEC, 1995). Golder Associate's QA personnel validated the laboratory data following guidance provided by USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic and Inorganic Data Review and the USEPA Region II Data Validation Standard Operating Procedures (SOPs), as applicable to USEPA SW-846 methodology. The DUSRs are presented in Appendix H. In summary, there were relatively few data that were rejected for this project and the overall completeness for the project was 99.4%, which exceeds the completeness goal of 85% specified in the RI/FS Work Plan and Sampling and Analysis Plan.

4.0 SUMMARY OF GEOLOGIC AND HYDROGEOLOGIC INVESTIGATION RESULTS

4.1 Site Geology

The Quanta Resources property is located approximately 450 feet northeast of Newtown Creek that drains into the East River in the western part of Long Island. Newtown Creek drains to the northwest. The banks of the river and the surficial materials on the Quanta Resources property have been largely altered through time by land reclamation activities that preceded much of the modern history of this part of Long Island. The topography and surficial geology in the vicinity of the Quanta Resources property is largely a reflection of man-made urban fill and unconsolidated natural deposits related to the Wisconsin stage glaciation.

The following geologic interpretation is based on the results obtained during the remedial investigation. The stratigraphy at the Quanta Resources property and the immediately adjacent properties consists of the following units, from youngest to oldest:

1. Urban Fill;
2. Glacial Deposits consisting of an upper and lower sand and gravel unit; and,
3. Lower Clay (Raritan Clay).

A brief description of each geologic unit is provided below and geological cross-sections are presented on Figures 7, 7A, and 8. Urban fill/soil boring logs are provided in Appendix C.

4.1.1 Urban Fill Unit

The unit directly underlying the Quanta Resources property, and adjacent properties, consists of miscellaneous urban fill. The urban fill ranges in thickness on-property from about 3 feet at GAL-04 to about 16 feet at SB-05 and off-property from about 0.5 feet at GAGW-04 to about 17 feet at MW-7R (South Capasso property). The urban fill generally consists of a mixture of heterogeneous soil including angular to sub angular, loose to compact, silty fine sand and gravel intermixed with various debris, including, but not limited to, brick fragments, asphalt, wire, and plastic.

4.1.2 Glacial Deposits

Unconsolidated sedimentary deposits consisting predominately of interbedded horizons of fine to coarse sand, and fine to coarse gravel comprise the youngest natural material underlying the urban fill at Quanta Resources property. These deposits are of glacial origin and can be further subdivided into two distinct units (an “upper” unit and a “lower” unit) based largely on their lateral extent, and natural color, as shown on Figures 7 and 8. The distinguishing characteristic between the upper and lower glacial deposits is a change in color. Hydraulically, the two units are expected to behave similarly (discussed in Section 4.2). The upper unit is predominately gray to dark gray and the lower unit is predominately yellowish brown to brown. The upper surface of the lower unit is located at approximately -30 feet mean sea level (MSL)

Some discrete and laterally discontinuous horizons of silt, silty clay and clay are also present within the upper unit of the glacial deposits. These horizons appear to be primarily localized in the eastern portion of the Quanta Resources property such as those intercepted at monitoring well location GAL-08 and south of the Quanta Resources property such as those intercepted at monitoring wells GAL-27, GAL-28 and MW-7R.

In the eastern portion of the Quanta Resources property, these silts, silty clays and clay horizons are generally slightly greater than 10 feet in thickness and have also been observed at off-property well GAL-15 located approximately 30 feet east of GAL-08 but were not encountered in other borings completed as part of the Phase I RI. The elevation of the top of the silt, silty clay and clay horizons at locations GAL-08 and GAL-15 is 9 feet and 5 feet MSL, respectively. An additional silt unit, at a still higher elevation, has also been intercepted at monitoring wells GAL-08, GAGW-04 and GAL-04. This silt horizon ranges in thickness from about 3 feet (at GAL-04 and GAL-08) to about 5.5 feet at GAGW-04. The elevation of this uppermost silt horizon occurs at about 0.5 feet bgs (25 feet MSL) at GAGW-04 and about 8 feet bgs at GAL-04 (8 feet MSL) and GAL-08 (17 feet MSL).

South of the Quanta Resources property a clay horizon was encountered at GAL-27 and GAL-28 which was 6 feet and 2.5 feet thick, respectively. The elevation of this clay horizon occurs at about 18 feet bgs (-5 feet MSL) at GAL-27 and 23 feet bgs (-10.5 feet MSL) at GAL-28. At MW-7R, a monitoring well installed by Haley and Aldrich in September 2002, a clay horizon was also encountered at about 17 feet bgs (-6.8 feet MSL). The geologic sections provided on Figures 7 and 8 illustrate the occurrences of the silt and clay horizons.

4.1.3 Lower Clay Unit

The deepest natural geologic unit intercepted during the remedial investigation at the Quanta Resources property is a laterally continuous, finely laminated to thinly bedded, silty clay, silt, or clay. This clay unit, referred to as the Lower Clay Unit, has been identified as the Raritan formation of Late Cretaceous age based on a review of available published literature. The clay encountered has been described as dark gray silty clay (GAGW-04D) and white to light gray clay (GAGW-01, GAGW-02, GAGW-03 and GAGW-05).

The Raritan Clay or Lower Clay Unit was encountered at deep groundwater monitoring well borings GAGW-01, GAGW-02, GAGW-03, GAGW-04D, and GAGW-05 at depths ranging from 71 feet bgs (elevation -45 feet MSL) at GAGW-04D to 85 feet bgs (elevation -61 feet MSL) at GAGW-03. This clay is believed to be continuous across the Quanta Resources and adjacent properties.

4.2 Site Hydrogeology

The hydrogeologic investigation included the installation of seven deep and one shallow groundwater monitoring wells, hydrogeologic testing (slug tests), and water level measurements. Deep groundwater monitoring wells GAGW-01, GAGW-02, GAGW-03, and GAGW-05 and shallow groundwater monitoring well GAGW-06I were installed on the Quanta Resources property, deep groundwater wells GAGW-07 and GAGW-08 were installed on the North Capasso property, and deep groundwater monitoring well GAGW-04D was installed north of the Quanta Resources property across Review Avenue.

Slug tests were conducted on all wells to provide estimates of the hydraulic conductivity of the glacial deposits (Glacial Aquifer) above the underlying Raritan Clay. Synoptic water levels were collected in the deep and shallow groundwater monitoring wells to assess horizontal and vertical hydraulic gradients and the resultant groundwater flow direction. In addition to manual measurements, continuous groundwater level measurements were collected using transducers/dataloggers.

4.2.1 Analysis of Precipitation and Tidal Effects

Figure 9 provides plots of water level elevations measured in two on-property monitoring wells (GAGW-01 and GAGW-03) using transducers/dataloggers during the period between May 13, 2004 and June 8, 2004. Precipitation data (daily totals) were obtained from the Queens College weather observation center located in Flushing, New York.

Review of the groundwater elevation graphs shown on Figure 9 indicates consistent cyclical, low-amplitude (generally between approximately 0.05 feet to 0.1 feet) fluctuation of water levels superimposed on longer-term increasing and decreasing elevation trends. The cyclical, low-amplitude fluctuations generally occur twice per day and are the result of tidal influences from the rising and lowering of Newtown Creek. The longer-term fluctuations appear to correlate with precipitation events. Water level elevations in both wells begin to increase within 24 to 48 hours after each precipitation event. Between precipitation events, water level elevations decrease. The lag-time and magnitude of water level changes in response to precipitation are likely influenced by a number of factors, including the actual time of precipitation event(s)[10], the total rainfall volume at the Quanta Resources and adjacent properties[11], the intensity of the precipitation event and the cumulative effect of multiple rainfall events. Groundwater elevations in the two wells appear to respond similarly to precipitation events in terms of lag-time and magnitude of response. Lack of significant water level changes (for the period shown on Figure 9) also indicates that no significant groundwater pumping occurs near the Site.

Figure 10 includes a plot of water levels as measured in GAGW-03 versus calculated water level elevations in Newtown Creek for the period from January 9, 2004 through January 16, 2004. Water levels in Newtown Creek were calculated based on tidal data obtained from Hunters Point, Newtown Creek gauging station located approximately 0.6 miles east of the Quanta Resources property. These data were corrected for both time and magnitude using published correction data. The tidal data should be considered semi-quantitative and only approximate the times of the tides at Newtown Creek nearest the Quanta Resources property. Figure 10 indicates a clear response in groundwater elevations on the Quanta Resources property to tidal changes in Newtown Creek and the lag time of groundwater elevation fluctuations to tide changes can be roughly estimated to be several hours.

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[10] The daily precipitation totals were assigned to 12:00 pm on the date the precipitation was recorded. The actual time of the precipitation could have occurred any time during the previous 24 hours.

[11] The total volume of rainfall at the Quanta Resources and adjacent properties may be different than the total recorded at Queens College.

4.2.2 Groundwater Flow Direction

Figure 11 presents an interpreted groundwater contour map constructed from a synoptic round of water levels taken on July 24 and August 31, 2004 during the Phase I RI from the deep and shallow groundwater monitoring wells. The general direction of groundwater flow within the lower portion of glacial deposits above the lower clay in July and August 2004 is south-southwest to southwest with a stronger southwesterly component observed in the southern area of the Quanta Resources property in August 2004. As discussed in Section 4.2.1 above, while tidal effects on groundwater elevation have been observed, these effects are believed to be minor, uniform across the Quanta Resources property, and are not anticipated to materially alter the groundwater flow direction.

Figure 12 presents the interpreted groundwater contour map constructed from a synoptic round of water levels taken on April 19, 2005 during the Phase II RI from the deep and shallow groundwater monitoring wells including shallow wells GAL-27, GAL-28 and MW-7R located south of the Site. The general direction of groundwater flow within the lower portion of glacial deposits above the lower clay is south-southwest to southwest. As shown on this figure, there is a groundwater mound located in the area of the clay horizon detected in wells GAL-27 and GAL-28. The presence of this groundwater mound and how it may impact groundwater flow direction is discussed below.

As described in the preceding paragraph, a high degree of confidence can be placed in groundwater level measurements collected from the groundwater monitoring wells, such that a relative interpretation of groundwater flow can be achieved. The same is not true for water level measurements collected from LNAPL wells. Estimating the groundwater flow direction based on groundwater level and density corrected LNAPL thickness measurements is not appropriate and will yield inconsistent results. As discussed in Section 4.2.1, groundwater fluctuations were observed as a result of both precipitation and tidal changes. The magnitude of the tidal influenced changes is approximately 0.05 feet to 0.1 feet. Although these fluctuations are not large, they do have an affect on the measured LNAPL thickness in the LNAPL monitoring wells. During the Phase I RI, numerous LNAPL thickness and water level measurements were collected. These data indicate that a change in water level of up to 0.1 foot as observed in the deep groundwater monitoring wells would result in a change in measured LNAPL thickness ranging between 0.7 feet (MW-11) and 0.06 feet (GAL-06). Each LNAPL well responded differently to fluctuations in groundwater levels likely due to the differences in the LNAPL properties and

LNAPL transmissivity at each location. Therefore, it is not appropriate to assess groundwater flow direction using groundwater level and LNAPL thickness measurements from the LNAPL wells.

The groundwater levels measured in the shallow and deep groundwater wells provide a reasonable estimate of groundwater flow direction at and adjacent to the Quanta Resources property. It is important to note that the interpreted groundwater elevation contours and resulting directions of groundwater flow presented on Figures 11 and 12 show that deep groundwater monitoring wells GAGW-07 and GAGW-08, located on the North Capasso property, are hydraulically upgradient (July 2004 and April 2005) or crossgradient (August 2004) of monitoring wells GAGW-01 and GAGW-05 located on the western side of the Quanta Resources property.

As shown on Figure 12, the data collected in April 2005 includes groundwater level data collected from Phase II RI wells GAL-27 and GAL-28. The groundwater elevations at these locations are higher in elevation than the groundwater elevations of the deeper wells located on the Quanta Resources and North Capasso properties. The higher groundwater elevations indicate the presence of a groundwater mound in this area which is most likely a result of the clay horizon encountered at GAL-27 and GAL-28. The clay horizon has a lower permeability which will inhibit recharge of water from the surface to the underlying aquifer. This scenario causes the groundwater to “mound” where this clay horizon is present. The groundwater mound is believed to be transient and the degree of mounding will vary seasonally along with long term periods of drought or precipitation.

A three-dimensional numerical groundwater conceptual model was constructed at the site and surrounding properties. The model was used to quantitatively assess the potential impacts of the lower permeability (hydraulic conductivity) zone identified in borings just below the water table in the vicinity of wells GAL-27 and GAL-28 (refer to cross sections in Figures 7, 7A and 8). Although the model was not calibrated nor detailed sensitivity analysis performed, the model is none the less valuable for visualizing three-dimensional groundwater flowpaths in and around the low permeability zone described above. The model code known as MODFLOW was used for these simulations (USGS, 1988). A summary of the model input parameters are listed below:

- Finite difference grid 1,000 feet by 1,000 feet in size, with six layers and a cell size of 10 feet by 10 feet;

- The six model layers correspond to the following:

    - Layer 1 includes the surficial aquifer layer impacted at the Quanta Resources property by separate phase LNAPL. In the LNAPL impacted area the hydraulic conductivity of the aquifer materials is 1.5x10^{-4} cm/s, grading towards Newtown Creek to fill/soil having a hydraulic conductivity estimated to be 1x10^{-2} cm/s. The bottom elevation of the Layer 1 is set at 0 feet MSL;
    - Beneath the Quanta Resources property, Layer 2 includes the upper part of the LNAPL smear zone (hydraulic conductivity estimated to be 1x10^{-3} cm/s). South of the Quanta Resources property towards Newtown Creek, Layer 2 includes the clay encountered at wells GAL-27 and GAL-28 (see cross sections in Figures 7 and 8) with hydraulic conductivity estimated to be 1x10^{-6} cm/s and the granular sediments downgradient of the clay horizons with a hydraulic conductivity estimated to be 1x10^{-3} cm/s. The bottom elevation of the Layer 2 is set at -10 feet MSL;
    - Layers 3 and 4 represent the upper sand a gravel unit and the lower part of the LNAPL smear zone. Well GAGW-06I is screened within Layer 3 (-12 feet to -22 feet MSL). The hydraulic conductivity of these layers estimated to be 1x10^{-2} cm/s. The bottom elevations of the Layers 3 and 4 are set at -20 and -30 feet MSL, respectively; and
    - Layers 5 and 6 represent the lower sand and gravel unit that is not impacted by LNAPL smear zone (hydraulic conductivity estimated to be 2x10^{-2} cm/s). The bottom elevations of the Layers 5 and 6 are set at -45 and -60 feet MSL, respectively. This is the zone that wells GAGW-01, 02, 03, 04D, 05, 07 and 08 are screened within.

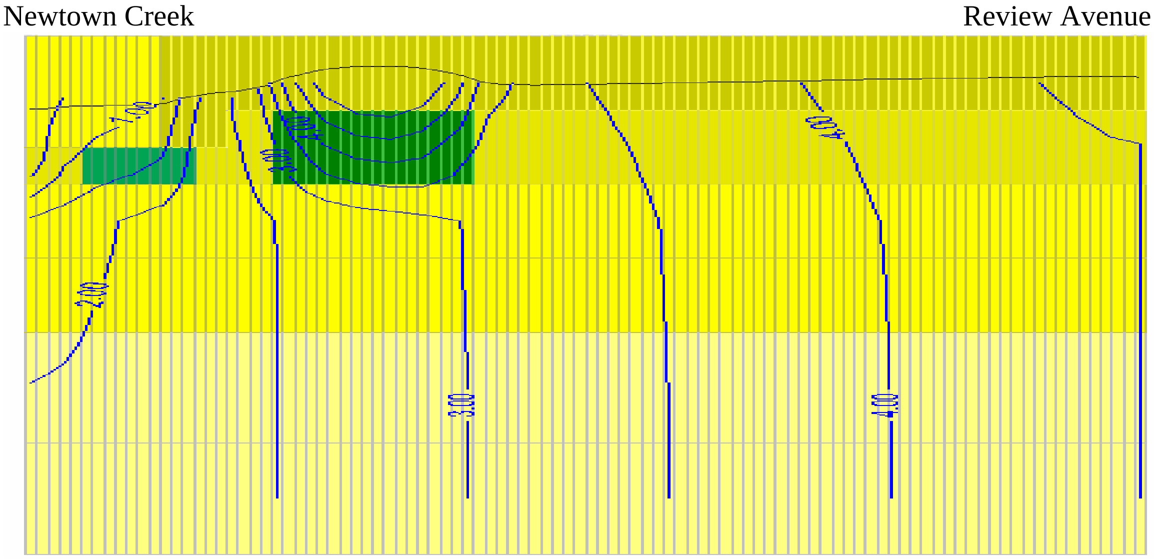
- Constant head cells are set along Review Avenue at 4.5 feet MSL and along Newtown Creek at 0.25 feet MSL;

- No flow boundaries were set along the model sides (the boundaries perpendicular to Review Avenue and Newtown Creek);

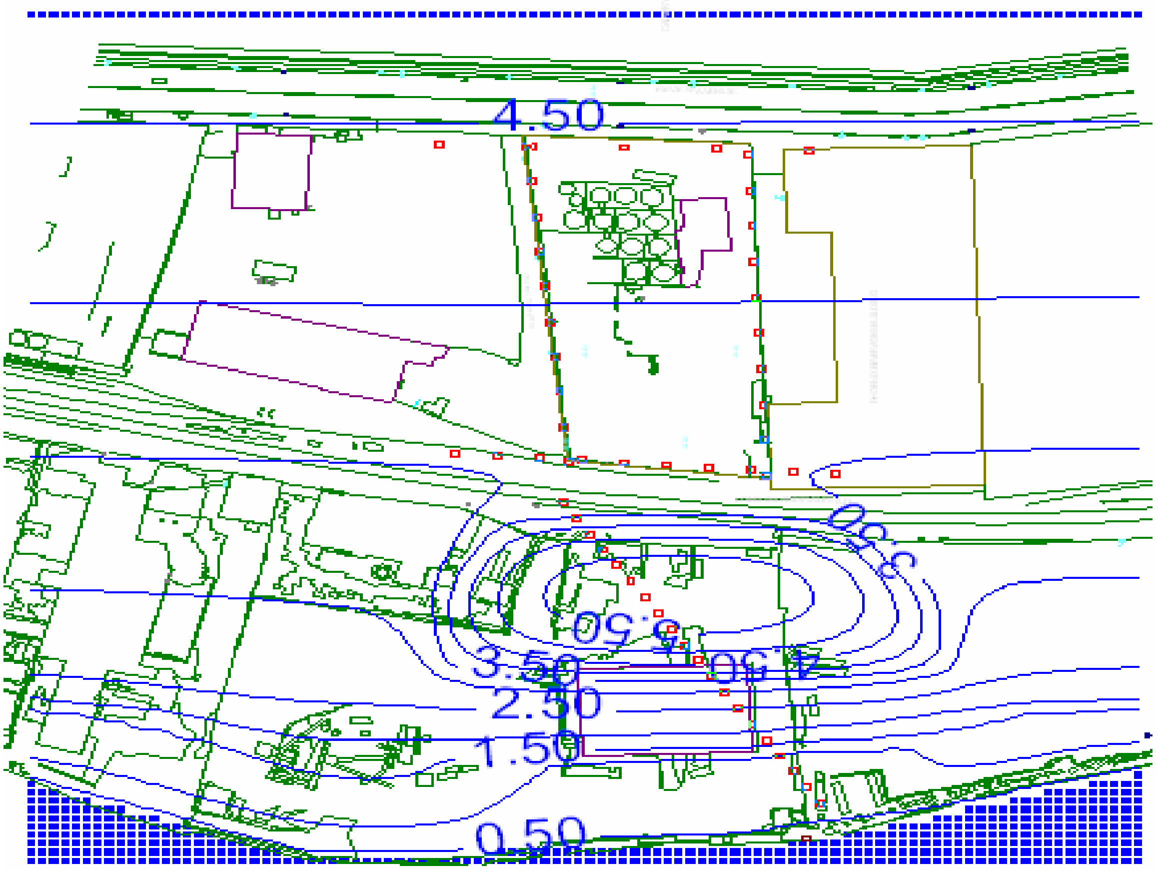
- The bottom model boundary was set as a no flow boundary corresponding to the Raritan Clay; and,

- The upper model boundary is simulated as a free surface (the water table) with the precipitation recharge set to 15.75 inches/year.

The conceptual numerical model simulations (see Model Diagrams below) show similar results with the interpreted groundwater equipotentials shown in plan view on Figure 12 and on cross sectional view on Figure 7A.



Model Diagram 1 (vertical scale exaggerated)
Simulated Hydraulic Heads Shown in Cross-Sectional View
(Green zones represent clay layers. Yellow zones represent sand and gravel units; lighter colors indicate higher hydraulic conductivities)



Model Diagram 2
Simulated Hydraulic Heads Model Layer 1

The simulated hydraulic heads for Layer 1 shown on Model Diagrams 1 and 2 show the presence of a groundwater mound developed over the clay horizon on the South Capasso property. The cross-sectional view of the simulation (Model Diagram 1) shows that at the shallow level the vertical hydraulic gradients are downward beneath the Quanta Resources property (Layers 1, 2, and upper portion of Layer 3). These small downward gradients also indicate that impacts to groundwater from the LNAPL will be seen within the smear zone and not just at a thin horizon immediately below the smear zone. Towards Newtown Creek, the vertical hydraulic gradients are upward, typical for the groundwater discharge zone. The vertical hydraulic gradients are also downward beneath the clay horizon located south of the Quanta Resources property. In the deeper units the groundwater flow is relatively horizontal (lower portion of Layer 3 and Layers 4, 5 and 6), except in the vicinity of Newtown Creek, where upward groundwater flow is noted in all six layers. The flow towards Newtown Creek is also illustrated by the simulated groundwater equipotentials for modeling Layer 3, shown in Model Diagram 3 below.

Model Diagram 3 - Simulated Hydraulic Heads Model Layer 3

Particle tracking simulations were carried out using MODPATH (Pollok, 1994). Particles were released in Model Layer 1 along the northern border of the Quanta Resources property and traveled beneath the groundwater mound located south of Quanta Resources property. The particle path simulations (see Model Diagram 4) indicate that the groundwater from the Quanta Resources property, as well as groundwater coming off of the mound, flows southwestward, migrates downward beneath the mound and discharges into Newtown Creek.

In addition, these flow path simulations indicate that groundwater from the Quanta Resources property flows in a fairly uniform straight line pattern to Newtown Creek and is not diverted to the northwest or southeast around the mound. Note that the contours shown on Model Diagram 4 are only for Model Layer 1 and the particle path lines shown represent particle migration in multiple Model Layers. That is, the simulated path lines begin in Model Layer 1 and move vertically down to Model Layer 2 and 3 as they approach the low permeability zone. They then move vertically upward to Model Layer 1 as they approach and ultimately discharge to Newtown Creek.

Model Diagram 4
Particle Paths Simulations and Hydraulic Heads for Model Layer 1

4.2.3 Hydraulic Gradients

The July and August 2004 and April 2005 synoptic water level measurements were used to calculate the horizontal and vertical gradients. The average horizontal gradient is 0.0015 ft/ft. The vertical hydraulic gradient for clustered monitoring well GAGW-06I and GAGW-02 was calculated by dividing the hydraulic head difference between the two wells by the difference in the elevation of the mid-point of the screened intervals. The vertical gradient in July 2004 and April 2005 was slightly downward (0.0002 ft/ft) and in August 2004 there was no vertical gradient as the groundwater elevation in the shallow (lower portion of the LNAPL smear zone (GAGW-06I)) and the deep well were the same. These data indicate that in the three dimensional groundwater flow domain, flow is occurring in the horizontal direction and that groundwater at the Site (within Model Layers 4, 5, and 6 as defined above in the three-dimensional numerical groundwater model) is not moving vertically downward towards or through the Raritan Clay (lower confining unit). In the upper portion of the aquifer (within Model Layers 1, 2, and 3) there is a vertical downward groundwater component and flow occurs in the horizontal direction until it gets near Newtown Creek where the vertical component is upward.

4.2.4 Hydraulic Conductivity

Slug tests were conducted to estimate the horizontal hydraulic conductivity of the glacial deposits above the lower clay. The slug test data analysis sheets and tables of data generated during the RI are presented in Appendix I. A summary of the results of the hydraulic conductivity testing are provided in Table 7. The data collected during the slug testing program was analyzed using both the Bouwer and Rice (1976) method and the Hvorslev (1951) method. Both methods yielded similar results. The hydraulic conductivities ranged from $2.20\text{x}10^{-2}$ cm/sec (62.5 ft/day) at GAGW-05 to $2.71\text{x}10^{-4}$ cm/sec (0.5 ft/day) at GAGW-05 with an overall geometric mean value of $2.03\text{x}10^{-3}$ cm/sec (5.8 ft/day).

4.3 Hydrogeologic Model Summary

The topography and surficial geology at the Quanta Resources and adjacent properties is largely a reflection of man-made land alterations and the placement of urban fill that ranges in thickness from 0.5 feet to 17 feet. Unconsolidated glacial deposits, consisting predominantly of interbedded horizons of fine- to coarse-sand and fine- to coarse-gravel, comprise the youngest natural material underlying the urban fill. Intermixed within these glacial deposits are discrete and laterally discontinuous lenses of silts and clays, particularly to the north, east, and south. Underlying the glacial deposits is a laterally continuous clay unit (Raritan Formation) observed at an average depth of approximately 75 feet bgs during the remedial investigation field work.

The Quanta Resources property lies between a local topographic high located to the northeast (local groundwater recharge area) and Newtown Creek (a regional groundwater discharge area). Groundwater flow, in the relatively flat area of the Quanta Resources and adjacent properties, generally flows horizontally south-southwest within the glacial deposits towards Newtown Creek. Tidally-influenced groundwater fluctuations are observed on the order of approximately 0.05 feet to 0.1 feet. Larger influences on groundwater levels are also observed in response to precipitation events. These groundwater level fluctuations are not expected to materially alter groundwater flow direction. Minor variations in groundwater flow direction were observed with flow ranging between the south-southwest and the southwest.

Overall, horizontal hydraulic gradients are flat (on the order of 0.0015 ft/ft) and vertical gradients are minimal suggesting nearly horizontal flow. However, there may be a small localized vertical downward flow component in the upper portion of the saturated zone within the LNAPL smear zone as shown on Model Diagram 1. Upward vertical gradients are anticipated under natural conditions as groundwater approaches its discharge to Newtown Creek located 450 feet south-southwest from the Quanta Resources property. Figure 13 presents a conceptual hydrogeologic model of the Quanta Resources property and surrounding area.

A groundwater mound (which is believed to be seasonally transient) has been observed on the South Capasso property, as defined by Phase II RI wells GAL-27 and GAL-28. While this mound is likely to have an impact on LNAPL flow as discussed in Section 7.0, this mound does not appear to materially influence the direction of groundwater flow from the Quanta Resources property to Newtown Creek. When the mound is present, it may influence the three-dimensional flow path of groundwater in the immediate vicinity of the mound. The impact of the mound quickly diminishes with depth. Whether the mound is present or not, all groundwater at the Quanta Resources property flows in a nearly straight path and eventually discharges to Newtown Creek.

5.0 SUMMARY OF SAMPLE ANALYSES RESULTS

Section 3.0 described the field investigation and laboratory analyses activities that were conducted during the remedial investigation. Section 4.0 presented a summary of the geologic and hydrogeologic investigation results and an updated Hydrogeologic Model for the Quanta Resources and surrounding properties. This section presents a summary of the remedial investigation field monitoring data and the groundwater, urban fill/soil and LNAPL sample analyses results.

5.1 Groundwater Sample Analysis Results

5.1.1 Remedial Investigation Groundwater Sample Results

Groundwater samples were collected from one shallow well (GAGW-06I) and seven deep groundwater wells (GAGW-01, GAGW-02, GAGW-03, GAGW-04D, GAGW-05, GAGW-07, and GAGW-08) installed on the Quanta Resources and North Capasso properties and along Review Avenue. Groundwater monitoring wells GAGW-01, GAGW-02, GAGW-03, GAGW-05, and GAGW-06I are located on the Quanta Resources property. As shown previously on Figures 11 and 12, groundwater monitoring wells GAGW-07 and GAGW-08 are located on the North Capasso property at locations considered hydraulically upgradient (July 2004 and April 2005 contours) or crossgradient (August 2004 contours) to wells GAGW-01 and GAGW-05 located on the western portion of the Quanta Resources property. Well GAGW-04D is a deep well located northeast of the Quanta Resources property, across Review Avenue, and represents background groundwater conditions.

One shallow, on-property monitoring well GAGW-06I is a double-cased well, screened within the LNAPL smear zone over an interval of 31 to 41 feet bgs. This shallow well was installed to obtain groundwater quality data representative of groundwater in contact with the LNAPL smear zone. The LNAPL smear zone is estimated to extend to approximately 38 feet bgs based on visual impacts and soil TPH data. Concentrations of TPH from soil samples collected at 31, 33, 34, and 39 feet bgs in boring GAGW-06I were 25,300 ppm, 19,200 ppm, 8,500 ppm, and 39 ppm, respectively. The outer protective casing was set to 30 feet bgs in order to mitigate the potential for free LNAPL to enter the well and the GAGW-06I well screen was set from 31 to 41 feet bgs. Based on numerous synoptic rounds of LNAPL/groundwater level measurements collected during the remedial investigation from adjacent LNAPL well GAL-16, the LNAPL/groundwater interface ranged from

21.3 to 23.5 feet bgs which is approximately 14 feet to 12 feet from the mid-point of the well screen from which groundwater samples were collected.

During sampling of well GAGW-06I a sheen was observed on the surface of the groundwater sample. The presence of a sheen and vertical downward groundwater gradients within the upper portion of the LNAPL smear zone (see Section 4.2.2) indicate that this well is appropriately screened to obtain groundwater quality data representative of groundwater in contact with the LNAPL smear zone and to monitor potential impacts to groundwater that could result from partitioning of constituents from the LNAPL mass to groundwater. As discussed in Section 5.1.2, additional data collected at the site as part of the pre-remedial investigations conducted were also considered and evaluated with respect to defining impacts to groundwater within the LNAPL smear zone.

The remaining wells (both on-property and off-property) are deep wells, double-cased through the LNAPL smear zone and are screened above the underlying continuous clay unit over intervals ranging from approximately 60 to 70 feet bgs. The purpose of these wells, as stated in the RI/FS Work Plan, was to collect representative groundwater samples below the LNAPL smear zone to assess the presence and magnitude of constituents of potential concern dissolved in groundwater. The top of the well screens in these wells are approximately 17 to 30 feet below the bottom of the LNAPL smear zone. As discussed in Section 4.2.2, groundwater flow is predominately occurring in a horizontal direction within the lower portion of and beneath the LNAPL smear zone. Table 1 provides a summary of groundwater monitoring well construction details.

Groundwater samples were collected from each of the wells and were analyzed for VOCs, SVOCs, PCBs, metals and natural attenuation parameters as discussed in Section 3.2.5. The laboratory sample analyses results were compared to New York State Department of Environmental Conservation (NYSDEC) Technical & Operational Guidance Series (TOGS) 1.1.1 Class GA (groundwater) standards and guidance values, collectively referred to as TOGS 1.1.1 GA criteria. The TOGS 1.1.1 GA criteria include constituents that have a groundwater standard in 6 NYCRR Part 703, as well as constituents that have NYSDEC guidance values. Based on a review of the TOGS 1.1.1 GA criteria documentation, Class GA standards are stated to be based on the protection of the use of groundwater as drinking water. However, groundwater in the near vicinity of the Quanta Resources property is not utilized for drinking water purposes. In fact, the nearest groundwater source used for drinking is expected to lie several miles from the Quanta

Resources property[12]. Therefore, comparing the on-property and off-property groundwater sample analysis results to the TOGS 1.1.1 GA criteria is a very conservative screening step since the exposure pathway used to develop the TOGS 1.1.1 GA criteria (groundwater as drinking water) is not applicable to the Quanta Resources property. Nonetheless, the groundwater sample analyses results have been compared to the TOGS 1.1.1 GA criteria.

As discussed in Section 4.2.2, groundwater flow is generally to the southwest or south-southwest. Given this direction of groundwater flow and the hydrogeologic model discussed in Section 4.3, groundwater beneath the Quanta Resources property ultimately discharges to Newtown Creek, a NYSDEC listed Class SD surface water body. As stated in 6 NYCRR Part 701, Class SD is the lowest classification for saline surface water, suitable only for fish survival and fishing[13]. Therefore, the results of the groundwater sample analyses have also been compared to TOGS 1.1.1 Class SD surface water quality standards to assess whether any meaningful potential exists for groundwater underlying the Quanta Resources property to adversely impact Newtown Creek surface water, based on the assigned SD classification. This is another conservative screening comparison since natural attenuation mechanisms will reduce groundwater impacts that potentially originate from the Quanta Resources property prior to the discharge of groundwater to Newtown Creek (refer to Section 5.2.3). With few exceptions (e.g. copper), the TOGS 1.1.1 Class SD surface water criteria are generally less stringent then the TOGS 1.1.1 Class GA groundwater criteria.

Groundwater Volatile Organic Compounds (VOCs)

Fifteen VOCs were detected in samples collected from one or more of the shallow and/or deep groundwater monitoring wells. Table 8a presents a summary of VOC detections as well as a comparison of the VOC detections to TOGS 1.1.1 GA criteria. Figure 14 shows the exceedances

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[12] Public drinking and industrial water supplies for Queens County are supplied primarily by the New York Reservoir System. The area of Queens County that relies on groundwater as its source for potable water is located approximately 6 miles southeast of the Quanta Resources property. In addition, according to the 1990 LMS Report, only a small number of private wells are permitted by the New York City Department of Health for non-potable uses. The Inactive Hazardous Waste Disposal Report (NYSDEC, April 2003) for Roehr Chemicals, Inc. facility which is located approximately 900 feet north of the Quanta Resources property states that “Drinking water contamination is unlikely as groundwater is not used as a potable supply within a five mile radius” and for the Quanta Resources property it states “The aquifer of concern is not used as a source for drinking water. Groundwater wells in the area of Queens are used only for commercial and industrial purposes”.

[13] This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for primary and secondary contact recreation and fish propagation. Considerations used to derive Class SD criteria include human fish consumption, H(FC); fish survival, A(A); wildlife protection, W; and aesthetic considerations, E.

of the TOG 1.1.1 GA criteria. The following VOCs were identified in one or more groundwater samples at concentrations greater than the TOGS 1.1.1 GA criteria:

North Capasso Property Deep Groundwater Wells (GAGW-07 & GAGW-08)

- Methyl tertiary-butyl ether or MTBE (TOGS 1.1.1 GA criteria = 10 ug/l); detected concentrations ranged between 150 ug/l at GAGW-07 and 240 ug/l at GAGW-08); and,

- Trichloroethene or TCE (TOGS 1.1.1 GA criteria = 5 ug/l); detected concentration ranged between 9.3 ug/l at GAGW-07 and 21 ug/l at GAGW-08).

Quanta Resources Property Deep Groundwater Wells (GAGW-01, GAGW-02, GAGW-03, and GAGW-05)

- Chloroform (TOGS 1.1.1 GA criteria = 7 ug/l); single exceedance of 7.9 ug/l at GAGW-03);

- MTBE (TOGS 1.1.1 GA criteria = 10 ug/l); detected concentrations ranged between 40 ug/l at GAGW-02 and 270 ug/l at GAGW-05); and,

- TCE (TOGS 1.1.1 GA criteria = 5 ug/l); single exceedance of 17 ug/l at GAGW-05.

Quanta Resources Property Shallow Groundwater Well (GAGW-06I)

- Benzene** (TOGS 1.1.1 GA criteria = 1 ug/l); detected at 1.1 ug/l in duplicate sample);

- cis-1,2-dichloroethene** (1,2-DCE) (TOGS 1.1.1 GA criteria = 5 ug/l; detected at 5.1 ug/l in duplicate sample);

- MTBE (TOGS 1.1.1 GA criteria = 10 ug/l); detected at 33 ug/l); and,

- Vinyl Chloride (TOGS 1.1.1 GA criteria = 2 ug/l); detected at 2.1 ug/l).

  **Note: Benzene and cis-1,2-dichloroethene only slightly exceeded the TOGS 1.1.1 GA criteria in the duplicate of the GAGW-06I sample (FGAGW-06I) but did not exceed the TOGS 1.1.1 GA criteria in the primary GAGW-06I sample.

With the exception of MTBE, three VOCs slightly exceeded the TOGS 1.1.1 GA criteria in this well by an amount of only 0.1 ug/l.

Background Deep Groundwater Well (GAGW-04D)

No VOCs were detected in this well installed north of Review Avenue.

Additional Groundwater Monitoring Well Data along Review Avenue

The Roehr Chemicals, Inc. (Roehr) facility is located at 52-20 37th Street, Long Island City, New York and currently listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 2-41-014 with a Classification of "2". The Roehr facility is located approximately 900 feet north of the Quanta Resources property, west of Calvary Cemetery. Investigations at the Roehr facility have been on-going since about 1991. In October 2000, an off-site investigation was conducted by Roehr to determine the impact of on-site contamination on downgradient properties. The groundwater flow direction from Roehr is south-southwesterly towards the Quanta Resources property. The primary constituent of concern at the Roehr facility is xylene.

In November 2000, four groundwater monitoring wells were installed along Review Avenue and include MW-14S, MW-14D, MW-15 and MW-16 as shown on Figure 4[14]. According to the borehole/well construction logs prepared by SMC Environmental, wells MW-14S and MW-15 are screened from 20 to 30 feet bgs, MW-14D is screened from 35 to 40 feet bgs, and MW-16 is screened from 17 to 27 feet bgs. Notably, the boring log for MW-14S, which is located approximately 190 feet north of the Quanta Resources property (upgradient with respect to groundwater flow direction), indicates a solvent odor detected from about 23 to 30 feet bgs. Following construction, each well was sampled. The data summarized below was obtained from a data table entitled "Table 4, *Off-Site Investigation, Groundwater Quality Data along Review Avenue, Roehr Chemicals, Inc., Long Island City, New York*" which was prepared by SMC Environmental. This table presents a summary of VOC detections from the analysis of groundwater samples collected from MW-14S, MW-14D, MW-15 and MW-16.

Thirteen VOCs were detected in samples collected from one or more of the Roehr Chemical wells in November 2000 as summarized below:

- Benzene (TOGS 1.1.1 GA criteria = 1 ug/l); detected in one well at 1 ug/l at MW-16;
- Ethylbenzene (TOGS 1.1.1 GA criteria = 5 ug/l); detected in one well at 5 ug/l at MW-15;
- Xylenes (TOGS 1.1.1 GA criteria = 5 ug/l); detected in one well at 19 ug/l at MW-15;

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[14] In July 2004 Golder contacted LFR, Inc., the current environmental consultant to Roehr, to obtain permission for access to the four wells for the purpose of collecting water/LNAPL measurements, sampling of the wells if LNAPL is present, and to survey the wells.

- MTBE (TOGS 1.1.1 GA criteria = 10 ug/l); detected at 4 ug/l at MW-14D and 170 ug/l at MW-16;
- Cis 1,2-Dichloroethene or cis 1,2-DCE (TOGS 1.1.1 GA criteria = 5 ug/l); detected in one well at 210 ug/l at MW-15; and,
- TCE (TOGS 1.1.1 GA criteria = 5 ug/l; detected at 14 ug/l at well MW-14D and 100 ug/l at well MW-15).

Other VOCs detected include 1,2,4-trimethylbenzene (up to 44 ug/l), 1,3,5-trimethylbenzene (up to 12 ug/l), isopropylbenzene (up to 2 ug/l), n-propylbenzene (up to 2 ug/l), p-isopropyltoluene (up to 9 ug/l), sec-butylbenzene (up to 4 ug/l), and tert-butylbenzene (up to 4 ug/l).

On July 8, 2004, LFR provided Golder Associates a copy of the VOC analytical results from wells MW-14S, MW-14D, and MW-16. These wells were sampled by LFR on June 28, 2004 and according to LFR they are sampled on a quarterly basis. LFR does not collect a groundwater sample from well MW-15 because LNAPL is present in this well. LFR reported that two VOCs were detected in samples collected from one or more of the wells as summarized below:

- MTBE (TOGS 1.1.1 GA criteria = 10 ug/l; detected at 21 ug/l at MW-14S and 2 ug/l at MW-16); and,
- TCE (TOGS 1.1.1 GA criteria = 5 ug/l; detected at 9 ug/l at well MW-14D).

Summary of VOCs Detected in Groundwater

MTBE was detected in the North Capasso property deep wells GAGW-07 and GAGW-08 and at well MW-14S located along Review Avenue at concentrations exceeding TOGS 1.1.1 GA groundwater criteria. MTBE was also detected at concentrations that exceeded the TOGS 1.1.1 GA criteria in deep wells GAGW-01, GAGW-02, and GAGW-05, and the shallow well GAGW-06I on the Quanta Resources property. TCE was detected in the North Capasso property deep wells GAGW-07 and GAGW-08 and at well MW-14D located along Review Avenue at concentrations exceeding TOGS 1.1.1 GA groundwater criteria. TCE was also detected in Quanta Resources property well GAGW-05 at concentrations exceeding TOGS 1.1.1 GA groundwater criteria, but at concentrations lower than in North Capasso well GAGW-08. According to the interpreted groundwater contours shown on Figures 11 and 12, Quanta Resources property wells GAGW-01 and GAGW-05 are at times (e.g., July 2004 and April 2005) downgradient from the North Capasso wells GAGW-07 and GAGW-08 and Review Avenue wells MW-14S and MW-14D. Therefore, well GAGW-04D referred to in this report as the

"Deep Background Well," should not be considered solely representative of background conditions for the entire Site. That is, groundwater flows to the Site property from the vicinity of well GAGW-04D and from other areas proximal to wells GAGW-07 and GAGW-08. These upgradient wells can, at times, also be considered as background wells for the Site.

Groundwater detections were also screened against TOGS 1.1.1 Class SD surface water criteria for VOCs. Of the 15 VOCs detected in groundwater at the Quanta Resources and North Capasso properties, only 4 VOCs have published TOGS 1.1.1 Class SD surface water criteria; benzene (10 ug/l human fish consumption (H(FC)) and 670 ug/l aquatic acute (A(A)); toluene (6,000 ug/l (H(FC)) and 430 ug/l (ACA)); trichloroethene (40 ug/L (H(FC)) and total xylene (170 ug/L (A(A)). None of the VOCs detected in the Quanta Resources or North Capasso groundwater monitoring wells exceeded the TOGS 1.1.1 Class SD surface water criteria.

Semi-Volatile Organic Compounds (SVOCs)

Eighteen SVOCs were detected in samples collected from one or more of the shallow and/or deep groundwater wells. Table 8b presents a summary of the SVOC detections and a comparison of SVOC detections to the TOGS 1.1.1 GA criteria. Figure 14 shows the exceedances of the TOGs 1.1.1 GA criteria. The following SVOCs were identified in one or more groundwater samples at concentrations exceeding the TOGS 1.1.1 GA criteria:

North Capasso Property Deep Groundwater Wells (GAGW-07 & GAGW-08)

No SVOCs were detected in these wells.

Quanta Resources Property Deep Groundwater (Wells GAGW-01, GAGW-02, GAGW-03, and GAGW-05)

- Chrysene (TOGS 1.1.1 GA Criteria = 0.002 ug/l); detected at 0.3 ug/l in GAGW-01);
- Benzo(a)pyrene (TOGS 1.1.1 GA Criteria = not detected); detected at 0.3 ug/l in GAGW-03);
- Benzo(b)fluoranthene (TOGS 1.1.1 GA Criteria = 0.002 ug/l); detected at 0.3 ug/l in GAGW-03);
- Benzo(k)fluoranthene (TOGS 1.1.1 GA Criteria = 0.002 ug/l); detected at 0.4 ug/l in GAGW-03); and,
- Indeno(1,2,3-cd)pyrene (TOGS 1.1.1 GA Criteria = 0.002 ug/l); detected at 0.3 ug/l in GAGW-03).

Quanta Resources Property Shallow Groundwater Well (GAGW-06I)

SVOCs were either not detected or detected at concentrations less than the TOGS 1.1.1 GA criteria.

Background Groundwater Well (GAGW-04D)

No SVOCs were detected in this well.

Summary of SVOCs Detected in Groundwater

The SVOC exceedances of the TOGS 1.1.1 GA groundwater criteria included only polynuclear aromatic hydrocarbons (PAHs) and, with the exception of chrysene, were limited to well GAGW-03. The single exceedance of chrysene occurred only in well GAGW-01. All of the PAHs that exceeded the TOGS 1.1.1 GA criteria were detected at concentrations less than 1 ug/l.

The detection of SVOCs in groundwater were also screened against TOGS 1.1.1 Class SD surface water criteria. Of the 18 SVOCs detected in groundwater, only 6 SVOCs have published TOGS 1.1.1 Class SD surface water criteria; acenaphthene (60 ug/L); benzo(a)pyrene (0.0006 ug/L); fluorene (23 ug/L); 2-methylnapthalene (38 ug/L); naphthalene (140 ug/L) and phenanthrene (170 ug/L). Only one SVOC, benzo(a)pyrene (single detection of 0.3 ug/l at well GAGW-03), exceeded the TOGS 1.1.1 Class SD surface water criteria. It is noted that the SD criteria for benzo(a)pyrene is below the method detection limit of standard laboratory methods. All other wells did not have exceedances of the TOGS 1.1.1 Class SD criteria.

Polychlorinated Biphenyls (PCBs)

No PCBs were detected in groundwater samples collected during the remedial investigation as shown in Table 8c. PCBs have very stringent TOGS 1.1.1 Class SD surface water standards (0.0001 ug/L), which is below the method detection limit of standard laboratory methods. The method detection limit achieved for PCBs in groundwater for this project ranged from 0.50 ug/l to 0.57 ug/l.

Metals

Fifteen metals were detected in samples collected from one or more of the shallow and deep groundwater monitoring wells. Table 8d presents a summary of the metals detected in groundwater, as well as a comparison of metal detections to TOGS 1.1.1 GA criteria. Figure 14 shows the exceedances of the TOG 1.1.1 GA criteria. The following metals were identified in one or more groundwater samples at concentrations that exceed the TOGS 1.1.1 GA criteria:

North Capasso Property Deep Groundwater Wells (GAGW-07 & GAGW-08)

- Iron (TOGS 1.1.1 GA criteria = 300 ug/l); detected at 1,700 ug/l in GAGW-07);
- Magnesium (TOGS 1.1.1 GA criteria = 35,000 ug/l); detected concentrations ranged between 48,000 ug/l at GAGW-07 and 63,100 ug/l at GAGW-08); and,
- Sodium (TOGS 1.1.1 GA criteria = 20,000 ug/l); detected concentrations ranged between 145,000 ug/l at GAGW-07 and 213,000 ug/l at GAGW-08).

Quanta Resources Property Deep Groundwater Wells (GAGW-01, GAGW-02, GAGW-03, and GAGW-05)

- Iron (TOGS 1.1.1 GA criteria = 300 ug/l); detected concentrations ranged between 464 ug/l at GAGW-02 and 4,600 ug/l at GAGW-05);
- Magnesium (TOGS 1.1.1 GA criteria = 35,000 ug/l); detected concentrations ranged between 66,600 ug/l at GAGW-01 and 46,300 ug/l at GAGW-02);
- Manganese (TOGS 1.1.1 GA criteria = 300 ug/l); detected concentrations ranged between 753 ug/l at GAGW-02 and 807 ug/l at GAGW-05); and,
- Sodium (TOGS 1.1.1 GA criteria = 20,000 ug/l); detected concentrations ranged between 205,000 ug/l at GAGW-01 and 92,800 ug/l at GAGW-03).

Quanta Resources Property Shallow Groundwater Well (GAGW-06I)

- Iron (TOGS 1.1.1 GA criteria = 300 ug/l; detected at 19,200 ug/l);
- Manganese (TOGS 1.1.1 GA criteria = 300 ug/l; detected at 1,110 ug/l); and,
- Sodium (TOGS 1.1.1 GA criteria = 20,000 ug/l; detected at 74,300 ug/l).

Background Deep Groundwater Well (GAGW-04D)

- Iron (TOGS 1.1.1 GA criteria = 300 ug/l; detected at 4,370 ug/l);
- Magnesium (TOGS 1.1.1 GA criteria = 35,000 ug/l; detected at 55,300 ug/l); and,
- Sodium (TOGS 1.1.1 GA criteria = 20,000 ug/l; detected at 200,000 ug/l).

Summary of Metals Detected in Groundwater

Groundwater exceedances for the metals iron, magnesium, and sodium appear to be uniformly distributed across the Quanta Resources property. In many cases, these same metals were detected in the background groundwater well (GAGW-04D) at concentrations approximately equal to or higher than the downgradient groundwater monitoring wells. These data indicate that exceedances for these three metals in Quanta Resources property wells are due to, or at least partially attributable to, local background concentrations.

In addition, exceedances of TOGS 1.1.1 GA criteria for manganese were noted in the southern and southwestern wells on the Quanta Resources property (GAGW-02, GAGW-05, and GAGW-06I). The TOGS 1.1.1 GA criteria for manganese and iron is based on “E”, aesthetics, when used as a potable water source, due to the discoloration and staining these metals can produce. Because groundwater at the Quanta Resources property will not be used for potable purposes, the TOGS 1.1.1 GA criteria for manganese and iron do not directly apply. Furthermore, as discussed below, reducing conditions were observed in groundwater. As a result, it is expected that the presence of iron and manganese in groundwater is largely due to naturally occurring iron and manganese in geologic sediments being dissolved.

The detections of metals in groundwater were also screened against TOGS 1.1.1 Class SD surface water criteria. Of the 15 metals detected in groundwater, only 5 metals have published TOGS 1.1.1 Class SD surface water criteria; arsenic (120 ug/L); copper (4.8 ug/L or 7.9 ug/L in New York Harbor); lead (204 ug/L); nickel (74 ug/L); and zinc (140 ug/L). One metal, copper, exceeded TOGS 1.1.1 Class SD surface water criteria in groundwater (for non-New York Harbor waters only), at groundwater monitoring well GAGW-04D, the background monitoring well. No exceedances of the TOGS 1.1.1 Class SD surface water criteria for copper were observed in downgradient monitoring wells on the Quanta Resources property.

Natural Attenuation Parameters

Eleven natural attenuation (NA) parameters (see Table 8e) were analyzed for each groundwater sample. Two NA parameters, nitrate and sulfate, have TOGS 1.1.1 GA criteria. There were no exceedances of TOGS 1.1.1 GA groundwater criteria for either nitrate or sulfate. No TOGS 1.1.1 Class SD surface water criteria exist for the NA parameters.

Based on the review of the natural attenuation parameter data presented in Table 8e, along with the field parameter data collected during groundwater sampling, presented in Table 3, there is evidence that natural attenuation of dissolved organic chemicals in groundwater is occurring and that the geochemical conditions in groundwater will support continued natural attenuation. The following presents an overview of some of the major lines of evidence that support the occurrences of natural attenuation and the presence of amenable geochemical conditions:

1. Dissolved oxygen and oxidation reduction potential have been sufficiently depressed in groundwater to support reductive (anaerobic) biological degradation of organic compounds.

    - Dissolved oxygen levels are all less than 1 mg/l. No dissolved oxygen was observed (DO = 0.0 mg/L) in monitoring wells GAGW-01, GAGW-02, GAGW-03, and GAGW-05.
    - Similarly, the oxidation reduction potential of groundwater at the Quanta Resources property is depressed at levels ranging from +90 mV to -126 mV, with wells GAGW-01, GAGW-02, GAGW-03, GAGW-05, and GAGW-06I all having negative (-) values of oxidation reduction potential.

2. Variably elevated levels of CO_2, methane, ethane, and ethene have been observed, particularly at monitoring wells GAGW-02 (500 ug/l) and GAGW-06I (5,000 ug/l). The highest methane, ethane, and ethene levels were found in well GAGW-06I. These methane levels are evidence of strongly reducing conditions.

3. Concentrations of nitrate and sulfate (electron acceptors) were reduced in downgradient wells GAGW-02 and GAGW-06I compared with background well GAGW-04D, indicating that nitrate- and sulfate-reducing biological attenuation processes may be occurring. Notably, some electron acceptor capacity remains.

4. Reduced groundwater conditions are also present in background well GAGW-04D (downgradient of the Calvary Cemetery) such that the difference between upgradient and downgradient natural attenuation parameters is not as pronounced.

In summary, there are indications that natural attenuation of organic compounds in groundwater is occurring and that the documented geochemical conditions in groundwater support natural biological attenuation. The greatest observed potential for natural biodegradation is within monitoring well GAGW-06I, which is expected since this well is screened in the lower portion of the LNAPL smear zone. As there were few chemical detections of organic compounds in groundwater observed in GAGW-06I, as well as in the other groundwater wells, these natural attenuation processes, along with the low to negligible solubility of the compounds detected in

LNAPL[15], appear to be effective for mitigating potential dissolved phase groundwater impacts from LNAPL. These results were expected due to the extended period that the property has been inactive, which has provided a substantial period of time for natural attenuation processes to become established and to reduce and sequester the potentially mobile chemicals present in the LNAPL smear zone.

A further evaluation of groundwater quality within the LNAPL smear zone and downgradient of the site is discussed in Section 5.1.2 below, which utilizes data collected prior to the remedial investigation (Pre-Remedial Investigation data). A discussion on groundwater contaminant fate and transport is presented in Section 5.1.3.

5.1.2 Pre-Remedial Investigation Groundwater Data

Prior to the remedial investigation, several investigations have been conducted which included the installation and sampling of monitoring wells on the Quanta Resources and surrounding properties (North Capasso, South Capasso, Phoenix Beverages, and Prince Plastics properties). This information, although generated by others and not validated under the RI QA/QC Plan, was used to augment the data generated in this RI, as best as possible. These investigations focused on evaluating the extent of LNAPL and included sampling of the LNAPL, where present, and sampling of groundwater. In some instances, a groundwater sample was collected at a well directly through LNAPL that had accumulated in the well. In many of these cases the groundwater sample integrity was compromised (LNAPL droplets or high turbidity observed) and thus the sample was not representative of groundwater. Consequently, the data was used for certain wells on a worst case basis only, as supporting data-gap information. The pre-remedial investigation monitoring well samples that will be discussed and the properties the wells were installed on include the following:

- Quanta Resources Property: GW-1, GW-2, GW-3, MW-6 and MW-11;
- North Capasso Property: MW-1, MW-2, MW-4, and MW-4R (replacement well for MW-4);

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[15] The chemical composition of the LNAPL contain approximately 2% Gasoline Range Organics (boiling point 60 – 170°C; 68% Diesel Range Organics (boiling point 170 – 400°C); and 30% Mineral Range Organics (boiling point > 260°C). The target analyte list VOC make up less than 1% and target analyte list SVOC less than 2% (PAHs make up almost 100% of the SVOC) of the entire LNAPL mass. The chemical structure of the majority of the LNAPL mass consists of high-molecular weight, cyclic aliphatic hydrocarbons which have a very low to negligible solubility.

- South Capasso Property: MW-3, MW-3R (replacement well for MW-3), MW-7 and MW-7R;
- Phoenix Beverages Property: MW-8; and,
- Prince Plastics Property: MW-9.

The location[16] of the pre-remedial investigation monitoring wells is shown on Figures 4 and 5. Table 9 provides a summary of the groundwater sampling and analysis conducted at each of these wells, and the boring/well installation logs for these wells, except for MW-9 and MW-10, are provided in Appendix C. Well purge and sample forms from wells GW-1, GW-2, and GW-3 are also provided in Appendix F. Tables 10a, 10b, 10c, and 10d present a summary of chemical detections in these wells and a comparison of the detections to the TOGS 1.1.1 GA criteria.

The following provides a brief chronology of the pre-remedial investigation groundwater investigations:

- From 1988 to 1990, Lawler, Matusky & Skelly Engineers (LMS) conducted a Phase II investigation on the Quanta Resources property for NYSDEC. This investigation included the installation of wells GW-1, GW-2, and GW-3 on the Quanta Resources property. Monitoring well GW-1 is still present and is located adjacent to remedial investigation well GAL-09. The top of the GW-1 well screen is located approximately 3 feet below the LNAPL/groundwater interface. Monitoring wells GW-2 and GW-3 could not be located during the remedial investigation. According to the available well installation logs and well purging forms these wells were screened across the LNAPL/groundwater interface and LNAPL was present in these wells. The well installation logs, well purging forms, and groundwater sample analyses results from the LMS Phase II investigation were reported in the report titled "*Engineering Investigations at Inactive Hazardous Waste Sites – Phase II Investigation, Hudson Oil Refinery (Quanta Resources) Site – Volume I*" prepared by LMS, dated May 1990.
- In 1992, ERM-Northeast (ERM) conducted a Phase II investigation on the North and South Capasso properties which included the installation of monitoring wells MW-1, MW-2 and MW-4[17] on the North Capasso property and MW-3 on the South Capasso property.
- In September 2000, Haley and Aldrich installed the following monitoring wells: MW-6 on Quanta Resources property, MW-4R (replacement well for MW-4) on the North Capasso property; MW-3R (replacement well for MW-3) and MW-7 on the South Capasso property; and MW-8 on the Phoenix Beverages property; and,

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[16] Monitoring wells MW-1, MW-3, MW-3R, MW-6, MW-7, MW-9, GW-2 and GW-3 could not be located during the RI. The location of these wells as shown on Figure 5 is approximate based on Figures provided by others.

[17] Subsequently, MW-4 was replaced with well MW-4R and MW-3 was replaced by MW-3R by Haley and Aldrich.

- In October 2002, Haley and Aldrich installed the following wells: MW-11 on the Quanta Resources property; MW-10 on the North Capasso property; MW-7R on the South Capasso property; and MW-9 on the Prince Plastics property.

In summary, the pre-remedial investigation wells can be categorized according to their screen interval and function as follows:

- Shallow Groundwater Monitoring Wells – These wells include MW-1[18], MW-2, MW-3, MW-3R, MW-7, MW-7R and MW-9 and are wells screened in shallow groundwater that are located beyond the limit of LNAPL impact.

- Shallow Groundwater LNAPL Smear Zone Well – Well GW-1. This well is located in the northern portion of Quanta within the area of LNAPL impact. The top of the well screen is located approximately 3 feet below the LNAPL/groundwater interface and is screened within the upper portion of the LNAPL smear zone.

- LNAPL Monitoring Wells – These wells include MW-4R, MW-6, MW-8, MW-10, MW-11, GW-2 and GW-3 and are wells that are located within the area of LNAPL impact and are screened across the LNAPL/groundwater interface. Based on the pre-remedial investigation data, these wells have always been reported to have LNAPL present.

The data presented in Tables 10a, 10b, 10c, and 10d represent all of the data that has been made available to Golder Associates for these pre-remedial investigation wells. However, not all of the groundwater sample analyses results presented in these tables are considered representative of groundwater within the LNAPL smear zone or downgradient of the area impacted by LNAPL. It is generally very difficult to collect a representative groundwater sample through a LNAPL layer that has accumulated in a monitoring well without compromising the integrity of the sample. The inadvertent collection of LNAPL droplets or suspended solids on which LNAPL is adsorbed to in a groundwater sample, can greatly skew the sample analyses results and result in erroneous conclusions regarding LNAPL impacts to groundwater.

In order to evaluate the representativeness of the pre-remedial investigation groundwater sample analyses results, Golder Associates evaluated sample conditions as defined by the well purge and sampling forms (if available), hydrogeologic conditions, and the analytical data in order to

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[18] Based on data provided to Golder, LNAPL has only been observed once at MW-1, in April 1992 when the measured LNAPL thickness in this well was reported to be 0.55 feet. In October 2000 no LNAPL was observed. The depth to water was recorded at 21.25 feet. According to the well installation log prepared by ERM, the well is screened from 15 to 35 feet bgs which indicates that the well is appropriately screened to monitor for the presence of LNAPL. Based on the RI data collected the approximate location of this well is in close proximity to the area impacted by LNAPL and therefore the data from this well will be used to help assess potential groundwater impacts from the LNAPL. Sometime after October 2000, this well was paved over and no further information was generated from this well.

determine whether the sample integrity was compromised and whether the pre-remedial investigation analytical data was potentially representative of groundwater impacts within the LNAPL smear zone. Notably, even though this evaluation of the pre-remedial investigation data may have identified a sample as being potentially representative of groundwater in the smear zone, these data should be considered representative of worst-case (or near worst-case) conditions since sample impacts from the accumulated LNAPL layer in a well are nearly impossible to avoid entirely. Based on this sample integrity evaluation, the pre-remedial investigation groundwater samples collected from wells GW-2, GW-3, MW-2, MW-3, MW-3R and MW-4R are not believed to be representative of groundwater within the LNAPL smear zone as discussed below.

- Well GW-2 and GW-3: Wells GW-2 and GW-3 are LNAPL wells. Both wells were sampled in December 1988 and February 1990. The groundwater purge and sample forms completed in the field by LMS for both sampling events indicate that LNAPL was present in the groundwater samples collected. The concentrations of PAHs detected in these samples exceed their solubility further indicating that LNAPL was collected in the sample. PAHs do not readily partition into groundwater in significant concentrations because PAHs tend to have very low solubilities and a tendency to absorb to soil, thus particulate impacts to the sample were also possible.

- Well MW-2: MW-2 is located over 300 feet from the Quanta Resource property in the southwest corner of the North Capasso property and 80 feet from remedial investigation well GAL-13. Based on groundwater flow direction, this well is sidegradient of the area impacted by LNAPL and could be downgradient of potential upgradient sources from the North Capasso property.

- Wells MW-3 and MW-3R: As discussed in Section 4.2, these wells are likely installed in the transient groundwater mound located south of the Quanta Resources property and therefore samples from these wells do not represent groundwater quality downgradient of the area impacted by LNAPL.

- Well MW-4R: This well is an LNAPL monitoring well. The very high concentrations of PAH constituents detected in the groundwater sample far exceed their solubility (over 7,000 times) indicating that the groundwater sample was most likely compromised with LNAPL and/or particulates containing LNAPL. PAHs do not readily partition into groundwater in significant concentrations because PAHs tend to have very low solubilities and a tendency to absorb to soil, thus particulate impacts are likely.

- Well MW-6: This well is an LNAPL monitoring well. According to a summary table prepared by Environ, a note on this table indicated that LNAPL was present in the sample collected. As such, this sample was considered compromised and not representative of actual groundwater conditions.

In summary, groundwater data collected from the following wells are considered representative[19] of groundwater quality either downgradient of the LNAPL impacted zone or within the LNAPL impacted zone.

- December 1988 Sampling Event (LMS, Phase II Investigation) – GW-1;
- February 1990 Sampling Event (LMS, Phase II Investigation – GW-1;
- October 2000 Sampling Event (Samples collected by ARCADIS Geraghty & Miller (Arcadis)) – MW-1 and MW-7; and,
- November 2002 Sampling Event (data reported by Environ. It is not known who collected the groundwater samples) – MW-7R, MW-8, MW-9, MW-10, and, MW-11

The following presents a discussion of these data along with a comparison to the TOGS 1.1.1 GA criteria.

Groundwater Volatile Organic Compounds (VOCs)

December 1988 Sampling Event (Monitoring Well GW-1)

A total of eight VOCs were detected from the analysis of the sample collected from well GW-1 in which three VOCs exceeded the TOGS 1.1.1 GA Criteria: benzene at 4 ug/l, 1,2-dichloroethene at 4 ug/l and total xylenes at 17 ug/l. The total VOC concentration was 60 ug/l. No VOC exceeded the TOGS 1.1.1 SD criteria.

February 1990 Sampling Event (Monitoring Well GW-1)

A total of five VOCs were detected from the analysis of the sample collected from well GW-1 in which four VOCs exceeded the TOGS 1.1.1 GA Criteria: benzene at 6 ug/l, 1,2-dichloroethene at 3 ug/l; 1,2-dichloropropane at 2 ug/l and total xylenes at 25 ug/l. The total VOC concentration was 39 ug/l. No VOCs exceeded the TOGS 1.1.1 SD criteria.

October 2000 Sampling Event (Monitoring Wells MW-1 and MW-7)

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[19] In general, it is difficult to collect a representative groundwater sample through an accumulated LNAPL layer in a monitoring well without compromising sample integrity and some degree of sample integrity impact from LNAPL or particulates is likely. Therefore, the groundwater sample collected through an accumulated LNAPL layer from such wells (e.g., MW-8, MW-10, and MW-11) is considered “worst” case (or nearest worst case). Further, although well GW-1 is screened below the LNAPL/groundwater interface there were some “tiny oil droplets” observed in the sample collected from this well in December 1988. When the well was resampled in February 1990 only a sheen was observed. The conditions observed in December 1988 could be a function of LNAPL material that was brought down during drilling and then became mobile when the well was developed. After development a groundwater sample was collected. Thus, these samples are also believed to represent worst-case (or near worst-case) conditions.

A total of four VOCs were detected from the analysis of the sample collected from well MW-1 which one VOC exceeded the TOGS 1.1.1 GA Criteria: benzene at 11 ug/l. Two VOCs were detected from the analysis of the sample collected from well MW-7 of which none exceeded the TOGS 1.1.1 GA criteria.

Total VOC concentration in wells MW-1 and MW-7 were 26.5 ug/l and 9 ug/l, respectively. Benzene marginally exceeded the TOGS 1.1.1 SD Criteria of 10 ug/l (H(FC)) at MW-1.

November 2002 Sampling Event (Monitoring Wells MW-7R, MW-8, MW-9, MW-10, and MW-11)

- A total of five VOCs were detected from the analysis of the sample collected from well MW-7R, two of which exceeded the TOGS 1.1.1 GA Criteria: benzene at 2 ug/l and chloroform at 7.4 ug/l. The total VOC concentration was 16 ug/l;

- A total of four VOCs were detected from the analysis of the sample collected from well MW-8, of which none exceeded the TOGS 1.1.1 GA Criteria. The total VOC concentration was 6.1 ug/l;

- No VOCs were detected from the analysis of the sample collected from well MW-9;

- A total of six VOCs were detected from the analysis of the sample collected from well MW-10, of which four exceeded the TOGS 1.1.1 GA Criteria: benzene at 46.4 ug/l, ethylbenzene at 90.3 ug/l, toluene at 9 ug/l, and xylenes at 398 ug/l. The total VOC concentration was 548 ug/l; and,

- A total of seven VOCs were detected from the analysis of the sample collected from well MW-11, of which three exceeded the TOGS 1.1.1 GA Criteria: benzene at 8.9 ug/l, ethylbenzene at 10.3 ug/l, and xylenes at 54.5 ug/l. The total VOC concentration was 83.1 ug/l.

There were no constituents that exceeded the TOGS 1.1.1 SD Criteria at locations MW-7R, MW-8, MW-9, and MW-11. Three VOCs exceeded TOGS 1.1.1 SD Criteria at MW-10: benzene, ethylbenzene and xylenes. Well MW-10 is located approximately 600 feet from Newtown Creek. As discussed in Section 5.1.3, these VOCs rapidly attenuate and no impacts to Newtown Creek are predicted.

Semi-Volatile Organic Compounds (SVOCs) Data

December 1988 Sampling Event (Monitoring Well GW-1)

A total of 14 SVOCs were detected from the analysis of the sample collected from well GW-1 of which five SVOCs exceeded the TOGS 1.1.1 GA Criteria: benzo(a)anthracene at 27 ug/l, benzo(a)pyrene at 4 ug/l, benzo(b)fluoranthene at 5 ug/l, benzo(k)fluoranthene at 5 ug/l, and chrysene at 33 ug/l. The total SVOC concentration was 147 ug/l. Only one SVOC (benzo(a)pyrene) exceeded the TOGS 1.1.1 SD criteria.

__February 1990 Sampling Even (Monitoring Well GW-1)__

A total of 9 SVOCs were detected from the analysis of the sample collected from well GW-1 of which three SVOCs exceeded the TOGS 1.1.1 GA Criteria: benzo(a)anthracene at 15 ug/l, benzo(a)pyrene at 3 ug/l, and chrysene at 19 ug/l. The total SVOC concentration was 71 ug/l. Only one SVOC (benzo(a)pyrene) exceeded the TOGS 1.1.1 SD criteria.

__October 2000 Sampling Event (Monitoring Wells MW-1 and MW-7)__

A total of 11 SVOCs were detected from the analysis of the sample collected from well MW-1 of which three exceeded the TOGS 1.1.1 GA Criteria: benzo(a)anthracene at 1 ug/l, benzo(a)pyrene at 0.2 ug/l, and chrysene at 1 ug/l. A total of seven SVOCs were detected from the analysis of the sample collected from well MW-7 of which none exceeded the TOGS 1.1.1 GA.

Total SVOCs in wells MW-1 and MW-7 were 14.4 ug/l and 2 ug/l, respectively. There were no constituents that exceeded the TOGS 1.1.1 SD Criteria at MW-7. Benzo(a)pyrene exceeded the TOGS 1.1.1 SD Criteria at MW-1.

__November 2002 Sampling Event (Monitoring Wells MW-7R, MW-8, MW-9, MW-10, and MW-11)__

- A total of one SVOC was detected from the analysis of the sample collected from well MW-7R which exceeded the TOGS 1.1.1 GA Criteria: chrysene 2.2 ug/l. Total SVOCs were 2.2 ug/l;

- A total of 13 SVOCs were detected from the analysis of the sample collected from well MW-8 of which four exceeded the TOGS 1.1.1 GA Criteria: benzo(a)anthracene at 4.6 ug/l, benzo(a)pyrene at 1.4 ug/l, benzo(b)fluoranthene at 0.88 ug/l, and chrysene at 5.5 ug/l. Total SVOCs were 37 ug/l;

- Only one SVOC was detected at a concentration of 1.6 ug/l (acenaphthene) from the sample collected from analysis of well MW-9 which did not exceed the TOGS 1.1.1 GA Criteria;

- A total of 12 SVOCs were detected from the analysis of the sample collected from well MW-10 of which five exceeded the TOGS 1.1.1 GA Criteria: benzo(a)anthracene at 13.2 ug/l, benzo(a)pyrene at 1.9 ug/l, benzo(b)fluoranthene at 2.1 ug/l, chrysene at 14 ug/l, and naphthalene at 46.9 ug/l. Total VOCs were 124 ug/l; and,

- A total of eight SVOCs were detected from the analysis of the sample collected from well MW-11 of which two exceeded the TOGS 1.1.1 GA Criteria: benzo(a)anthracene at 9.4 and chrysene at 11.9 ug/l. Total SVOCs were 56 ug/l.

There were no constituents that exceeded the TOGS 1.1.1 SD Criteria at locations MW-7R, MW-9, and MW-11. One constituent (benzo(a)pyrene) exceeded TOGS 1.1.1 SD Criteria at MW-8 and MW-10. Well MW-8 is located approximately 550 feet from Newtown Creek and well MW-10 is located approximately 600 feet from Newtown Creek.

As discussed in Section 5.1.3, the low concentrations of benzo(a) pyrene are expected to attenuate prior to their discharge to Newtown Creek and no adverse impacts are predicted.

Polychlorinated Biphenyls (PCBs)

No PCBs were detected in groundwater samples collected from wells GW-1, MW-1, and MW-7.

Metals

February 1990 Sampling Event (Monitoring Well GW-1)

A total of 5 metals were detected at concentrations exceeding the TOGS 1.1.1 GA Criteria from the analysis of well GW-1: antimony at 28.7 ug/l, iron at 62,400 ug/l, manganese at 2,550 ug/l, sodium at 42,400 ug/l and vanadium at 21.7 ug/l. Copper exceeded the TOGS 1.1.1 SD Criteria. Notably, copper exceeded the TOGS 1.1.1 SD criteria in background well GAGW-04D.

It should be noted that the well purge and sample form indicated that the sample was slightly turbid. Particulates in the sample could affect the sample results.

October 2000 Sampling Event[20](Monitoring Wells MW-1 and MW-7)

- A total of 3 metals were detected at concentrations exceeding the TOGS 1.1.1 GA Criteria from the analysis of well MW-1: iron at 39,300 ug/l, manganese at 812 ug/l, and sodium at 200,000 ug/l. Copper exceeded the TOGS 1.1.1 SD Criteria.

- A total of 9 metals were detected at concentrations exceeding the TOGS 1.1.1 GA Criteria from the analysis of well MW-7: antimony at 5.1 ug/l, arsenic at 61.9 ug/l, copper at 308 ug/l, iron at 31,400 ug/l, lead at 234 ug/l, magnesium at 49,000 ug/l,

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[20] The groundwater sampling methodology is unknown and no sampling data was available. As such, there is no information to evaluate the potential effect of particulates on the sample results.

manganese at 1,810 ug/l, sodium at 226,000 ug/l, and vanadium at 24.3 ug/l. Copper, lead and zinc exceeded the TOGS 1.1.1 SD Criteria.

5.1.3 Groundwater Contaminant Fate and Transport

As discussed in Section 4.2 groundwater from the Quanta Resources property flows nearly horizontally in a southwest to west-southwest direction and discharges to Newtown Creek. Given the considerable industrial discharges and spills which have occurred over the past century, Newtown Creek is listed as a Class SD surface water which is the lowest classification for saline surface water in New York State.

As discussed in Sections 5.1.1 and 5.1.2, the groundwater sample analysis data from well GAGW-06I installed during the remedial investigation and several monitoring wells installed prior to the remedial investigation were evaluated and determined to be representative of groundwater within the LNAPL smear zone at the site directly below the bulk of the LNAPL mass. In fact, since a number of samples from these wells were collected through a LNAPL layer in the wells, the resulting groundwater data are believed to represent worst-case or near worst-case conditions.

A number of VOCs and SVOCs were detected at concentrations exceeding the TOGS 1.1.1 SD criteria in these wells. In addition, while metals were also detected above the SD criteria, their concentrations are likely more attributable to naturally occurring metals in the subsurface (e.g., background well GAGW-04D) and/or urban fill (e.g., downgradient off-site well MW-7R). To assess the potential impact of organic constituents in groundwater within the LNAPL smear zone at the site to Newtown Creek surface water, one-dimensional solute transport modeling was conducted as described in Appendix J. This modeling evaluated the transport and attenuation of the maximum concentrations of the VOCs and SVOCs in the LNAPL smear zone, described in Sections 5.1.1 and 5.1.2, without any retardation (i.e., retardation was set as unity in the model) which have a TOGS 1.1.1 SD Criteria. The following table summarizes the groundwater contaminant fate and transport modeling results and predicts the concentration of the constituent in groundwater just prior to its discharge to Newtown Creek.

Constituent	Maximum Concentration	Well No.	Predicted Concentration at Edge of Newtown Creek	TOGS 1.1.1 SD Criteria
Benzene	46.4 ug/l	MW-10	0.015 ug/l	10 ug/l
Ethylbenzene	90.3 ug/l	MW-10	Non-Detectable	41 ug/l
Toluene	9.0 ug/l	MW-10	Non-Detectable	430 ug/l
Xylene	398 ug/l	MW-10	Non-Detectable	170 ug/l
Benzo(a)pyrene	4 ug/l	GW-1	0.07 ug/l[21]	0.006 ug/l
Napthalene	46.9	MW-10	Non-Detectable	140 ug/l
Phenanthrene	16.9	MW-11	Non-Detectable	14 ug/l

Notably, all VOC and SVOC constituents (except for benzo(a)pyrene) are predicted to be less than the TOGS 1.1.1 SD criteria prior to discharge to Newtown Creek. Using a retardation factor for benzo(a)pyrene, the predicted concentration prior to discharge to Newtown Creek is non-detectable. Further, attenuation of potential impacts from site groundwater would occur in the bank sediments of the creek prior to discharge and via dilution (likely orders of magnitude) within the creek itself. These results indicate that the low concentrations of VOC and SVOC detected in groundwater as a result of the partitioning of LNAPL VOC and SVOC into groundwater (i.e., LNAPL smear zone impacts) are not predicted to have an adverse impact to Newtown Creek.

This modeling also evaluated the transport and attenuation of the maximum concentrations of the VOCs and SVOCs that exceeded the TOGS 1.1.1 GA Criteria for the remedial investigation deep wells (GAGW-01, GAGW-02, GAGW-03, GAGW-05, GAGW-07 and GAGW-08) and LNAPL smear zone well GAGW-06I. The one-dimensional solute transport simulations assumed, in a very conservative fashion, that the maximum concentration of these constituents would be hypothetically present at the downgradient end of the Quanta Resource property (southern boundary) at a constant concentration over a long period of time (i.e., 50 years). In addition, these simulations assumed that the solute migration is not affected by retardation.

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[21] Using a retardation factor, predicted concentrations are non-detectable.

Constituent	Maximum Conc.	Well No.	Predicted Concentration at Edge of Newtown Creek	TOGS 1.1.1 GA Criteria	TOGS 1.1.1 SD Criteria
Chloroform	7.9 ug/l	Southern Boundary	0.57 ug/l	7 ug/l	NA
1,2-DCE	5 ug/l	Southern Boundary	0.91 ug/l	2 ug/l	NA
MTBE	270 ug/l	Southern Boundary	0.17 ug/l	10 ug/l	NA
TCE	21 ug/l	Southern Boundary	1.8 ug/l	5 ug/l	40 ug/l
Vinyl Chloride	2.1 ug/l	Southern Boundary	0.38 ug/l	2 ug/l	NA
Benzo(a)pyrene	0.3 ug/l	Southern Boundary	0.006 ug/l	0.0	0.0006 ug/l
Chrysene	0.3 ug/l	Southern Boundary	0.05 ug/l	0.002 ug/l	NA
Benzo(b)fluoroanthene	0.3 ug/lo	Southern Boundary	0.02 ug/l	0.002 ug/l	NA
Benzo(k)fluoroanthene	0.3 ug/l	Southern Boundary	0.13 ug/l	0.002 ug/l	NA
Indeno(1,2,3,-cd)pyrene	0.3 ug/l	Southern Boundary	0.05 ug/l	0.002 ug/l	NA

All VOC constituents detected in the deep and shallow wells are predicted to be less than the TOGS 1.1.1 GA and SD Criteria prior to discharge to Newtown Creek. Using a retardation factor for PAHs, the predicted concentration prior to discharge to Newtown Creek is non-detectable. Further attenuation of potential impacts from site groundwater would occur in the bank sediments of the creek prior to discharge and via dilution (likely orders of magnitude) within the creek itself.

It is believed the above analysis performed and conclusions reached are conservative for the following reasons:

- The maximum concentrations were used in the analysis, i.e., an average groundwater contaminant flux was not used;
- No retardation was used in the model (except for benzo(a)pyrene);
- Attenuation within Newtown Creek sediment was not considered; and,
- Dilution within Newtown Creek was not considered.

Altogether, these analyses conservatively conclude that groundwater from the Quanta Resources property does not pose a significant threat to Newtown Creek.

5.2 Surface Urban Fill/Soil Sample Analyses

Five surficial urban fill/soil samples (SS-01 through SS-05) were collected at unpaved locations on the western and central portions of the Quanta Resources property, as shown on Figures 4 and 5. The five samples, and a sample duplicate (DSS-01, corresponding to sample SS-01) were analyzed for PAHs, PCBs and Metals.

The surface urban fill/soil sample analyses results were compared to the NYSDEC recommended soil cleanup objectives as presented in tables in Appendix A of the NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4046 (Table 2 for SVOCs; Table 3 for PCBs; and Table 4 for metals). According to TAGM 4046, the following primary alternative bases (A, B, C and D) were used in determining TAGM 4046 recommended soil cleanup objectives (TAGM 4046 soil objectives):

A. Human health based levels that correspond to excess lifetime cancer risks of one in a million for Class A (proved) and B (probable) carcinogens, or one in 100,000 for Class C (possible) carcinogens based on a residential exposure scenario. These levels were taken from USEPA's Health Effects Assessment Summary Tables (HEASTs) which are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances Regulation;

B. Human health based levels for systemic toxicants, calculated from Reference Doses (RfDs). RfDs are an estimate of the daily exposure an individual (including sensitive individuals) can experience without appreciable risk of health effects during a lifetime. An average residential scenario of exposure in which children ages one to six (who exhibits the greatest tendency to ingest soil) is assumed. These levels were taken from USEPA's Health Effects Assessment Summary Tables (HEASTs) which are compiled and updated quarterly by the NYSDEC's Division of Hazardous Substances Regulation;

C. Environmental concentrations which are protective of drinking water quality, based on promulgated or proposed New York State Standards; and,

D. Background values.

The TAGM 4046 soil objectives are based on the criterion that produces the most stringent value using basis A, B, and C for organic chemicals, and basis A, B, and D for metals. If basis A and/or B are below basis D for a metal, its background value (basis D) should be used as the cleanup objective. Cleanup objectives developed using this approach are, at a minimum, set above the method reporting limit (MDL) and it is preferable to have the TAGM 4046 soil cleanup objectives above the Contract Required Quantitation Limit (CRQL) as defined by NYSDEC.

Basis A, B, and C are conservative for the current and projected future use of the Quanta Resources property. Basis A and B consider a residential exposure scenario, which is not applicable to the Quanta Resources property. The current use of the Quanta Resources and surrounding properties is industrial and the future use of the Quanta Resources property will remain industrial as future commercial/light industrial development is being planned and deed restrictions will prohibit residential development. In addition, current land zoning for the Quanta Resources property is heavy manufacturing. Therefore, since the Quanta Resources property will not be used for residential purposes (Basis A and B) and groundwater will not be used for drinking purposes (Basis C), the exposure pathways on which the TAGM 4046 soil objectives are based do not apply to the Quanta Resources property. Nonetheless, the TAGM 4046 soil objectives are used for comparison to the subsurface fill/soil sample analyses results as a conservative screening step.

Figure 15 summarizes the exceedances of the TAGM 4046 soil objectives for constituents detected in surficial urban fill/soil samples collected from unpaved portions on the Quanta Resources property. The following discusses the exceedances of the TAGM 4046 soil objectives in surficial soil samples/fill.

5.2.1 Polynuclear Aromatic Hydrocarbons (PAHs)

Sixteen PAHs (including estimated “J” values below reportable quantification limits) were detected in surficial urban fill/soil samples collected from the Quanta Resources property (see Table 11a). The PAH detections were compared to the TAGM 4046 soil objectives. The following five PAHs were detected at concentrations exceeding TAGM 4046 soil objectives in one or more surficial soil/fill samples:

- Benzo(a)anthracene: 0.23 mg/kg to 1.4 mg/kg;
- Benzo(a)pyrene: 0.23 mg/kg to 0.94 mg/kg;
- Benzo(k)fluoranthene: 0.29 mg/kg to 1.2 mg/kg;
- Chrysene: 0.3 mg/kg to 1.3 mg/kg;
- Dibenz(a,h)anthracene: ND to 0.14 mg/kg

* ND – not detected above the method reporting limit.

Figure 15 illustrates the distribution of TAGM 4046 soil objective exceedances for PAHs detected in surface urban fill/soil. As discussed above, the TAGM 4046 soil objectives are based upon the lower of groundwater (drinking water) protection values for urban fill/soil and USEPA health based criterion (for residential exposures).

The only PAHs that exceeded TAGM 4046 soil objectives based on the USEPA human health criterion were benzo(a)anthracene, benzo(a)pyrene, and dibenzo(a,h)anthracene. The remaining exceedances of the TAGM 4046 soil objectives were based upon the groundwater protection criteria (chrysene and benzo(k) fluoranthene). Given the presence of LNAPL overlying the aquifer in the vicinity of the site, the urban fill/soil to groundwater leaching pathway is considered to be of negligible consequence. Additional discussion of the soil leaching pathway is provided in Section 5.3, Subsurface Urban Fill/Soil Sample Analysis, below.

5.2.2 Polychlorinated Biphenyls (PCBs)

PCBs (Aroclor 1260) were detected in three of the five surficial urban fill/soil samples at the Quanta Resources property. The total PCB concentration in each subsurface fill/soil sample was compared to the TAGM 4046 soil objective for total PCB of 1 mg/kg in surficial soil as summarized in Table 11b. Only one sample (SS-01) exceeded this concentration. The NYSDEC TAGM 4046 criteria generally correlate or are more stringent than the PCB soil remediation regulations found in 40 CFR 761 (Federal PCB regulations). Total PCBs were detected in the urban surficial fill/soil sample collected from boring SS-01 (and the corresponding duplicate, DSS-01), at a concentration of 15 mg/kg (14 mg/kg in the duplicate). Because of the low concentrations and isolated nature of the PCBs in surficial urban fill/soil and the fact that PCBs have not been detected in groundwater, PCBs do not likely pose a significant threat to human heath or the environment. Furthermore, 40 CFR Part 761 (Federal PCB Regulations) provide for higher surficial PCB concentrations where access to the site is limited and/or institutional controls or protective covers/caps are in place. These protective measures are included as part of the Quanta Resources property development plan.

5.2.3 Metals

As stated in TAGM 4046, Eastern USA or New York State soil background values may be used as soil objectives for metals. A list of tabulated background values is provided in TAGM 4046, Table 9d. TAGM 4046 also states that soil background data near a site, if available, is preferable and can be used as the cleanup objective for metals. The fill/soil background boring, GAGW-04, which was installed across Review Avenue from the Quanta Resources property and immediately adjacent to the Calvary Cemetery, provides background concentrations of metals in subsurface soil, which was applied to surficial urban fill/soils as well. Therefore, based upon TAGM 4046, the recommended soil cleanup objectives for metals are the higher of the numeric values presented in TAGM 4046 Table 9d, the Eastern United States/New York State background soil concentrations shown in TAGM 4046 Table 9d or site background as determined by the analysis of soil samples collected from boring GAGW-04.

The following TAGM 4046 soil objectives for metals were developed based on the above site background determination.

Metal	Objective (mg/kg)	Rationale
Aluminum	33,000	Eastern US Background
Antimony	0.6	Kabata-Pendias, Alina, Henryk Pendias, "Trace Elements in Soils and Plants", 1985 CRC Press Inc.
Arsenic	15.5	Site Background
Barium	600	Eastern US Background
Beryllium	1.75	Eastern US Background
Cadmium	1	Eastern US Background
Calcium	35,000	NYS Background
Chromium	40	NYS Background
Cobalt	60	NYS Background
Copper	50	Eastern US Background
Iron	550,000	Eastern US Background
Lead	608	Site Background
Magnesium	5000	Eastern US Background
Manganese	5000	Eastern US Background
Mercury	0.2	Eastern US Background
Nickel	25	Eastern US Background
Potassium	43,000	New York State Background
Selenium	3.9	Eastern US Background
Silver	SB (ND)	Local Background
Sodium	8000	Eastern US Background
Vanadium	300	Eastern US Background
Zinc	50	Eastern US Background

Table 11c presents a summary of the detected metal results and compares the results to the above TAGM 4046 soil objectives. Based on the above, the following seven metals exceed the TAGM 4046 soil objectives in surficial urban fill/soil:

- Calcium: 1,640 mg/kg to 76,100 mg/kg;
- Chromium: 13.6 mg/kg to 43.3 mg/kg;
- Copper: 25.3 mg/kg to 388 mg/kg;
- Lead: 46.1 mg/kg to 913 mg/kg;
- Magnesium: 1520 mg/kg to 22,000 mg/kg;

- Nickel: 11.7 mg/kg to 27.3 mg/kg; and
- Zinc: 66.2 mg/kg to 334 mg/kg.

Figure 15 illustrates the distribution of exceedances of the TAGM 4046 soil objectives for metals in surficial urban fill/soil.

5.3 Subsurface Urban Fill/Soil Sample Analyses

As discussed in Section 4.1, urban fill was encountered in all of the soil borings advanced on the Quanta Resources, North Capasso, and Phoenix Beverages properties. The urban fill thickness ranged from approximately 16 feet at Boring SB-05 to less than 5 feet at Boring GAL-04. Less than 1 foot of urban fill was observed in background Boring GAGW-04 and GAGW-04D. The geologic cross-sections shown on Figures 7 and 8 illustrate the distribution of urban fill across the properties. Due to its ubiquitous distribution, several of the subsurface samples at the Quanta Resources property were collected within urban fill and thus may contain impacts not associated with historic Quanta Resources operations. The presence of urban fill at the Quanta Resources property is typical of the conditions found in many New York metropolitan area sites.

Similar to the surficial urban fill/soil discussed in Section 5.2, the subsurface urban fill/soil sample analyses results were compared to the NYSDEC recommended soil cleanup objectives as presented in tables in Appendix A of the NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4046 (Table 1 for VOCs; Table 2 for SVOCs; Table 3 for PCBs; and Table 4 for metals).

Figures 16 (VOC), 17 (SVOC), and 18 (metals) summarize the exceedances of the TAGM 4046 soil objectives for urban fill/soil samples collected from borings installed on the Quanta Resources property. Notably, sampling intervals within the urban fill are shaded orange on these figures. The following discusses the exceedances of the TAGM 4046 soil objectives in subsurface urban fill/soil.

5.3.1 Volatile Organic Compounds (VOCs)

Twenty-nine VOCs (including estimated “J” values below reportable quantification limits) were detected in subsurface fill/soil samples collected from the Quanta Resources property (see Table

12a)[22]. These VOC detections were compared to the TAGM 4046 soil objectives. The following ten VOCs were detected at concentrations exceeding TAGM 4046 soil objectives in one or more fill/soil samples:

- Acetone: ND mg/kg to 8.4 mg/kg;
- Benzene ND mg/kg to 0.63 mg/kg;
- 1,2-Dichlorobenzene ND mg/kg to 11 mg/kg;
- 1,1-Dichloroethane ND mg/kg to 13 mg/kg;
- Ethylbenzene ND mg/kg to 11 mg/kg;
- Methylene Chloride ND mg/kg to 1.1 mg/kg;
- Toluene ND mg/kg to 6.9 mg/kg;
- Trichloroethylene ND mg/kg to 3.5 mg/kg;
- Vinyl Chloride ND mg/kg to 1.7 mg/kg; and
- Xylene (total) ND mg/kg to 33 mg/kg.

* ND – not detected above the method reporting limit.

As discussed above, the TAGM 4046 soil objectives are based upon the lower of groundwater protection criteria or USEPA health based criteria. All of the VOC exceedances noted on Figure 16 are based solely on the groundwater protection criteria. None of the VOC concentrations identified in subsurface soil exceed the USEPA human health based criteria for residential exposures. Given the presence of LNAPL overlying groundwater on the property, and since groundwater at the Quanta Resources property is not and will not be used as a drinking water supply, the fill/soil to groundwater leaching pathway for VOCs is considered to be of negligible consequence.

Furthermore, of the VOCs identified on the above list, only benzene, trichloroethylene, and vinyl chloride have been identified in shallow or deep groundwater exceeding TOGS 1.1.1 GA criteria (see Section 5.1.1) as follows:

- Benzene only marginally exceeded the TOGS 1.1.1 GA criteria (1 ug/l) in one well, the duplicate sample at GAGW-06I (1.1 ug/l), but did not exceed the criteria in the primary sample;

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[22] Subsurface soil samples were collected from two borings on the North Capasso property (GAGW-07 and GAL-18), and one boring on the Phoenix Beverages property (GAL-15). The samples were analyzed for VOCs to assess the potential source of elevated PID readings observed during the installation of these borings. Table 12a presents a summary of the analytical results from samples collected at these borings.

- TCE was detected at higher concentrations in wells on the North Capasso property upgradient and/or sidegradient to the wells where trichloroethylene was detected on the Quanta Resources property; and,

- Vinyl chloride only marginally exceeded the TOGS 1.1.1 GA criteria (2 ug/l) in well GAGW-06I (2.1 ug/l).

Preliminarily, the exceedances of the TAGM 4046 soil objectives for VOCs in subsurface soil do not appear to pose a significant threat to human health or the environment. However, these data will be explored further in the Exposure Assessment.

5.3.2 Semi-Volatile Organic Compounds (SVOCs)

Twenty-nine SVOCs (including estimated “J” values below reportable quantification limits) were detected in subsurface fill/soil samples collected from the Quanta Resources property (see Table 12b). The SVOC detections were compared to the TAGM 4046 soil objectives. The following eleven SVOCs were detected at concentrations exceeding TAGM 4046 soil objectives in one or more fill/soil samples:

- 2-Methylnapthalene: ND mg/kg to 56 mg/kg;
- 4-Methylphenol: ND mg/kg to 2.3 mg/kg;
- Benzo(a)anthracene: ND mg/kg to 21 mg/kg;
- Benzo(a)pyrene: ND mg/kg to 52 mg/kg;
- Benzo(b)fluoranthene: ND mg/kg to 7.8 mg/kg;
- Chrysene: ND mg/kg to 29 mg/kg;
- Dibenzo(a,h)anthracene: ND mg/kg to 14 mg/kg
- Indeno(1,2,3-cd)pyrene: ND mg/kg to 12 mg/kg;
- Naphthalene: ND mg/kg to 36 mg/kg;
- Phenol: ND mg/kg to 3.7 mg/kg; and,
- Bis 2-ethylhexyl-phthalate: ND mg/kg to 120 mg/kg.

* ND – not detected above the method reporting limit.

Figure 17 illustrates the distribution of TAGM 4046 soil objective exceedances for SVOCs detected in subsurface fill/soil. As discussed above, the TAGM 4046 soil objectives are based upon the lower of groundwater protection values for fill/soil and USEPA health based criterion.

Except for bis-2ethylhexyl-phthalate in sample SB-10 (5.5 ft), the only SVOCs that exceeded TAGM 4046 soil objectives based on the USEPA human health criterion were carcinogenic Polycyclic Aromatic Hydrocarbons (c-PAHs) benzo(a)anthracene, benzo(a)pyrene, and dibenzo(a,h)anthracene. The remaining exceedances of the TAGM 4046 soil objectives were based upon the groundwater protection criteria. Given the presence of LNAPL overlying the aquifer in the vicinity of the site, the fill/soil to groundwater leaching pathway is considered to be of negligible consequence.

Furthermore, of the SVOCs that exceeded the TAGM 4046 soil objectives based on groundwater protection, only benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene were detected in groundwater at concentrations above the TOGS 1.1.1 GA criteria. Notably, the detected concentrations of these compounds in groundwater are all less than 1 ug/l and occurred only in two monitoring wells as discussed in Section 5.1.1.

Therefore, the SVOC exceedances of the TAGM 4046 soil objectives, based on groundwater protection, do not appear to pose a significant threat to human health or the environment. A more rigorous review of the exceedances of the TAGM 4046 health-based criteria to more appropriate industrial exposure scenario based criteria may be completed as part of the Exposure Assessment.

5.3.3 Polychlorinated Biphenyls (PCBs)

Four PCB aroclors (aroclor-1242, aroclor-1248, aroclor-1254, and aroclor-1260) were detected in subsurface fill/soil samples at the Quanta Resources property. No subsurface soil samples were collected from adjacent properties for PCB analyses. The total PCB concentration in each subsurface fill/soil sample was compared to the TAGM 4046 soil objective for total PCB of 10 mg/kg in subsurface soils as summarized in Table 12c. As discussed in Section 5.2.2, the TAGM 4046 criterion generally correlate to the Federal PCB regulations identified in 40 CFR 761. One fill/soil sample collected from boring SB-14, at a depth of 5 feet has a total PCB concentration of 10.2 mg/kg, which only slightly exceeds the TAGM 4046 soil objective for total PCB of 10 mg/kg in subsurface soils. This fill/soil sample was collected in overlying urban fill material present at the site. PCB fill/soil concentrations were lower or not detected in the other samples collected in the same boring. Because of the low concentrations and isolated nature of the PCBs in subsurface soil and the fact that PCBs have not been detected in groundwater, PCBs do not likely pose a significant threat to human heath or the environment.

5.3.4 Metals

As stated in TAGM 4046, Eastern USA or New York State soil background values may be used as soil objectives for metals. A list of tabulated background values is provided in TAGM 4046, Table 12d. TAGM 4046 also states that soil background data near a site, if available, is preferable and can be used as the cleanup objective for metals. The fill/soil background boring, GAGW-04, which was installed across Review Avenue from the Quanta Resources property and immediately adjacent to the Calvary Cemetery, provides background concentrations of metals in subsurface soil. As discussed for surficial urban fill/soil samples in Section 5.2.3, based upon TAGM 4046, the recommended soil cleanup objectives for metals are the higher of the numeric values presented in TAGM 4046 Table 12d, the Eastern United States/New York State background soil concentrations shown in TAGM 4046 Table 12d or site background as determined by the analysis of soil samples collected from boring GAGW-04.

Table 12d presents a summary of the detected metal results and compares the results to the above TAGM 4046 soil objectives. Based on the above, the following thirteen metals exceed the TAGM 4046 soil objectives:

- Antimony: ND mg/kg to 76.6 mg/kg;
- Arsenic: ND mg/kg to 332 mg/kg;
- Cadmium: ND mg/kg to 16 mg/kg;
- Calcium: 187 mg/kg to 37,800 mg/kg;
- Chromium: 1.4 mg/kg to 57.1 mg/kg;
- Copper: 2.2 mg/kg to 1,130 mg/kg;
- Lead: 1.6 mg/kg to 608 mg/kg;
- Magnesium: 88.2 mg/kg to 11,800 mg/kg;
- Mercury: ND mg/kg to 27 mg/kg;
- Nickel: ND mg/kg to 98.3 mg/kg;
- Selenium: ND mg/kg to 125 mg/kg; and,
- Zinc: ND mg/kg to 1,310 mg/kg.

* ND – not detected above the method detection limit.

Figure 18 illustrates the distribution of exceedances of the TAGM 4046 soil objectives for metals. It is important to note that the majority of the soil samples having exceedances of the TAGM

4046 soil objectives were located in the upper portion of each fill/soil boring, within urban fill, and therefore may be attributable to the urban fill and not necessarily related to oil recycling operations on the Quanta Resources property.

As discussed above, the TAGM 4046 soil objectives are based on restoration of site conditions to background, and not directly based on groundwater or human health protection. Given the ubiquitous distribution of urban fill across the Quanta Resources and adjacent properties, the objective for restoration to background is not realistic and thus the comparison of the subsurface soil metals results to the background objective values was performed only as an initial conservative screening step. Based on the groundwater data collected, presented in Section 5.1.1, leaching of metals to groundwater is not a concern. Of the metals listed above, only magnesium was identified in groundwater at concentrations exceeding TOGS 1.1.1 GA criteria. Screening of the above list of metals that exceed the TAGM 4046 objectives to industrial use human health based criteria may be performed as part of the Exposure Assessment.

5.3.5 Total Petroleum Hydrocarbons (TPH)

Numerous TPH samples were collected in both the on-property and off-property soil borings to provide a profile of TPH with depth (Table 12e). These data were collected to assess the degree of LNAPL saturation at the various boring locations. The LNAPL saturation in soils is an important property which will be used, along with other soil and LNAPL properties, to evaluate LNAPL mobility and volumes. Table 12e presents a summary of the TPH data collected in each boring.

In addition to the standard TPH analysis (utilizing USEPA Method 418.1) discussed above, several subsurface soil samples were collected for speciated petroleum hydrocarbon analyses utilizing modified USEPA Method 8015. The purpose of this analysis was to assess the general proportions of hydrocarbon compounds making up the petroleum hydrocarbon fraction (i.e., the percentage of hydrocarbons having a given number of carbon atoms (e.g., C8, C10, C12, etc.).

Table 12f presents a summary of the speciated hydrocarbon analysis results. The majority of the petroleum hydrocarbons detected in soil was in the diesel range and heavier, have more than 14 carbon atoms and less than 34 carbon atoms. Notably, few gasoline-range hydrocarbons having less than 9 carbons (e.g., benzene, toluene, xylene, and ethylbenzene) were detected, which is consistent with the low levels of VOCs detected in the subsurface fill/soil samples collected on the Quanta Resources property.

5.3.6 Geotechnical Parameters

Numerous samples were collected for grain size analyses (GSA) in both on-property and off-property borings at various depths. The GSA results were used for two primary purposes. First, the GSA sample analyses were used to confirm geologic interpretations and were thus collected at various intervals having different field descriptions of geologic materials as listed in the boring logs. Second, the GSA results were used to provide a detailed description of the fill/soil grain size structure in the LNAPL saturation zone, which is used in the assessment of LNAPL mobility and volumes as discussed in Section 7.0 and Appendix L.

5.3.7 LNAPL Mobility Soil Parameters

Soil samples were analyzed for additional parameters to assist in the evaluation of LNAPL mobility. These parameters include mineralogy and moisture content. The primary mineral make-up of the soil particles within the LNAPL saturation zone was determined to allow for the subsequent analysis of LNAPL contact angle. The moisture content of the soil matrix was determined to assist in the evaluation of LNAPL mobility and volumes. Soil moisture content data is presented in Appendix K.

5.3.8 Total Organic Carbon

Thirteen samples were collected from various boring locations and at various depths to provide a site-specific estimate of total organic carbon (TOC) of the soil matrix. Table 12g provides the TOC sample analyses results.

5.4 LNAPL Sample Analyses Results

The presence of LNAPL has been detected in thirteen LNAPL monitoring wells on the Quanta Resources property, eleven wells on the North Capasso property, and four wells on the Phoenix Beverages property. All of the wells where LNAPL has been observed have been sampled and all samples analyzed as described in Section 3.0. This section presents a summary of the monitoring measurements and sample analyses results. As there are no published New York State numerical criteria or screening levels for LNAPL, this section focuses on describing the general distribution of LNAPL and the chemical constituents that comprise the LNAPL. In addition, distinguishing LNAPL characteristics between the Quanta Resources, North Capasso, and Phoenix Beverages properties are also discussed.

In addition to LNAPL detected in monitoring wells, LNAPL was also detected in two sumps; one on the Quanta Resources property and one on the North Capasso property, as shown on Figure 4. Due to their unique chemical characteristics, the analytical results from samples collected in these sumps are discussed separately from the LNAPL monitoring well sample analyses results.

A summary of LNAPL thickness measurements recorded on July 24 and August 31, 2004, and April 4 and April 19, 2005, is presented in Table 5. Summaries of detected LNAPL chemical and physical characteristics are presented in Table 13a (physiochemical properties), Table 13b (VOCs), Table 13c (SVOCs), Table 13d (PCBs), and Table 13e (metals). Figures illustrating some of the major LNAPL characteristics are provided and referenced in the following sections.

5.4.1 Physiochemical Parameters

The LNAPL samples were analyzed for a number of physiochemical parameters, including:

- % sediments;
- % sulfur;
- BTU;
- Flashpoint;
- Interfacial tension;
- Specific gravity;
- Surface tension;
- Total organic halides (TOX); and,
- Viscosity.

Table 13a presents a summary of the analytical results for these parameters.

The parameters % sediments, % sulfur, BTU, flashpoint, and TOX are useful parameters when evaluating LNAPL recycling and/or disposal options. Interfacial tension and surface tension were used in the calculation of specific free-product volumes presented above in Section 7.0. The following summarizes some general observations made with respect to the viscosity and specific gravity (density) results.

Viscosity

In general term, viscosity is a measure of a liquid's resistance to flow. The higher the viscosity the "thicker" the liquid is and the slower it will flow. For example, motor oil has a higher viscosity than gasoline. The viscosity of LNAPL is likely to increase over time due to weathering and the loss of the less viscous lighter components from volatilization, dissolution, biodegradation, and other weathering mechanisms. This physical property is a key parameter for calculations of mobility and recoverability, relative to physical movement of product through soil (Section 6.0 and 7.0).

Figure 19 illustrates an interpreted distribution of the viscosity of LNAPL on the three properties. On the Quanta Resources property, viscosity was lowest in the northern portion (30.72 cSt at GAL-06) and increased toward the south with the highest value on the property measured at GAL-02 (117 cSt). The viscosity of the LNAPL on the North Capasso property is generally less than that measured on the Quanta Resources property with the lowest values being measured at GAL-18 (27.85 cSt), GAL-22 (26.64 cSt), GAL-10 (24.43 cSt) and GAL-13 (23.27 cSt). The viscosity of the LNAPL on the Phoenix Beverage property ranged from 49.56 cSt at GAL-14 to 58.99 cSt at GAL-26. Overall, LNAPL viscosity is lowest on the North Capasso property and generally increases in a southerly direction toward the southern portion of the Quanta Resources property where the viscosity is highest.

Specific Gravity (Density)

LNAPL density varied slightly across the three properties. The lowest densities were measured on the North Capasso property, which may correlate to the presence of lighter, less viscous materials described above and higher concentrations of VOCs, as described in Section 5.4.2. A summary of the density measurements are provided below.

- On the Quanta Resources property, density generally ranged from 0.885 gm/cm^3 at GAL-01 to 0.905 gm/cm^3 at GAL-16. The highest density measured on the Quanta Resources property (0.915 gm/cm^3) occurred at GAL-08, which monitors a discrete and localized condition;

- On the North Capasso property, density ranged from 0.875 gm/cm^3 at GAL-13 and GAL-11 to 0.901 gm/cm^3 at GAL-12. The lowest density values were measured on the North Capasso property; and,

- On the Phoenix Beverage property, density ranged from 0.904 gm/cm^3 at GAL-17 to 0.908 gm/cm^3 at GAL-26.

5.4.2 LNAPL – Volatile Organic Compounds (VOCs)

The VOC content of LNAPL varied across the three properties with the highest amount of VOCs being detected on the North Capasso property. Table 13b presents a summary of detected VOC in LNAPL on the three properties. Interpreted distributions of Total VOCs plus TICS; Total VOCs; and, BTEX are illustrated on Figure 20. A summary of the distribution of VOCs in LNAPL is described below:

- The concentration of VOCs in LNAPL on the Quanta Resources property was highest at GAL-08 which is considered to monitor an isolated condition in the northeast corner of the Quanta Resources property. Uniquely, chlorinated ethane/ethene compounds comprised a large portion of the total VOCs detected in GAL-08;

- The highest concentrations of total VOCs and TICs and total BTEX from all three properties were found on the North Capasso property. Moreover, not considering GAL-08, the highest concentration of total VOCs were also detected on the North Capasso property. In many cases, VOCs on the North Capasso property were detected at concentrations an order of magnitude higher than on the Quanta Resources property;

- The highest concentrations of total VOCs and TICs were detected in well GAL-13 on the North Capasso property, which is located in the vicinity of a reported fuel dispensing pad and underground tanks. GAL-22, GAL-23, and GAL-24, on the North Capasso property also had similar order of magnitude concentrations of total VOCs and TICs concentrations;

- VOC concentrations were lowest on the Phoenix Beverages property at wells GAL-14 and GAL-17; and,

- The highest concentrations of chlorobenzene and dichlorobenzene were detected on the North Capasso property. Chlorobenzene was only detected on the North Capasso property with the highest concentration detected at GAL-13. Chlorobenzene and dichlorobenzene were not detected on the Phoenix Beverages property.

5.4.3 LNAPL – Semi-Volatile Organic Compounds (SVOCs)

Table 13c presents a summary of SVOCs detected in LNAPL on the three properties. PAHs comprise nearly 100% of the total SVOCs. The following property specific observations were noted with respect to the SVOC analytical results:

- Except GAL-08, total PAH concentrations were generally higher on the North Capasso property than on the Quanta Resources or Phoenix Beverages properties;

- Concentrations of naphthalene (one of the lightest, most volatile PAHs) are higher on the North Capasso property than on the Quanta Resources or Phoenix Beverages properties; and,

- The Quanta Resources and Phoenix Beverages properties exhibited similar concentrations of PAHs.

5.4.4 LNAPL – Polychlorinated Biphenyls (PCBs)

Table 13d presents a summary of total PCBs (PCB Aroclors) detected in LNAPL on the three properties. Two Aroclors were detected: Aroclor-1242 and Aroclor-1260. The following property-specific observations were noted with respect to the PCB analytical results:

- The highest concentrations of total PCBs were detected on the Quanta Resources property along the southern portion of the western perimeter at wells GAL-04 (77 mg/kg) and GAL-01R (80 mg/kg). PCBs were also detected in the southern/central portion of the Quanta Resources property at wells GAL-02 (55 mg/kg), GAL-07 (21.3 mg/kg), and GAL-05 (7.1 mg/kg);

- PCBs were not detected in the northern portion of the Quanta Resources property at wells GAL-06, GAL-08, GAL-09, MW-11, MW-19 and MW-20, nor were PCBs detected in the wells located north of Review Avenue (GAGW-04 and MW-15);

- PCBs were not detected along the southeastern portion of the Quanta Resources property adjacent to the Phoenix Beverages property at wells GAL-03 and GAL-16. PCBs were also not detected in any of the Phoenix Beverage property wells;

- PCBs were detected throughout the North Capasso property (including well GAL-13 at 5 mg/kg) with the highest detections occurring at wells MW-4R (34 mg/kg) and GAL-11 (11 mg/kg). Except at well MW-4R (34 mg/kg), lower concentrations of PCBs were detected on the North Capasso property than on the Quanta Resources property; and,

- Except in well GAL-05 where only Aroclor 1260 was detected, both Aroclor 1242 and Aroclor 1260 were detected in all wells on the Quanta Resources property. Only Aroclor 1260 was detected in the North Capasso property wells, except for well MW-4R where both Aroclor 1242 and 1260 were detected.

5.4.5 LNAPL - Metals

Table 13e presents a summary of metals detected in LNAPL on the three properties. General observations with respect to the types and distribution of metals in LNAPL at the three properties are listed below.

- The highest concentrations of metals were detected in GAL-04 and GAL-01R on the Quanta Resources property and in many cases GAL-11 on the North Capasso property for the following metals:
    - Barium
    - Calcium

  - Chromium
  - Iron;
  - Manganese; and,
  - Zinc.

- Higher concentrations of arsenic were detected in LNAPL on the North Capasso property than on the Quanta Resources and Phoenix Beverages properties;

- Higher concentrations of lead and selenium were detected on the Quanta Resources property than on the North Capasso and Phoenix Beverages properties; and,

- The highest concentration of aluminum was detected on the Phoenix Beverages property for one well (103 ppm).

5.4.6 LNAPL – GRO/DRO/MRO

The relative proportions of Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Mineral Oil Range Organics (MRO) provide an indication of LNAPL composition. For example, LNAPL having a higher GRO fraction is likely to contain a higher amount of VOCs than a sample with a low GRO fraction. Table 13f presents a summary of the GRO/DRO/MRO sample analyses results. The following presents general observations with respect to the GRO/DRO/MRO sample analysis results:

- Higher GRO concentrations were detected in wells on the North Capasso property than on the Quanta Resources or Phoenix Beverages properties, with the highest total GRO concentrations occurring in well GAL-24, with similar concentrations in other North Capasso wells. These results are consistent with the VOC analysis that show higher VOC concentrations on the North Capasso property;

- On the Quanta Resources property, the highest GRO concentration was detected at GAL-01R and GAL-19 (which lie adjacent to the North Capasso property) and GAL-08 which, as discussed above, monitors a localized occurrence of VOC on the Quanta Resources property that is uniquely comprised of primarily chlorinated VOCs;

- Wells in the central and southern portions of the Quanta Resources property (except GAL-08, discussed above) and the Phoenix Beverages property showed low GRO concentrations; and,

- The proportions of DRO/MRO were generally similar across all properties however some distinguishing observations were noted;

  - The Phoenix Beverage property wells have similar DRO and MRO proportions;
  - The southern/central Quanta Resources property wells have similar DRO and MRO proportions; and,
  - The northern Quanta Resources property wells and the wells across Review Avenue have similar GRO and MRO proportions.

5.4.7 LNAPL GC Fingerprints

All LNAPL samples were analyzed using a qualitative application of gas chromatography principles to provide chromatographic fingerprints (GC fingerprints) of the LNAPL. The laboratory ran chromatographic analysis using carefully controlled and uniform procedures to increase the comparability of the GC fingerprints. Figure 21(Phase I) and Figure 22 (Phase II) provide the GC fingerprints for each LNAPL sample analyses. The analytical laboratory evaluated each of the fingerprints and provided a general characterization of the LNAPL type as summarized in Table 13g. This table identifies all free product samples as having a predominant "mineral oil" fraction, indicative of heavier (non-volatile) hydrocarbons and with lesser amounts of a light petroleum product in the boiling range of degraded diesel #2 fuel oil[23]. Some of the samples (noted in yellow and orange headings in Table 13g and on Figures 21 and 22) also show a lighter fraction of hydrocarbons tentatively identified as being in the boiling range of mineral spirits. This lighter fraction is more prevalent on the North Capasso property. The exceptions to this general composition are the LNAPL taken from the sump near GAL-05 on the Quanta Resources property, which appears to have a unique mixture of lighter fuels plus the mineral range material, and GAL-13 on North Capasso, which contains a significantly higher proportion of a mixture of volatile hydrocarbons in the boiling range of mineral spirits.

In addition, the GC fingerprint of GAL-08 on the Quanta Resources property is not believed representative of LNAPL on the large majority of the Quanta Resources property, as discussed above. A number of chlorinated VOCs are believed to help comprise the light fraction at GAL-08 which was not appreciably detected at other Quanta LNAPL monitoring wells.

A review of the GC fingerprints illustrates some distinctions between the LNAPL samples collected at different areas of the three properties. The following presents an overview of the initial assessment of these fingerprints.

The fingerprint assessment focused on three portions of the chromatograms: 1) a light or early fraction; 2) mid-range peaks; and 3) a mineral oil hump, as shown on the example GC fingerprint

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[23] The GC fingerprint analysis performed by STL on the Phase II LNAPL samples identified samples as having a "lesser amount of a light petroleum product in the boiling range of degraded diesel #2 fuel oil." Golder requested STL to review the Phase I GC fingerprint chromatograms since this was not identified during Phase I. Upon further review of the chromatograms by STL, STL has stated that lesser amounts of a degraded diesel #2 fuel oil was observed in all Phase I samples collected in 2004.

from MW-10 presented as Figures 21 and 22. Each of these three fingerprint portions is discussed below, with fractions generally representing the GRO, DRO, and MRO fractions of the 8015 analysis:

1. Light or early fraction – Indicates the presence of light hydrocarbons in the mineral spirit range. The chromatograms clearly show that LNAPL on the North Capasso property has a larger light fraction component than the LNAPL on the Quanta Resources (except for GAL-08) and Phoenix Beverages properties. In many Quanta Resources and Phoenix Beverages samples, the light fraction is small or indiscernible. This finding is consistent with the VOC and GRO/DRO/MRO results discussed in Sections 5.4.2 and 5.4.6, respectively;

2. Mid-range peaks – These peaks are likely to be associated with phytane, pristine, and/or isoprenoids, or other similar compounds that are resistant to weathering (loss via volatility, dissolution, biodegradation, and other factors) and/or are produced during weathering. These types of compounds will begin to distinguish themselves from the overall chromatographic pattern as other compounds more susceptible to weathering are depleted. As weathering continues, these peaks become more pronounced. Therefore, the degree of separation of these peaks from the body of the GC fingerprint provides a general indication of the amount of weathering the LNAPL has undergone. LNAPL GC fingerprints that have clear separation of these peaks from the body of the chromatographic pattern (e.g., GAL-14) are considered to be older (longer time in the environment) and more weathered than LNAPL with little to no separation (e.g., GAL-13). The GC fingerprints show differences in the separation of the mid-range peaks on the different properties. In particular, the mid-range peaks are less pronounced on the North Capasso property than on the Quanta Resources and Phoenix Beverages properties;

3. Mineral oil hump – While the overall patterns appear similar, and represent the dominant fraction of the LNAPL material, this portion of the GC fingerprints has not been evaluated in detail.

5.4.8 Chemical Analysis of LNAPL in Sumps

In addition to LNAPL observed in monitoring wells, LNAPL was also observed in two sumps; one on the Quanta Resources property and one on the North Capasso property as shown on Figure 4. The analytical results from samples collected at these sumps are presented in Tables 13a (physiochemical characteristics), 13b (VOCs), 13c (SVOCs), 13d (PCBs), 13e (metals), 13f (GRO/DRO/MRO), and 13g (GC fingerprint description).

The analytical results indicate that the sump on the Quanta Resources property exhibits unique characteristics that are generally not representative of LNAPL observed in monitoring wells in the vicinity of the sump. In particular, the analytical data suggest that LNAPL in the sump on the Quanta Resources property is a different type of LNAPL than seen in surrounding LNAPL wells

GAL-03, GAL-05, and GAL-07. Therefore, the Quanta Resources property sump is not believed to be a source of the LNAPL observed in adjacent and downgradient wells. Similar observations can be made for the North Capasso property sump. The following summarizes the analytical results for each sump in comparison to the LNAPL monitoring wells adjacent to and/or downgradient of the sump.

Quanta Resources Property Sump:

VOCs: Higher concentrations of VOCs, in particular BTEX, were detected in the sump than in adjacent LNAPL wells.

SVOCs: While the concentrations of SVOCs were similar, fewer PAHs and higher concentrations of the lighter PAHs (naphthalene and 2-methylnaphthalene) were detected.

Metals: Higher concentrations of metals, in particular iron, lead and zinc, were detected in the sump.

GC Fingerprint: The GC fingerprint and laboratory description of the fingerprint differ from the nearby LNAPL wells.

North Capasso Sump:

VOCs: Lower concentrations of VOCs were detected in the sump and the VOCs consisted primarily of BTEX whereby several other VOCs (for example chlorobenzene and dichlorobenzenes) were detected in LNAPL in surrounding North Capasso wells.

SVOCs: Lower concentrations of SVOCs and fewer PAHs were detected in the sump. In general, higher amounts of naphthalene and 2-methylnaphthalene were detected.

PCBs: No PCBs were detected in the sump.

Metals: Higher concentrations of metals, in particular iron, lead and zinc, were detected. Arsenic was not detected. As discussed in Section 5.4.5, the North Capasso property wells have lower amounts of lead and higher amounts of arsenic than the Quanta Resources property wells.

GC Fingerprint: The GC fingerprint and laboratory description of the fingerprint differ from the nearby LNAPL wells.

6.0 LNAPL PILOT TEST

A Proposal to conduct a LNAPL Recovery Pilot Study was submitted to NYSDEC on March 18, 2004 and was subsequently approved. The pilot study was designed to assess the recoverability of LNAPL detected in LNAPL monitoring well GAL-07 on the Quanta Resources property. As part of the pilot study, two observation wells OW-1 and OW-2 were installed within 5 and 9 feet respectively, of well GAL-07. These wells were installed February/March 2004 and the locations are shown on Figure 4.

Construction of the pilot LNAPL recovery system commenced on March 25, 2004 and was completed on March 30, 2004. The primary components of the pilot LNAPL recovery system include two 275-gallon aboveground storage tanks within a secondary containment system. A compressed nitrogen gas cylinder rack, regulators and manifold to operate the pneumatic LNAPL recovery pump was also erected within the containment system. A high pressure gas line from the manifold was used to operate a specific gravity skimmer pump installed in GAL-07, which pumped the recovered LNAPL through a return line to the storage tanks. Schedule 80 PVC was used to protect and to provide for secondary containment for the high pressure gas line and the LNAPL return line. A chain-link fence was built surrounding the pilot LNAPL recovery system.

Between March 29 and April 2, 2004, the pilot system operation was initiated and tested. The pilot study commenced full-time operation at GAL-07 from April 5 to June 18, 2004. Upon completion of the pilot study at GAL-07, it was decided to conduct a second pilot study at GAL-02 as discussed further below. The pilot study at GAL-02 commenced on June 23, 2004 and was completed on July 9, 2004. Initial pumping rates for each test were selected based on the baildown test analysis at GAL-07 and GAL-02 and then adjusted during the pilot study.

LNAPL Pilot Study at GAL-07

The following summarizes the operation and results of the pilot study conducted at GAL-07. A summary of the LNAPL thickness data collected during the GAL-07 pilot study is provided on Figure 23.

- April 5 to May 6, 2004 – The LNAPL recovery pilot system operated at a rate of less than 0.01 gallons per minute (gpm) or approximately 10 gallons per day (gpd). During this period there was an overall decrease observed in the measured LNAPL thickness in GAL-07 of approximately 0.5 feet with no substantial change observed in the LNAPL thickness in two observation wells OW-1 and OW-2. Adjustments to the pump were made to allow for higher pumping rates.

- Pumping Well GAL-07, May 6, 2004 to June 18, 2004 – On May 6, the pumping rate was increased to approximately 0.02 gpm or about 30 gpd. At this pumping rate the measured LNAPL thickness at GAL-07 steadily decreased to less than 0.5 feet on May 27, 2004. From May 27, 2004 to June 18, 2004, the pumping rate was reduced from about 0.02 gpm to 0.017 gpm (about 25 gpd) to assess potential sustainable yields. At the reduced pumping rate, the LNAPL thickness remained at approximately 0.5 feet until June 18, 2004 when the pilot study was considered completed and was stopped.

- Observation wells OW-1 and OW-2, May 6 to June 18, 2004 – An overall decrease in the measured LNAPL thickness in the observation wells was observed. The measured LNAPL thickness at OW-1 decreased by approximately 1.2 feet and at OW-2 by approximately 1 foot. While a portion of the LNAPL thickness changes at OW-1 and OW-2 may be due to normal LNAPL thickness variations, the overall decrease is a result of the influence from pumping at GAL-07.

- The pilot study at GAL-07 was completed on June 18, 2004. Upon completion of the pilot study at GAL-07, approximately 1,300 gallons of LNAPL were removed.

LNAPL Pilot Study at GAL-02

Following completion of the pilot study at GAL-07, a similar pilot study was conducted at GAL-02. GAL-02 is located in the southwestern-most area of the Quanta Resources property where the LNAPL viscosity is highest (about 2.5 times greater than at location GAL-07). The primary objective for conducting the pilot study at GAL-02 was to assess pump operation and recovery rates in higher viscosity LNAPL. Observation wells were not installed for the pilot study at GAL-02.

The following summarizes the operation and results of the pilot study conducted at GAL-02. A summary of the field measurements collected during the pilot study at GAL-02 is provided on Figure 24.

- June 25, 2004: The pilot study at GAL-02 was initiated at a pumping rate of approximately 0.017 gpm (or 25 gpd).

- June 26, 2004: After less than 24 hours of operation, the measured LNAPL thickness in the well decreased to less than 0.5 feet and the pumping rate was decreased to 0.01 gpm or about 15 gpd.

- From June 26 to July 9 – The measured LNAPL thickness was maintained at less than 0.5 feet and the pumping rate was decreased to less than 0.01 gpm or approximately 10 gpd at the end of the pilot test.

- The pilot study at GAL-02 was completed on July 9, 2004. Upon completion of the pilot study at GAL-02, approximately 200 gallons of LNAPL were removed.

Summary of Pilot Test Results

In summary, the pilot study indicates that a pneumatically operated specific gravity skimmer pump operated in a passive recovery mode (i.e., without depression of the groundwater phreatic surface) will effectively recover LNAPL at the two locations tested that have LNAPL with varying viscosities. Based on a graphical analysis performed on the data collected at GAL-07, the predicted radius of influence for the passive recovery of LNAPL having a similar viscosity is approximately 12 feet. This radius of influence will vary across the Quanta Resources property due to vary conditions such as LNAPL viscosity, LNAPL volume in soil, and hydraulic conductivity. Low LNAPL recovery rates are predicted for the Quanta Resources property and will similarly vary based on LNAPL viscosity, volume, and hydraulic conductivity. LNAPL recovery rates at the end of the pilot study at GAL-07 and GAL-02 were approximately 25 gpd and 10 gpd, respectively, and these rates would be expected to decrease over time.

7.0 LNAPL DISTRIBUTION, VOLUME, MASS, AND MOBILITY

7.1 LNAPL Distribution

In 2004, the American Petroleum Institute (API) published a document on LNAPL (API, 2004) that states… "In the past, a common misconceptualization of the vertical distribution of free product at the water table was based on the idea that LNAPL occurs as a distinct lens in which the drainable pore space is completely saturated with LNAPL. This was often referred to as the "pancake layer" conceptualization. Under the pancake layer paradigm, LNAPL saturations are 100 percent. This paradigm predicts large free oil volumes, high mobilities, and large recoverable volumes." Conversely, LNAPL occupies the soil pore space with water and sometimes air. Thus, the LNAPL saturation is never 100% and is variable depending on a variety of conditions, such as the depth of the plume, soil type, hydrogeological conditions, and LNAPL properties. In addition, the measured thickness of LNAPL in a monitoring well is influenced by a number of these same factors as well as groundwater table fluctuations. Based on these considerations, the API considers that "an updated paradigm that is more representative of typical soil capillarity is referred to as the "multiphase" conceptualization, in which LNAPL saturation decreases continuously with depth" (API, 2004).

Based on the API's "multiphase" conceptualization, the measured thickness of LNAPL in a well may not be representative of the total volume of LNAPL in the soil at that location. In fact, the volume of LNAPL in the formation is often much less than the measured LNAPL thickness at a monitoring well might suggest (API, 2004). A better, more realistic expression of the volume of LNAPL in soil at a well location has been developed by the API and is called the "specific free-product volume." The specific free-product volume is defined as the total volume of LNAPL per unit area in the vicinity of a monitoring well. This total volume comprises a non-mobile portion (residual phase or residual LNAPL) that is bound within the soil matrix and a potentially mobile portion (free phase or free LNAPL). It is important to note that while free phase LNAPL may exist at a well, it is not necessarily mobile, since a driving force is necessary for LNAPL migration to occur.

The primary equation leading to an estimate of the specific free-product volume of LNAPL in soil is given below (API, 2003):

$$D_o(b_o) = \int_{Z_{ow}}^{Z_{\max}} nS_o(z)(dz)$$

Where D_o is the specific free-product volume, b_o is the measured LNAPL thickness in the monitoring well, n is the soil porosity, S_o is the LNAPL saturation in soil, z_{max} is the maximum free-product elevation and z_{ow} is the elevation of the water-LNAPL interface.

This equation gives an estimate of the specific free-product volume of LNAPL in soil for a specific monitoring well. For each monitoring well where LNAPL is detected, one value of D_o is obtained and represents the approximate volume of LNAPL in cubic feet within a 1-foot by 1-foot area around the monitoring well in question. To estimate the total volume of LNAPL in soil, the specific free-product volume values obtained at each well are interpolated over the impacted area.

7.1.1 Remedial Investigation Results

Appendix L presents a description of the calculations used to estimate specific free-product volumes at each monitoring well. The distribution of LNAPL at the Site, as represented by the predicted specific free-product volume (adjusted for TPH measured at the site) is shown on Figure 25.

As explained in Appendix L, two values of LNAPL specific free-product volume are presented; the model predicted value and the model predicted value adjusted for TPH saturation measured in fill/soil in a monitoring well boring. Figure 25 illustrates the distribution of the model predicted LNAPL specific free-product volumes adjusted for TPH. As noted in Appendix L, specific free-product volumes were not adjusted due to either the lack of TPH data at MW-10 or anomalous TPH data at MW-4R. As can be seen on Figure 25, higher specific free-product volumes are observed on the Quanta Resources property than on the North Capasso or Phoenix Beverages properties. The highest predicted LNAPL specific free-product volume was detected in the vicinity of GAL-07, in the southwest central portion of the Quanta Resources property.

The presence of LNAPL was detected in all of the Quanta Resources, North Capasso, and Phoenix Beverage property wells that were monitored during the remedial investigation with the exception of the following:

- LNAPL was not detected in wells MW-1 (located in the northeast corner of the North Capasso property) and MW-2 (located in the western portion of the North Capasso property). The remedial investigation determined that the screen for MW-1 may be below the groundwater table and thus the well may not be suitable as a LNAPL monitoring point. Well MW-2 is properly screened to monitor LNAPL;

- LNAPL was not detected in wells GAL-15 and GAL-25, which are located on the Phoenix Beverages property. In addition, only a small amount (less than 3 inches) of LNAPL was measured in GAL-26 on the Phoenix Beverages property; and,

- Wells specifically constructed to monitor groundwater conditions did not show the presence of LNAPL.

7.1.2 Pre-Remedial LNAPL Distribution Data

Golder Associates was provided additional tabulated data (pre-dating the remedial investigation) from previous investigations at or in the vicinity of the Quanta Resources site that indicate whether or not LNAPL was observed in monitoring wells installed during those investigations. These data indicate that LNAPL was detected in monitoring wells MW-1 (initially, but not in later rounds), MW-4R, and MW-10 located on the North Capasso property. LNAPL was not detected in MW-2 also located on the North Capasso property. The locations of these wells were surveyed during the remedial investigation and are shown on Figure 25.

Pre-remedial investigation monitoring data was also provided for three monitoring wells located on the South Capasso property, i.e., MW-7, MW-7R, MW-3R, and one monitoring well (MW-9) located on a small parcel located between the North Capasso and South Capasso properties (Prince Plastics). Except for a brief initial indication of LNAPL at well MW-3R, the data provided for MW-7, MW-7R, and MW-9 and subsequent data from MW-3R do not indicate the presence of LNAPL at these locations, which are all located southwest of the Quanta Resources and North Capasso properties. The approximate locations of these wells are shown on Figure 25.

7.1.3 Description of LNAPL Distribution

As discussed above, the remedial investigation has defined the overall distribution of LNAPL impacts. Figure 25 shows the distribution of measured LNAPL (as specific free product volume) along with wells where LNAPL has not been detected that generally bound the limits of the LNAPL mass. A number of potential LNAPL source areas existed on the Quanta Resources property throughout its operational history, however, the primary suspected source area is the tank farm area located in the northern portion of the Quanta Resources property. All primary sources of LNAPL on the Quanta Resources property have been removed at least 23 years ago since the facility was decommissioned in 1982 (see Section 2.3). The following discusses the general distribution of LNAPL at and in the vicinity of the Quanta Resources property.

Northern Distribution

Upgradient from the tank farm area, LNAPL extends to GAGW-04 where a low specific free product volume (0.042 feet) exists. It is not expected that LNAPL will extend much further north from this well because it lays upgradient (northeast) from the main LNAPL flow direction (southwest). The presence of LNAPL in this area north of the Quanta Resources property has likely been caused by the radial flow created by the suspected release of LNAPL in the vicinity of the tank farm. Since the LNAPL source has been removed at least 23 years ago, any further radial migration of LNAPL upgradient from the Quanta Resources property is not expected.

Eastern Distribution

To the east, on the Phoenix Beverages property, LNAPL has not been observed in wells GAL-15 and GAL-25 and less than 3 inches has been measured in GAL-26 (specific free product volume of 0.019 feet). Therefore, it is likely that the eastern edge of the LNAPL has been defined and that LNAPL will not extend much further to the southeast considering the small to non-detectable amounts of LNAPL in wells GAL-25 and GAL-26 and the dissipated driving force resulting from source removal. Some uncertainty exists in the corner of the Phoenix Beverages property between GAL-26 and GAL-16 due to the lack of data in this area and the potential effects on LNAPL distribution from the transient mound south of the Quanta Resources property. However, it is estimated that given the transient nature of the groundwater mound and high viscosity of LNAPL in this area, any lateral migration to the southeast caused by the mound would most likely be limited to the area south of the Quanta Resources property within the LIRR ROW and should not materially alter the estimated distribution on the Phoenix Beverages property. In addition, given the high viscosity and low velocities (see Section 7.4) observed in the southern portion of the Quanta Resources property and on the Phoenix Beverages property, any further lateral migration to the southeast is expected to be limited.

Western Distribution

The presence of LNAPL on the North Capasso property is likely attributable to a combination of lateral migration of LNAPL from the Quanta Resources property and a source of LNAPL in the western central portion of the North Capasso property. An LNAPL source on the North Capasso property is suspected given the noted differences in LNAPL chemistry and viscosity characteristics described in Section 5.4 of this RI Report and from the estimated LNAPL gradient observed on the North Capasso property (see Section 7.4), which laterally slopes downward from GAL-13 (western portion of North Capasso property) towards the Quanta Resources property. Since there are not believed to be any active LNAPL sources on the North Capasso property, and since the source(s) on the Quanta Resources property were removed at least 23 years ago, it is not expected that any further substantial migration of LNAPL would occur to the northwest. No LNAPL has been observed in MW-2 on the North Capasso property.

Southern Distribution

Downgradient from the Quanta Resources property, LNAPL was not detected in wells GAL-27 and GAL-28 (installed on the South Capasso property during the remedial investigation) and well MW-9 (pre-remedial investigation well on the Prince Plastics property). Based on these data, the downgradient edge of LNAPL is located between the southern boundaries of the Quanta Resources and North Capasso properties and those three wells on the South Capasso (GAL-27 and GAL-28) and Prince Plastics (MW-9) properties, probably within the LIRR ROW. As discussed in Section 4.2, a transient groundwater mound has been observed on the South Capasso property as identified by GAL-27 and GAL-28 (boring log information for MW-9 was not available to Golder Associates). This mound, along with the high LNAPL viscosities, restricts LNAPL migration further to the southwest. The mound may also cause some limited northwest and southeast lateral extension of the LNAPL distribution. However, based on the high viscosity and low velocities of LNAPL (see Section 7.4) observed in the southern section of the Quanta Resources property and the transient nature of the mound, any diversion of the LNAPL to the northwest and southeast is not expected to be substantial and is likely confined within the limits of the LIRR ROW.

7.2 Estimation of LNAPL Volumes

Appendix L provides a detailed discussion of how specific free product volumes for each LNAPL well were calculated. The specific free product volume can be viewed to represent the approximate volume of LNAPL in cubic feet within a 1-foot by 1-foot area around the well in question. To estimate the total volume of LNAPL in soil, the specific free product volumes obtained at each well are interpolated over the LNAPL impacted area.

The total estimated volume of LNAPL in soil is a sum that includes a residual LNAPL volume (non-mobile) and a free LNAPL volume (potentially mobile). The residual volume is considered to be non-mobile and corresponds to volume of LNAPL trapped in soil pores. Residual LNAPL may be found in soil in the vadose and saturated zones as a result of seasonal and other fluctuations of the groundwater table. Typically, a large portion of the total predicted LNAPL volume consists of non-recoverable residual LNAPL that is trapped within soil pores.

The specific free-product volume values were interpolated between well locations to estimate the total LNAPL volume. Table LNAPL 1 below presents the results of the total volume estimation. The volumes presented in Table LNAPL 1 below are based on the Model Predictions Adjusted specific free product volumes (values adjusted using site-specific TPH data). Using the Model Prediction Values without adjusting for site-specific TPH concentration would result in the prediction of higher volumes.

Table LNAPL-1
Total and Residual LNAPL Volume of LNAPL in Soil for each Properties

Property	Total LNAPL Volume (gal)	Residual LNAPL Volume (gal)
	Model Predicted Adjusted	
Quanta	261,000	75,000
Phoenix	44,000	12,000
North Capasso	168,000	40,000

7.3 Estimation of Total Petroleum Hydrocarbon Mass

Appendix L, specifically Section L.3, describes the methods used to estimate the total petroleum hydrocarbon mass and the residual petroleum hydrocarbon mass within both the vadose zone and saturated zones. Table LNAPL 2 below summarizes these petroleum hydrocarbon mass estimates.

Table LNAPL-2
Estimates of Petroleum Hydrocarbon (TPH) Mass in Soil

	Mass of Petroleum Hydrocarbons in soil (lb)			
	Quanta	Phoenix	North Capasso	Estimated Totals
Total Mass	7,920,000	1,870,000	5,940,000	15,730,000
Mean deviation	±528,000	±286,000	±726,000	NA
Total Mass in the vadose zone	4,070,000	880,000	2,420,000	7,370,000
Total Mass in the Saturated Zone	3,850,000	990,000	3,520,000	8,360,000
Residual Mass in the vadose zone (Saturation = or less than 0.1 or 10%)	1,100,000	550,000	1,980,000	3,630,000
Residual Mass in the Saturated Zone	3,850,000	990,000	3,520,000	8,360,000

Note
The total mass in the vadose zone (residual mass) may be underestimated as the urban fill zone was generally not included in the vertical interpolation domain.

These estimates[24] are useful for understanding the relative magnitude of the petroleum hydrocarbon mass at a site and for understanding the estimated proportion of residual petroleum hydrocarbon mass to the total hydrocarbon mass. Based on the mass estimates presented above, it can be seen that the proportion of residual mass to total mass varies per property and on average, the residual mass makes up approximately 50% of the total mass.

7.4 LNAPL Mobility

The mobility of LNAPL is a general concept that refers to the potential of LNAPL to migrate. The mobility of LNAPL is an important factor considered when assessing potential risks to downgradient receptors over time. In many cases, as in the case for the Quanta Resources property, the mere presence of LNAPL does not necessarily represent an unacceptable risk. A complete exposure pathway, i.e., migration of LNAPL to a receptor, is needed for a potential risk to occur. Due to the low to extremely low mobility of the LNAPL at the Quanta Resources property, LNAPL at the Quanta Resources property does not pose a significant threat to Newtown Creek.

Furthermore, as will be discussed in more detail below, the LNAPL source was removed from the Quanta Resources property at least 23 years ago and thus the driving force behind LNAPL migration has been dissipating since that time (over 23 years). Given the high viscosity of LNAPL in the downgradient portion of the site, the low LNAPL gradients, the transient groundwater mound downgradient of the site, and the length of time the driving force has dissipated, it is not surprising that low to extremely low mobilities are predicted at the downgradient edge of the LNAPL mass. The following discusses the calculation and results of the LNAPL mobility evaluation.

The LNAPL mobility can be quantified and expressed as LNAPL velocity. Similar to groundwater, LNAPL velocity is influenced by the individual soil and fluid properties, but is influenced even more so by the interaction between soil and fluids. LNAPL velocity (LNAPL

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[24] The total petroleum hydrocarbon mass estimates do not correlate with the estimates of total LNAPL volume presented in Section 7.2 for several reasons, including those listed below:

- The petroleum hydrocarbon mass estimates are based on measured TPH concentrations. The total LNAPL volume estimates are based on measured LNAPL thicknesses in monitoring wells;
- The horizontal interpolation domain for the petroleum hydrocarbon mass estimates is considerably greater than for the LNAPL volume estimates and includes TPH data from monitoring well borings where LNAPL was not detected; and,
- The vertical interpolation domain for the petroleum hydrocarbon mass estimates considered TPH concentrations throughout the LNAPL smear zone, which was not considered in the LNAPL volume estimates.

seepage velocity) is estimated using the LNAPL conductivity, the LNAPL gradient, and the soil effective porosity (API, 2003a). The LNAPL gradient is the driving force leading the potential movement of LNAPL. Typically, as long as an LNAPL release (source) continues, sufficient driving force is maintained, and LNAPL in the subsurface is able to migrate. Once the release stops (i.e., source is removed), the forces driving migration dissipate and the rate of LNAPL migration slows. With time, LNAPL migration will stop when the driving force in the LNAPL is insufficient to overcome the pressure needed to displace the water and possibly air out of the soil pore space (capillary pressure) at the margin of the LNAPL mass (API, 2003b).

Of the properties that influence LNAPL mobility, LNAPL viscosity and soil TPH saturation are probably the most important. Within an area of LNAPL impact, the LNAPL occupies the soil pore space with water and sometimes air (see Figure 26). Thus, the LNAPL saturation is never 100% and is variable depending on a variety of conditions, such as the depth of the plume, soil type, hydrogeological conditions, and LNAPL properties. At the Quanta Resources property, the degree of measured TPH saturations of the soil pore space was generally less than 50%. The soil TPH saturation influences the LNAPL relative permeability and thus the effective LNAPL conductivity. LNAPL saturation is needed to form flow paths through unsaturated soil, thus the greater the saturation the more flow paths exist and the greater the effective LNAPL conductivities. Moreover, to be able to migrate, a LNAPL must reach a certain degree of saturation to be able to overcome the soil capillary pressure. If the driving force and/or degree of saturation of the LNAPL within the soil pores are not sufficient to overcome the soil capillary pressure, then the LNAPL will not migrate and thus can be considered stable or naturally contained. Finally, since the LNAPL saturation is variable over the impacted area, the LNAPL velocity will also vary within the impacted area. Usually, the LNAPL saturation is low near the edge of the LNAPL body and higher in the core. Therefore, while the LNAPL velocities are generally higher in the core of the LNAPL mass, the velocity at the fringe is the true indication of the mobility of the LNAPL mass.

At the Quanta Resources property, the primary source of LNAPL has been removed and the driving force for LNAPL migration has thus been dissipating for at least 23 years and will continue to dissipate with time until LNAPL migration completely stops. Given the high LNAPL viscosities, low LNAPL gradients, the transient groundwater mound, and the length of time the driving force has been dissipating, low to extremely low migration velocities are predicted at the edge of the LNAPL mass, as discussed below. These low to extremely low predicted velocities indicate that the majority of the LNAPL mass at the Quanta Resources property is essentially stable and is being naturally contained.

Methods used estimate LNAPL velocities are presented in Appendix L, specifically Section L.4. The following presents the estimated LNAPL effective conductivities, transmissivities and velocities.

Table LNAPL-3
LNAPL Conductivities, Transmissivities, and Velocities

Well	Location	LNAPL Conductivity(1)	LNAPL Transmissivity(1)	LNAPL flow velocity
		ft/day	ft^2/day	ft/year
GAGW-04	Review Avenue	-	-	-
GAL-01R	Quanta	0.054	0.138	
GAL-02	Quanta	0.007	0.122	0.12
GAL-03	Quanta	0.036	0.092	0.50
GAL-04	Quanta	0.001	0.086	0.04
GAL-05	Quanta	0.147	0.083	2.01
GAL-06	Quanta	0.036	0.07	0.10
GAL-07	Quanta	0.213	0.298	1.83
GAL-09	Quanta	0.396	0.044	-
GAL-16	Quanta	0.072	0.211	0.08
GAL-20	Quanta	0.027	0.115	0.51
GAL-10	North Capasso	0.210	0.021	-
GAL-11	North Capasso	0.259	0.026	19.40
GAL-12	North Capasso	0.057	0.110	1.50
GAL-13	North Capasso	0.234	0.20	-
GAL-18	North Capasso	0.163	0.023	9.40
GAL-21	North Capasso	0.396	0.95	5.69
GAL-22	North Capasso	0.565	0.64	3.48
GAL-23	North Capasso	0.424	0.064	4.48
GAL-24	North Capasso	0.229	0.052	-
MW-4R	North Capasso	0.089	0.221	3.80
GAL-14	Phoenix	0.002	-	0.04

Note: (1) Estimated with the interpretation of baildown tests except at GAL-14

7.4.1 Estimated LNAPL Velocities on the Quanta Resources Property

On the Quanta Resources property, the main LNAPL gradient is toward Newton Creek, i.e., generally towards the southwest. This LNAPL gradient is consistent with the groundwater flow gradient. The estimated LNAPL flow velocities vary from 2.00 ft/yr in the center of the property near the tank farm (at GAL-05) to less than 0.1 ft/yr at the southern property boundary (at GAL-

02, GAL-16 and GAL-04). The extremely low velocities at the southern portion of the property are consistent with the higher viscosities measured in this area. This condition (along with low LNAPL gradients over the Quanta Resources property and the effects of the transient groundwater mound discussed below) forms a natural barrier which slows the LNAPL velocities at the center of the property to a near stand-still at the edge of the Quanta Resources property. With time, the LNAPL flow velocity will continue to decrease until the driving forces can no longer overcome the forces impeding LNAPL migration and LNAPL migration stops entirely. Importantly, this condition has essentially been reached at the southern portion of the Quanta Resources property where velocities are estimated to be less than 0.1 ft/yr.

No LNAPL has been observed at the new well locations GAL-27 and GAL-28 installed southwest of the Quanta Resources property, on the South Capasso property. As discussed in Section 4.0 of this RI Report, a transient groundwater mound exists on the South Capasso properties as identified by wells GAL-27 and GAL-28. This transient groundwater mound is likely to also contribute to the limited extension of LNAPL impacts south of the Quanta Resources property. In addition to restricting LNAPL migration toward the southwest, the transient mound may have also caused some diversion of the lateral extension of the LNAPL to the northwest and southeast beneath the LIRR ROW. As discussed previously, while the extent of this diversion, if any, is unknown, LNAPL migration to the southeast is not expected to be substantial given the low migration potential observed along the southern portion of the Quanta Resources property.

7.4.2 Estimated LNAPL Velocities on the Phoenix Beverages Property

Near the boundary between the Quanta Resources property and the Phoenix property (between GAL-03 and GAL-14), the approximate LNAPL flow velocity is 0.38 ft/yr. Near GAL-14, the LNAPL flow velocity is substantially lower with an approximate value of 0.04 ft/yr. As such, the LNAPL flow velocity is substantially decreasing towards the side-gradient edge of the LNAPL on the Phoenix Beverages property. Moreover, no significant amounts of LNAPL have been detected in wells GAL-15, GAL-25, and GAL-26 on the Phoenix property. Considering the age of the LNAPL body on the Quanta Resources property and that the primary source has been removed at least 23 years ago, the side-gradient equilibrium has likely been reached and any meaningful further lateral extension is not expected. Therefore, the LNAPL on the Phoenix property is considered essentially stable and should not continue to spread laterally or towards the southwest of the property.

7.4.3 Estimated LNAPL Velocities on the North Capasso Property

On the North Capasso property, the primary LNAPL gradient is similar to the Quanta Resources property and is mainly towards the southwest. The estimated LNAPL flow velocities vary from 19 ft/yr in the vicinity of GAL-11 and GAL-21, but mostly range around 3.5 ft/yr in the center of the property to between 1.5 and 3.8 ft/yr along the southern property boundary noted at GAL-12 and MW-4R, respectively. The relatively high LNAPL flow velocity calculated in the vicinity of GAL-11 and GAL-21 is a unique situation localized in that area. A combination of a relatively high LNAPL gradient between GAL-11 and GAL-21 and the high LNAPL conductivities estimated at those two monitoring wells explain this localized phenomena. Downgradient of that zone, the LNAPL gradient and the corresponding velocities decrease to values more typical of LNAPL velocities on the North Capasso property. The LNAPL flow velocities on North Capasso are, in general, higher than on the Quanta Resources property primarily as a result of the lower viscosity. Since no active sources are believed to exist on the North Capasso property, these LNAPL flow velocities will continue to decrease with time.

7.5 Summary of LNAPL Distribution, Volume, Mass, and Mobility

A number of potential LNAPL source areas existed on the Quanta Resources property throughout its operational history. The primary suspected source area is the tank farm located in the northern portion of the Quanta Resources property. The source(s) of the LNAPL release at the Quanta Resources property ended at least 23 years ago with the decommissioning of the facility and since then, no LNAPL sources were considered to be active. Radial LNAPL flow from the tank farm area appears to be the primary cause of the presence of LNAPL upgradient and northeast of Review Avenue and appears to have caused some lateral migration of LNAPL to the southeast and to the northwest. An additional source of LNAPL having more volatile and lower viscosity characteristics is also expected to have occurred on the North Capasso property.

The LNAPL detected on the Quanta Resources property is generally characterized as a viscous, weathered and heterogeneous petroleum product made up predominantly of high boiling point and low solubility petroleum hydrocarbons. The LNAPL gradient is generally low and is toward Newton Creek, i.e. toward the southwest. The low LNAPL gradient combined with high LNAPL viscosities and the dissipated driving forces (sources removed at least 23 years ago) has resulted in low to extremely low LNAPL flow velocities at the LNAPL fringes.

The remedial investigation revealed the presence of a transient groundwater mound on the South Capasso property, downgradient of the Quanta and North Capasso properties. This transient mound is likely to have created a natural barrier to LNAPL migration and has contributed to the limited extension of LNAPL impacts to the southwest. In addition to restricting LNAPL migration toward the southwest, the transient mound may have caused some diversion of the lateral extension of the LNAPL to the northwest and southeast beneath the LIRR ROW. While the extent of this diversion, if any, is unknown, LNAPL migration to the northwest and southeast is not expected to be substantial given the low migration potential of the LNAPL.

The overall area of LNAPL impact has been delineated. Upgradient from the tank farm, LNAPL extends to GAGW-04, which is located across Review Avenue from the Quanta Resources property. It is not expected that LNAPL will extend much further to the northeast since it is upgradient from the main LNAPL flow direction and the source has been removed over 23 years ago. To the southeast, on the Phoenix Beverages property, no LNAPL has been observed in GAL-25 and GAL-15 and only about 3 inches have been measured in GAL-26. Therefore, the southeastern extension of LNAPL has been identified. Further extension of LNAPL to the southeast is not expected considering the low LNAPL flow velocity near GAL-14 and the lack of a driving force (source removed). To the northwest, no LNAPL have been observed in MW-2 on the North Capasso property. The area located between GAL-13 and MW-2 is considered as the northwestern extension of the LNAPL. Since no LNAPL sources are known to be active on the North Capasso property, no further material migration of LNAPL is expected to the northwest. Downgradient from the Quanta Resources property, wells GAL-27 and GAL-28 (on the South Capasso property) and MW-9 (on the Prince Plastics property) revealed no LNAPL. Based on these data, the downgradient edge of the LNAPL is located between the southern portion of the Quanta and North Capasso properties and those three wells, likely within the LIRR ROW.

In summary, a large volume of LNAPL has been delineated at the Quanta Resources property and a large portion of this volume occurs as non-recoverable residual LNAPL that is trapped within the soil pore spaces. In addition, due to the high viscosities, the low LNAPL gradients, the dissipated driving force (source removed at least 23 years ago) and the transient groundwater mound located downgradient of the LNAPL, the majority of the LNAPL mass is considered to be stable and is being naturally contained. Consequently, LNAPL migration does not pose a significant threat to Newtown Creek.

8.0 CONCEPTUAL SITE MODEL

The Quanta Resources property consists of a 1.8-acre parcel of land within a highly industrialized area of Queens, New York. The entire property and surrounding properties have been used for a variety of industrial purposes since the late 19th century. Reportedly, the most prominent use of the Quanta Resources property was for the re-refining of used crankcase oil, which occurred from the 1930s into the 1970s under the name of Triplex Oil. Subsequent used oil and recycling operations were conducted in the 1970s up until 1981 under varying ownerships when operations ceased.

The property overlies man-made urban fill material consisting of a mixture of heterogeneous soil intermixed with brick fragments, asphalt, wire, plastic and other debris, ranging in thickness from 3 to 16 feet. Greater urban fill thicknesses have been reported southwest of the site, closer to Newtown Creek. Unconsolidated glacial deposits consisting predominately of interbedded horizons of fine to coarse sand and fine to coarse gravel comprise the youngest natural geologic horizon below the urban fill. The deepest natural geologic unit intercepted as part of the remedial investigation is a laterally continuous clay. This clay unit is referred to as the lower clay and has been identified as the Raritan formation. The lower clay is believed to be continuous across the Quanta Resources property and surrounding area. Localized shallow silt and clay horizons of glacial origin have been encountered in the eastern corner of the Quanta Resources property (in the vicinity of GAL-08) as well as on the northwest border of the South Capasso property (in the vicinity of GAL-27 and GAL-28).

The Quanta Resources property lies between a local topographic high located northeast of the site (a local groundwater recharge area) and Newtown Creek located southwest of the site (a tidally influenced regional groundwater discharge area). Within this area, groundwater gently flows within the glacial deposits in a horizontal south-southwest to southwest direction towards Newtown Creek. Vertical gradients in the southwestern portion of the Quanta Resources property are generally negligible. Upward vertical gradients within the lower portions of the saturated zone on the South Capasso property are anticipated under natural conditions as groundwater approaches its discharge to Newtown Creek located 450 feet south-southwest from the property. Figure 13 presents the conceptual hydrogeologic model, summarized in this section and presented in more detail in Section 4.

A shallow clay horizon identified just south of the Quanta Resources property (on the northwest border of the South Capasso property) is believed responsible for the formation of a seasonally transient groundwater mound. This groundwater mound does not appear to materially influence the overall direction of groundwater flow from the Quanta Resources property to Newtown Creek, however, when the mound is present, it may influence the three-dimensional flow path of groundwater in the immediate vicinity of the mound. The impact of the mound quickly diminishes with depth. Whether the mound is present or not, all groundwater at the Quanta Resources property follows a nearly straight path and eventually discharges to Newtown Creek.

As a result of NYCDEP and NYSDEC Removal Action activities conducted at the Quanta Resources property in the early 1980s, all primary sources were reportedly removed over 23 years ago. Secondary sources are mainly limited to chemical concentrations of oil residuals adsorbed within the urban fill and natural soil and/or oil residuals as LNAPL at the groundwater surface. Data were collected during the remedial investigation to characterize media potentially impacted by the secondary sources. As such, chemicals detected in urban fill/soil and groundwater along with the fate, transport, and exposure pathways associated with those chemicals and media are discussed below. In addition, the primary physical and chemical characteristics of LNAPL observed during the remedial investigation and an evaluation of LNAPL distribution volume, and mobility are also discussed in this Conceptual Site Model (CSM).

Groundwater

Groundwater within the vicinity of the property is not currently used for potable purposes and likely will not be used in the future as a potable source. Therefore, the only potential pathways of concern associated with groundwater are possible exposures to Newtown Creek surface water to which groundwater from the Site may discharge and potential exposures to vapors by volatilization of chemicals from groundwater. Newtown Creek has been substantially degraded by approximately a century of past unpermitted discharges upstream and downstream of the Site and has been given a SD classification by NYSDEC, which is the lowest classification for saline surface water in New York State.

Groundwater within the glacial deposits overlying the lower clay was characterized during the remedial investigation. This characterization generally focused on two portions of the saturated zone beneath the site: the portion of groundwater in contact with the LNAPL smear zone (smear zone groundwater) and the portion of groundwater beneath the LNAPL smear zone and above the lower clay (lower groundwater). While these two portions comprise the same hydrogeologic unit, they are distinguished with respect to their proximity to the LNAPL smear zone.

In addition to the sample analyses results collected during the remedial investigation, available groundwater sample analyses results collected by others prior to the remedial investigation were carefully considered for use to augment the characterization of smear zone groundwater. As many of these pre-remedial investigation groundwater samples were collected through an accumulated LNAPL layer in a monitoring well, these data are expected to represent worst-case or near worst-case groundwater conditions within the LNAPL smear zone.

Solute transport modeling was performed to determine whether smear zone groundwater impacts could adversely impact surface water quality within Newtown Creek. This evaluation determined that chemicals in the smear zone groundwater on the Quanta Resources property that exceed the designated surface water quality criteria for Newtown Creek (TOGS 1.1.1 SD criteria) would attenuate to concentration below the SD surface water criteria prior to discharge to Newtown Creek. Conservatively, maximum concentrations and no retardation (except for benzo(a)pyrene), were used in the evaluation. Therefore, even without considering other attenuation mechanisms, such as mixing of smear zone groundwater with the lower groundwater, attenuation within Newtown Creek sediments prior to discharge to the creek, or mixing directly with surface water in Newtown Creek, the chemical impacts identified within the smear zone groundwater on the Quanta Resources property do not threaten Newtown Creek.

With respect to the lower groundwater, only a small number of VOCs, SVOCs, and metals were detected in the lower groundwater at concentrations that exceed the TOGS 1.1.1 GA criteria (a drinking water protection criteria) and many of these chemicals can be attributable to upgradient sources. In addition, no site-related VOCs or metals were detected in the lower groundwater at concentrations that exceed the TOGS 1.1.1 Class SD surface water criteria. All SVOCs were below TOGS 1.1.1 Class SD surface water criteria with the exception of benzo(a)pyrene present in one lower groundwater well (GAGW-03).

In summary, the low solubility of chemicals detected in LNAPL and ongoing natural attenuation mechanisms occurring within groundwater, particularly within the groundwater/LNAPL smear zone interface, are effectively mitigating LNAPL chemical impacts to groundwater. Based on the contaminant fate and transport evaluations performed, groundwater at the property does not threaten the designated use of Newtown Creek.

With respect to the volatilization pathway, based on the data obtained during the RI, it appears that VOC or SVOC concentrations detected in groundwater will not pose a soil vapor intrusion concern for current and future commercial/industrial buildings. Consequently, groundwater beneath the Quanta Resources property area does not pose a significant threat to either on-property or off-property human or ecological receptors.

Urban Fill and Soil

Five surface urban fill/soil samples and fifty subsurface urban fill/soil samples were collected from the Quanta Resources property during the remedial investigation and were analyzed for VOCs, SVOCs, PCBs, and metals (along with physical characterization and LNAPL mobility assessment parameters). Except for the detection of three PAHs, two detections of bis-2ethylhexyl phthalate and one detection of PCBs, all VOCs, SVOCs, and PCBs were either not detected or were detected at concentrations less than the TAGM 4046 soil objective based on residential direct contact exposures (health based criteria). It should be noted that the use of the TAGM 4046 residential direct contact objectives is conservative since the Quanta Resources property is not and will not be used for residential purposes, based on zoning and the current plans for redevelopment of the Site. Metals detected in the urban fill and soil were compared to TAGM 4046 soil objectives based on background. Several metals were detected in urban fill/soil above the TAGM 4046 background objectives. However, given the ubiquitous distribution of urban fill across the Quanta Resources and adjacent properties, restoration to background is not believed to be a realistic objective.

Notwithstanding the above, as part of eventual redevelopment efforts, the entire Quanta Resources property will be regraded to incorporate a layer of clean fill, paved, and/or covered with buildings and other structures. In addition, because the future use of the property would be limited to commercial/industrial per planned deed restrictions, the only anticipated potential future exposure scenario would be exposure of a construction/utility worker during soil excavation, which can be mitigated through standard construction health and safety practices. This exposure can be mitigated through standard construction health and safety practices. Similarly, redevelopment of the Quanta Resources property would involve addressing the soil vapor intrusion pathway as needed, either through the use of physical barriers, passive ventilation, and/or active collection and treatment, depending on the identified future use and consequent potential exposures.

Several chemicals in urban fill/soil were detected above TAGM 4046 objectives based on groundwater protection. However, given the presence of LNAPL below the urban fill/soil and the minimal impacts to groundwater beneath the Quanta Resources property, the urban fill/soil leaching pathway is considered to be of negligible consequence. Therefore, given the minimal leachability of chemicals in the subsurface urban fill/soil, and considering the planned institutional and engineering controls that will address direct contact and vapor intrusion pathways, the chemicals detected in subsurface urban fill/soil do not pose a significant threat to human health and the environment.

LNAPL

LNAPL occurs in the subsurface occupying the soil pore space with water and sometimes air. Thus, the LNAPL saturation is never 100 percent and is variable depending on a number of site-specific factors, such as soil type, hydrogeological conditions, and LNAPL properties. In general, LNAPL saturations in soil at the Quanta Resources property are 50% or less. The measured thickness of LNAPL in a monitoring well is influenced by a number of these same factors as well as groundwater table fluctuations. Therefore, the measured thickness of LNAPL in a well may not be representative of the total volume of LNAPL present in soil at that location. In fact, as stated by the American Petroleum Institute (API), the volume of LNAPL in the formation is often much less than LNAPL thickness measurements at a monitoring well might suggest. Consequently, it is not appropriate to view LNAPL distribution as a pancake model defined by measured LNAPL thicknesses. It is important to note that while free phase LNAPL may exist at a well, it is not necessarily mobile since a driving force (LNAPL source and/or gradient) is necessary to cause migration of LNAPL.

In this conceptual model of the Quanta Resources property and the surround affected properties, a more realistic expression of volume of LNAPL in soil at a well location has been developed by the API that is called “specific free-product volume.” The specific free-product volume is defined as the total volume of LNAPL per unit area in the vicinity of a monitoring well. This total volume comprises a non-mobile portion (residual phase) that is bound within the soil matrix and a potentially mobile portion (free phase). The highest estimated specific free-product volume occurs in the southwest central portion of the Quanta Resources property (Figure 25). The specific free product volumes (adjusted for measured TPH concentrations in soil at the site) were interpolated between monitoring wells at all three properties. This interpolation resulted in an estimated total LNAPL volume of approximately 475,000 gallons. A large portion of this total LNAPL volume is comprised of residual (non-mobile) LNAPL (refer to Appendix L).

A number of potential LNAPL source areas existed on the Quanta Resources property throughout its operational history, however, the primary suspected source area is the tank farm area located in the northeastern portion of the Quanta Resources property. All primary sources of LNAPL on the Quanta Resources property were removed at least 23 years ago since the facility was decommissioned in 1982. Radial LNAPL flow from the tank farm area appears to be the primary cause of the presence of LNAPL upgradient and northeast of Review Avenue and may also have migrated to the southeast and northwest. An additional source of LNAPL having more volatile and lower viscosity characteristics is also expected to have occurred on the North Capasso property. Given that the LNAPL source(s) have been removed, and based on the measured LNAPL viscosities and the predicted low gradients and low viscosities at the LNAPL fringes, further radial extension of LNAPL to the northwest, northeast and southeast is not expected.

Downgradient from the Quanta Resources property, LNAPL was not detected in wells GAL-27 and GAL-28 (installed on the South Capasso property during the remedial investigation) and well MW-9 (a pre-remedial investigation well installed on the Prince Plastics property). Based on these data, the downgradient edge of LNAPL is located between the southern boundaries of the Quanta Resources and North Capasso properties and those three wells on the South Capasso (GAL-27 and GAL-28) and Prince Plastics (MW-9) properties, probably within the LIRR ROW. As discussed in Section 4.2, a transient groundwater mound has been observed on the South Capasso property as identified by GAL-27 and GAL-28 (boring log information for MW-9 was not available to Golder Associates). This mound, along with the measured LNAPL viscosities, restricts LNAPL migration further to the southwest. The mound may also have caused some limited northwest and southeast lateral extension of the LNAPL distribution. However, based on the measured high viscosity and predicted low velocities of LNAPL observed in the southern portion of the Quanta Resources property and the transient nature of the mound, any diversion of the LNAPL to the northwest or southeast is not expected to be substantial and is likely confined within the limits of the LIRR ROW.

The LNAPL detected on the Quanta Resources property is generally characterized as a viscous, weathered and heterogeneous petroleum product made up predominantly of high boiling point and low solubility petroleum hydrocarbons. The LNAPL gradient is generally low and is toward Newton Creek, i.e. toward the southwest. The low LNAPL gradient combined with high LNAPL viscosities and the dissipated driving forces (sources removed at least 23 years ago) has resulted in low to negligible LNAPL flow velocities at the LNAPL fringes.

In summary, LNAPL has been delineated at the Quanta Resources property and a large portion of this volume occurs as non-recoverable residual LNAPL that is trapped within the soil pore spaces. In addition, due to the high viscosities and low gradients of the LNAPL, the dissipated driving force (source removed at least 23 years ago) and the transient groundwater mound located downgradient of the LNAPL, the majority of the LNAPL mass is considered to be stable and is being naturally contained. Consequently, LNAPL migration does not pose a significant threat to Newtown Creek.

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TABLE 1
MONITORING WELL CONSTRUCTION DATA
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

WELL ID	DATE OF INSTALLATION	GROUND SURFACE ELEVATION (FT- MSL)	ELEVATION TOP OF INNER CASING (FT-MSL)	WELL DIAMETER & MATERIAL	TYPE OF WELL	BOTTOM DEPTH OF OUTER PROTECTIVE STEEL CASING (FT-BGS)	WELL DEPTH (FT- BGS)	SCREEN LENGTH (FT)	ELEVATION TOP OF SCREENED (FT - MSL)	ELEVATION BOTTOM OF SCREENED INTERVAL (FT-MSL)
ON-PROPERTY MONITORING WELLS										
GAGW-01	November 14, 2003	19.93	22.32	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	60	74	10	-44.1	-54.1
GAGW-02	November 21, 2003	17.66	20.40	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	60.5	73.5	10	-45.8	-55.8
GAGW-03	November 12, 2003	24.03	26.52	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	60.5	75	10	-41.0	-51.0
GAGW-05	November 19, 2003	16.30	18.65	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	60	73	10	-46.7	-56.7
GAGW-06I	June 28, 2004	18.95	21.46	2-INCH SCH 40 PVC	Shallow LNAPL Smear Zone Groundwater Monitoring Well	30	41	10	-12.1	-22.1
GAL-01	October 21, 2003	20.34	23.11	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	22	10	8.3	-1.7
GAL-01R	July 13, 2004	20.40	23.05	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	28	17	9.4	-7.6
GAL-02	October 28, 2003	18.21	20.20	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	23	15	10.2	-4.8
GAL-03	October 14, 2003	24.04	26.16	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	15	9.0	-6.0
GAL-04	October 21, 2003	15.96	18.65	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	23	15	8.0	-7.0
GAL-05	October 13, 2003	23.82	26.66	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	35	20	8.8	-11.2
GAL-06	October 13, 2003	26.42	28.79	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	29	15	12.4	-2.6
GAL-07	October 30, 2003	19.13	21.51	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	24	15	10.1	-4.9
GAL-08	November 6, 2003	25.17	27.71	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	28	15	12.2	-2.8
GAL-09	March 3, 2004	26.01	28.52	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	15	11.0	-4.0
GAL-16	July 1, 2004	18.72	21.29	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	28	15	5.7	-9.3
GAL-19	February 24, 2005	22.87	25.20	2-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	35	20	7.9	-12.1
GAL-20	March 1, 2005	27.78	29.90	2-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	33	17	11.8	-5.2

TABLE 1
MONITORING WELL CONSTRUCTION DATA
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

WELL ID	DATE OF INSTALLATION	GROUND SURFACE ELEVATION (FT- MSL)	ELEVATION TOP OF INNER CASING (FT-MSL)	WELL DIAMETER & MATERIAL	TYPE OF WELL	BOTTOM DEPTH OF OUTER PROTECTIVE STEEL CASING (FT-BGS)	WELL DEPTH (FT- BGS)	SCREEN LENGTH (FT)	ELEVATION TOP OF SCREENED (FT - MSL)	ELEVATION BOTTOM OF SCREENED INTERVAL (FT-MSL)
OFF-PROPERTY MONITORING WELLS										
GAGW-04D	August 2, 2004	25.69	25.54	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	40	69	10	-33.3	-43.3
GAGW-04	November 10, 2003	25.85	25.53	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	29	15	11.9	-3.2
GAGW-07	June 21, 2004	22.36	22.10	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	55	73	10	-40.6	-50.6
GAGW-08	June 17, 2004	19.17	18.92	2-INCH SCH 40 PVC	Deep Groundwater Monitoring Well	50	72	10	-42.8	-52.8
GAL-10	June 15, 2004	23.73	23.24	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	15	8.7	-6.3
GAL-11	June 18, 2004	18.79	18.59	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	26	15	7.8	-7.2
GAL-12	June 24, 2004	17.31	16.62	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	20	7.3	-12.7
GAL-13	June 16, 2004	18.09	17.74	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	26	15	7.1	-7.9
GAL-14	June 27, 2004	16.27	15.85	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	20	6.3	-13.7
GAL-15	June 26, 2004	21.78	21.43	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	28	15	8.8	-6.2
GAL-17	June 26, 2004	16.31	15.82	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	27	15	4.3	-10.7
GAL-18	July 14, 2004	22.69	22.22	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	15	7.7	-7.3
GAL-21	March 30, 2005	17.83	17.46	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	25	15	7.8	-7.2
GAL-22	March 31, 2005	21.28	21.11	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	30	15	6.3	-8.7
GAL-23	April 1, 2005	17.95	17.55	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	25	15	8.0	-7.1
GAL-24	March 29, 2005	18.38	17.91	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	26	15	7.4	-7.6
GAL-25	April 3, 2005	16.39	15.76	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	27	20	9.4	-10.6
GAL-26	April 3, 2005	15.83	15.55	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	28	20	7.8	-12.2
GAL-27	February 25, 2005	12.99	12.48	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	20	15	8.0	-7.0
GAL-28	February 28, 2005	12.54	12.40	4-INCH SCH 40 PVC	LNAPL Monitoring Well	NA	20	15	7.5	-7.5

NOTES:

(1) - Monitoring wells surveyed by GEOD Corporation in August 2004 and April 2005.

FT.-BGS: Feet Below Ground Surface

FT.-MSL: Feet Mean Sea Level

NA - Not Applicable

TABLE 2a
SAMPLING & ANALYSIS SUMMARY
SOIL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

			PARAMETERS[1,2]					
Sample Point	**Sample Depth (Ft.-BGS)**	**Date Sampled**	**TCL VOCs**	**TCL SVOCs**	**TCL PCBs**	**TAL Metals & Cyanide**	**Total Organic Carbon**	**Speciated TPH[3]**
SB-01 (GAL-01)	5	10/17/2003	×	×	×	×		
	11	10/20/2003	×	×	×	×		
SB-02 (GAL-02)	6.5	10/28/2003	×	×	×	×		
	10	10/29/2003	×	×	×	×	×	
	16.5	10/28/2003	×	×	×	×		
SB-03 (GAL-03)	6.5	10/31/2003	×	×	×	×		
	11	10/31/2003	×	×	×	×		
	14.5	11/3/2003	×	×	×	×	×	
	19	11/3/2003	×	×	×	×		
	23.5	11/3/2003	×	×	×	×		
SB-04 (GAGW-04)	1	11/10/2003	×	×	×	×		
	5	11/10/2003	×	×	×	×		
	11	11/10/2003	×	×	×	×		
	16	11/10/2003	×	×	×	×		
SB-05	6	12/29/2003	×	×	×	×		×
	10	12/29/2003	×	×	×	×	×	
	15	12/29/2003	×	×	×	×		
	21.5	12/29/2003	×	×	×	×		
	24.5	12/29/2003						×
SB-06	6.5	11/6/2003	×	×	×	×		
	11	11/6/2003	×	×	×	×		
	15	11/6/2003	×	×	×	×		
	20	11/6/2003	×	×	×	×		
SB-07	6	12/31/2003	×	×	×	×		
	11	12/31/2002	×	×	×	×	×	×
	16.5	12/31/2003	×	×	×	×		
	18.5	12/31/2003					×	
	22	12/31/2003	×	×	×	×		
	23	12/31/2003						×
SB-09	5.5	12/23/2003	×	×	×	×		
	9.5	12/23/2003	×	×	×	×		
	16.5	12/23/2003	×	×	×	×		
	18	12/22/2003					×	×
	20	12/23/2003	×	×	×	×		
	24	12/23/2003						×
SB-10	5.5	12/19/2003	×	×	×	×		
	7	12/19/2003					×	
	10	12/19/2003	×	×	×	×		
	14.5	12/22/2003						×
	15.5	12/22/2003	×	×	×	×		
	17	12/22/2003					×	
	19	12/22/2003	×	×	×	×		
	22.5	12/22/2003						×
SB-11	5	12/29/2003	×	×	×	×		
	7	12/31/2003						×
	10	12/29/2003	×	×	×	×	×	
	16	12/29/2003	×	×	×	×		
	20.5	12/30/2003	×	×	×	×		×

TABLE 2a
SAMPLING & ANALYSIS SUMMARY
SOIL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

			PARAMETERS[1,2]					
Sample Point	**Sample Depth (Ft.-BGS)**	**Date Sampled**	**TCL VOCs**	**TCL SVOCs**	**TCL PCBs**	**TAL Metals & Cyanide**	**Total Organic Carbon**	**Speciated TPH[3]**
SB-12	6.5	12/18/2003	×	×	×	×		×
	8.5	12/18/2003					×	
	10	12/18/2003	×	×	×	×		
	14.5	12/18/2003					×	
	16.5	12/18/2003	×	×	×	×		
	20.5	12/18/2003	×	×	×	×		
	22.5	12/18/2003						×
SB-13 (GAL-04)	6	10/22/2003	×	×	×	×		
	9	10/22/2003	×	×	×	×		
SB-14	5	12/17/2003	×	×	×	×	×	
	8.5	12/17/2003					×	×
	11	12/17/2003	×	×	×	×		
	16.5	12/17/2003	×	×	×	×		
	21	12/17/2003	×	×	×	×		×
SB-16 (GAL-19)	17	2/24/2005	×	×	×	×	×	
SB-17 (GAL-20)	17	3/1/2005	×	×	×	×		
GAL-15	12.5	6/26/2004	×					
GAGW-02	33	11/20/2003						×
	37	11/20/2003						×
GAGW-05	33	11/20/2003						×
	38.5	11/20/2003						×
GAGW-07	10.5	6/21/2004	×					×
	15.5	6/21/2004	×					×
QA/QC								
Field Duplicates								
DSGAL0222011	10	10/29/2003	×	×	×	×		
DGAL100520	20	6/15/2004						
DGAL130516	16	6/16/2004						
DGAGW081126	26	6/17/2004						
DGAL121519	19	6/24/2004						
DSB150820	20	6/25/2004						
DGAL171029	29	6/26/2004						
DGAL140515	15	6/27/2004						
DGAL01R1026	26	7/13/2004						
DGAL180620	20	7/14/2004	×					
Rinsate Blanks								
RB-01	Rinsate	2/24/2005	×	×	×	×		
RB-04	Rinsate	3/1/2005	×	×	×	×		

Notes:

[1] - TCL VOCs SW846 8260B, TCL SVOCs SW846 8270C, PCBs SW846 8082, TAL Metals SW846 6010 and Cyanide EPA 335.2

[2] - Refer to Table 12e for summary of soil samples collected for Total Petroleum Hydrocarbon (Method 418.1) analysis.

[3] - Speciated Petroleum Hydrocarbons - EPA Modified 8015

TABLE 2a
SAMPLING & ANALYSIS SUMMARY
SOIL
GRAIN SIZE ANALYSIS & MINERALOGY
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point	Sample Depth (Ft.-BGS)	Grain Size Analysis	Mineralogy
GAL-01	12-13	×	
	19-20	×	
	22-24	×	
GAL-01R	9	×	
	19	×	
	21	×	
GAL-02	11-13	×	
	15.5-16		×
	17-18	×	
	19-20.5	×	
	26-27	×	
GAL-03	16.5-17.5	×	
	17.5-18.5	×	
	23-23.5	×	
GAL-04	18-20	×	
GAL-05	19-20.5	×	
	25.5-26.5	×	
GAL-06	19-20	×	
	21-22.5	×	
GAL-07	7.5-8.5	×	
	15.5-16.5	×	×
	17.5-18.5	×	
	28-28.5	×	
GAL-08	16.3-17.3	×	
	18.5-19.5	×	
	23-23.5	×	
GAL-09	8	×	
	12	×	
	20	×	
	23	×	
GAL-10	13	×	
	20	×	
	24.5	×	
	26	×	
GAL-12	9	×	
	14	×	
	22	×	
	29	×	
GAL-13	6	×	
	17	×	
	20	×	
	26	×	
GAL-14	9	×	
	14	×	
	21	×	
	27	×	

TABLE 2a
SAMPLING & ANALYSIS SUMMARY
SOIL
GRAIN SIZE ANALYSIS & MINERALOGY
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point	Sample Depth (Ft.-BGS)	Grain Size Analysis	Mineralogy
GAL-15	10	×	
	15	×	
	18	×	
	20	×	
	29	×	
GAL-17	10	×	
	15	×	
	20	×	
	27	×	
GAL-20 (SB-17)	15	×	
	19	×	
	20-25	×	
GAL-21	14	×	
	18	×	
	8	×	
GAL-22	18	×	
GAL-23	8	×	
	15	×	
	21	×	
GAL-25	14	×	
	16	×	
	18	×	
GAL-27	15	×	
	20	×	
	23	×	
GAL-28	24	×	
SB-15	18	×	
	21	×	
	25	×	
GAGW-03	33.5-334	×	
GAGW-06I	6	×	
	15	×	
	21	×	
	29	×	
GAGW-07	6	×	
	19	×	
	22	×	
	27	×	
GAGW-08	9	×	
	17	×	
	25	×	
	33	×	
	52	×	

TABLE 2b
SAMPLING & ANALYSIS SUMMARY
GROUNDWATER
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample ID	Date Sampled	TCL VOCs	TCL SVOCs	TCL PCBs	TAL Metals	NAPs
GAGW-01	1/9/2004	×	×	×	×	×
GAGW-02	1/9/2004	×	×	×	×	×
GAGW-03	1/9/2004	×	×	×	×	×
GAGW-04D	8/12/2004	×	×	×	×	×
GAGW-05	1/9/2004	×	×	×	×	×
GAGW-06I	8/12/2004	×	×	×	×	×
GAGW-07	8/12/2004	×	×	×	×	×
GAGW-08	8/12/2004	×	×	×	×	×
QA/QC						
Field Duplicates						
FGAGW-02	1/9/2004	×	×	×	×	×
FGAGW-06I	8/12/2004	×	×	×	×	×
Trip Blanks						
TB01	1/9/2004	×				
TB-01	8/12/2004	×				
Rinsate Blanks						
RB01	1/9/2004	×	×	×	×	×
RB-01	8/12/2004	×	×	×	×	×

Notes:

TCL VOCs (SW846 8260B), TCL SVOCs (SW846 8270C), PCBs (SW846 8082), TAL Metals (SW846 6010B), Mercury (SW846 7470A), Total Cyanide (EPA 335.3).

Indicator Parameters Methodology: Alkalinity (EPA 310.1), Carbon Dioxide (SM4500 CO2D), Chloride (SM4500 CLB), Nitrate (EPA 353.2), Sulfate (EPA 375.4), Dissolved Organic Carbon (EPA 415.1),

Total Organic Carbon (EPA 415.1), Total Dissolved Solids (EPA 160.1) and Methane, Ethane and Ethene (AM18/AM20GAX).

TCL = Target Compound List as defined in Contract Laboratory Program Statement of Work OLM04.2

TAL = Target Analyte List as defined in Contract Laboratory Program Statement of Work ILM 04.0.

TABLE 2c
SAMPLING & ANALYSIS SUMMARY
LNAPL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		PARAMETERS[1]								
Sample Point	**Date Sampled**	**TCL VOCs**	**TCL VOCs+10**	**TCL SVOCs**	**TCL SVOCs+15**	**TCL PCBs**	**TAL Metals**	**GRO/DRO/MRO**	**GC Fingerprint**	**Conventional Parameters[3]**
GAL-01	11/18/2003	×		×		×	×	×	×	×
GAL-01R	7/16/2004		×		×	×	×	×	×	×
GAL-02	11/18/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL-03	11/18/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL-04	11/25/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL05	11/19/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL-06	11/17/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL-07	11/17/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL-07B[2]	11/19/2003	×		×		×	×	×	×	×
GAL-08	11/25/2003	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
GAL-09	7/10/2004		×		×	×	×	×	×	×
GAL-10	7/10/2004		×		×	×	×	×	×	×
GAL-11	7/9/2004		×		×	×	×	×	×	×
GAL-12	7/9/2004		×		×	×	×	×	×	×
GAL-13	7/9/2004		×		×	×	×	×	×	×
GAL-14	7/10/2004		×		×	×	×	×	×	×
GAL-16	7/10/2004		×		×	×	×	×	×	×
GAL-17	7/10/2004		×		×	×	×	×	×	×
GAL-18	7/16/2004		×		×	×	×	×	×	×
GAL-19	4/5/2005		×		×	×	×	×	×	×
GAL-20	4/6/2005		×		×	×	×	×	×	×
GAL-21	4/5/2005		×		×	×	×	×	×	×
GAL-22	4/5/2005		×		×	×	×	×	×	×
GAL-23	4/5/2005		×		×	×	×	×	×	×
GAL-24	4/5/2005		×		×	×	×	×	×	×
GAL-26	4/17/2005		×		×	×	×	×	×	×
GAGW-04		×		×		×	×	×	×	×
	7/9/2004		×		×			×	×	

TABLE 2c
SAMPLING & ANALYSIS SUMMARY
LNAPL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		PARAMETERS[1]								
Sample Point	**Date Sampled**	**TCL VOCs**	**TCL VOCs+10**	**TCL SVOCs**	**TCL SVOCs+15**	**TCL PCBs**	**TAL Metals**	**GRO/DRO/MRO**	**GC Fingerprint**	**Conventional Parameters[3]**
MW-4R	7/9/2004		×		×	×	×	×	×	×
MW-8	7/10/2004		×		×	×	×	×	×	×
MW-10	7/9/2004		×		×	×	×	×	×	×
MW-11	7/12/2004		×		×	×	×	×	×	×
MW-15	7/12/2004		×		×	×	×	×	×	×
Sump (Quanta) - 10 Ft	1/14/2004	×		×		×	×	×	×	×
	7/12/2004		×		×			×	×	
Sump (Quanta) - 27 Ft	1/14/2004	×		×		×	×	×	×	×
Sump (Quanta) - 44 Ft	1/14/2004	×		×		×	×	×	×	×
MH-Sump (North Capasso)	8/13/2004		×		×	×	×	×	×	×
QA/QC										
Field Duplicates										
DNGAL07B	11/19/2003	×		×		×	×	×	×	×
DLNGAL-01R	7/16/2004		×		×			×	×	
LNGAL-04	7/12/2004		×		×			×	×	
DLNGAL-10	7/10/2004		×		×	×	×	×	×	×
DLNGAL-21	4/5/2005		×		×	×	×	×	×	×

Notes:

[1] - TCL VOCs SW846 8260B, TCL SVOCs SW846 8270C, PCBs SW846 8082, TAL Metals SW846 6010 and Cyanide EPA 335.2

[2] - Two samples were collected: one at the surface and one at the mid point of the LNAPL column.

[3] - TOX, % sulfur, flash point, BTU, density, viscosity, surface tension, and interfacial tension.

TABLE 3
SUMMARY OF GROUNDWATER FIELD PARAMETERS
QUANTA RESOURCES SITE
QUEENS, NEW YORK

Monitoring Well ID	Temperature (°C)	pH (std)	Specific Conductance (mS/cm)	Turbidity (nTu)	Dissolved Oxygen (mg/l)	Redox Potential (mV)	Date Sampled
GAGW-01	13.6	7.2	2.77	<10	0	-126	1/9/2004
GAGW-02	13.0	6.9	1.75	20.0	0	-20	1/9/2004
GAGW-03	14.2	7.2	1.08	35.0	0	-18	1/9/2004
GAGW-04D	17.2	7.1	2.09	20.0	0.9	83	8/12/2004
GAGW-05	13.4	7.1	2.34	<10	0.0	-112	1/9/2004
GAGW-06I	16.5	6.8	0.64	32.0	0.3	-107	8/12/2004
GAGW-07	17.1	7.1	1.80	40.0	0.6	90	8/12/2004
GAGW-08	17.0	7.0	2.36	36.0	0.8	88	8/12/2004

TABLE 4
GROUNDWATER LEVEL MEASUREMENT DATA
JULY AND AUGUST 2004 AND APRIL 2005
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Monitoring Point ID	Date	Reference Elevation (FT. - MSL)	Depth to Groundwater (FT. BTIC)	Groundwater Elevation (FT. - MSL)
On-Property Wells				
GAGW-01	7/24/2004	22.33	18.85	3.48
	8/31/2004		18.81	3.52
	4/19/2005		18.36	3.97
GAGW-02	7/24/2004	20.40	17.13	3.27
	8/31/2004		17.03	3.37
	4/19/2005		16.62	3.78
GAGW-03	7/24/2004	26.52	23.04	3.48
	8/31/2004		22.94	3.58
	4/19/2005		22.55	3.97
GAGW-05	7/24/2004	18.65	15.29	3.36
	8/31/2004		15.32	3.33
	4/19/2005		14.88	3.77
GAGW-06I	7/24/2004	21.46	18.20	3.26
	8/31/2004		18.09	3.37
	4/19/2005		17.69	3.77
Off-Property Wells				
GAGW-04D	7/24/2004	25.54	See Note 1	
	8/31/2004		21.60	3.94
	4/19/2005		21.13	4.41
GAGW-07	7/24/2004	22.10	18.35	3.75
	8/31/2004		18.35	3.75
	4/19/2005		17.86	4.24
GAGW-08	7/24/2004	18.92	15.24	3.68
	8/31/2004		15.26	3.66
	4/19/2005		14.78	4.14

Notes:

(1) - Monitoring well GAGW-04D was not installed until August 2, 2004

FT. BTIC - Feet below top of inner well casing

MSL = Mean Sea Level

TABLE 5
LNAPL MEASUREMENT DATA
JULY AND AUGUST 2004 AND APRIL 2005
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Monitoring Point ID	Date	Reference Elevation (FT. - MSL)	Depth to Top of LNAPL (FT. BTIC)	Depth to Groundwater (FT. BTIC)
On-Property Wells				
GAL-01	7/24/2004	23.11	19.10	19.12
	8/31/2004	23.11	19.53	19.62
	4/19/2005	23.11	18.59	19.81
GAL-01R	7/24/2004	23.05	18.98	23.98
	8/31/2004	23.05	19.36	24.65
	4/19/2005	23.05	18.47	23.62
GAL-02	7/24/2004	20.20	NM	NM
	8/31/2004	20.20	16.61	22.46
	4/19/2005	20.20	15.61	19.79
GAL-03	7/24/2004	26.16	22.11	27.73
	8/31/2004	26.16	22.38	28.19
	4/19/2005	26.16	21.57	26.72
GAL-04	7/24/2004	18.65	14.46	18.41
	8/31/2004	18.65	15.14	17.50
	4/19/2005	18.65	14.22	16.46
GAL-05	7/24/2004	26.66	22.60	27.66
	8/31/2004	26.66	22.85	27.77
	4/19/2005	26.66	22.07	26.83
GAL-06	7/24/2004	28.79	24.71	26.85
	8/31/2004	28.79	24.96	26.98
	4/19/2005	28.79	24.12	25.90
GAL-07	7/24/2004	21.51	17.51	23.70
	8/31/2004	21.51	17.88	24.12
	4/19/2005	21.51	16.97	23.44
GAL-08	7/24/2004	27.71	18.76	21.70
	8/31/2004	27.71	19.00	26.10
	4/19/2005	27.71	17.21	20.95
GAL-09	7/24/2004	28.52	24.40	27.35
	8/31/2004	28.52	24.66	27.55
	4/19/2005	28.52	23.92	26.57
GAL-16	7/24/2004	21.29	17.32	25.06
	8/31/2004	21.29	17.64	25.55
	4/19/2005	21.29	16.65	25.56
GAL-19	4/4/2005	25.20	21.03	30.10*
	4/19/2005	25.20	20.85	26.10*
GAL-20	4/4/2005	29.90	25.44	25.80
	4/19/2005	29.90	25.40	27.04
MW-11	7/24/2004	18.59	20.72	24.72
	8/31/2004	18.59	21.06	24.86
	4/19/2005	18.59	20.24	23.62

TABLE 5
LNAPL MEASUREMENT DATA
JULY AND AUGUST 2004 AND APRIL 2005
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Monitoring Point ID	Date	Reference Elevation (FT. - MSL)	Depth to Top of LNAPL (FT. BTIC)	Depth to Groundwater (FT. BTIC)
Off-Property Wells				
MW-2	7/24/2004	16.42	Not Present	12.73
	8/31/2004	16.42	Not Present	12.72
	4/19/2005	16.42	Not Present	12.29
MW-4R	7/24/2004	15.01	11.02	16.65
	8/31/2004	15.01	11.55	16.64
	4/19/2005	15.01	11.59	15.81
MW-8	7/24/2004	16.96	12.90	18.57
	8/31/2004	16.96	NM	NM
	4/17/2005	16.96	12.40	18.18
MW-10	7/24/2004	18.34	14.52	17.21
	8/31/2004	18.34	15.08	17.92
	4/19/2005	18.34	13.98	16.51
GAGW-04	7/24/2004	25.53	21.48	23.22
	8/31/2004	25.53	21.80	23.53
	4/19/2005	20.53	20.93	22.10
GAL-10	7/24/2004	23.24	19.20	20.48
	8/31/2004	23.24	19.66	20.92
	4/19/2005	23.24	18.69	19.78
GAL-11	7/24/2004	18.59	NM	NM
	8/31/2004	18.59	15.08	18.67
	4/19/2005	18.59	14.03	17.52
GAL-12	7/24/2004	16.62	12.75	16.78
	8/31/2004	16.62	13.20	17.65
	4/19/2005	16.62	12.24	16.12
GAL-13	7/24/2004	17.74	13.79	15.26
	8/31/2004	17.74	14.35	16.15
GAL-14	7/24/2004	15.85	12.02	20.05
	8/31/2004	15.85	NM	NM
	4/17/2005	15.85	11.52	15.10
GAL-15	7/24/2004	21.43	Not Present	14.43
	8/31/2004	21.43	NM	NM
	4/17/2005	21.43	Not Present	12.38
GAL-17	7/24/2004	15.82	11.72	16.93
	8/31/2004	15.82	NM	NM
	4/17/2005	15.82	11.30	15.42
GAL-18	7/24/2004	22.22	18.11	20.40
	8/31/2004	22.22	18.64	20.90
	4/19/2005	22.22	17.56	19.72

TABLE 5
LNAPL MEASUREMENT DATA
JULY AND AUGUST 2004 AND APRIL 2005
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Monitoring Point ID	Date	Reference Elevation (FT. - MSL)	Depth to Top of LNAPL (FT. BTIC)	Depth to Groundwater (FT. BTIC)
GAL-21	4/4/2005	17.46	13.14	16.50
	4/19/2005	17.46	13.01	16.94
GAL-22	4/4/2005	21.11	16.82	18.10
	4/19/2005	21.11	16.62	17.99
GAL-23	4/4/2005	17.55	13.27	15.52
	4/19/2005	17.55	13.12	15.32
GAL-24	4/4/2005	17.91	13.63	15.00
	4/19/2005	17.91	13.49	14.63
GAL-25	4/9/2005	15.76	Not Present	11.88
	4/17/2005	15.76	Not Present	11.65
GAL-26	4/9/2005	15.55	11.57	11.95
	4/17/2005	15.55	11.41	11.71
GAL-27	4/4/2005	12.48	Not Present	5.05
	4/19/2005	12.48	Not Present	6.00
GAL-28	4/4/2005	12.40	Not Present	6.46
	4/19/2005	12.40	Not Present	6.49
MW-14S	7/24/2004	22.79	Not Present	18.78
	8/31/2004	22.79	Not Present	18.77
	4/19/2005	22.79	Not Present	18.28
MW-15	7/24/2004	24.94	20.85	22.32
	8/31/2004	24.94	21.22	22.70
	4/19/2005	24.94	20.30	21.68
MW-16	7/24/2004	27.71	Not Present	20.75
	8/31/2004	27.71	Not Present	20.15
	4/19/2005	27.71	Not Present	18.71
MW-7R	4/19/2005	9.82	Not Present	9.16

Notes:

🟨 LNAPL not present
FT. BTIC - Feet below top of inner well casing
NM - Not Measured

TABLE 6
SUMMARY OF LNAPL BAILDOWN TEST INTERPRETATION
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Well ID	LNAPL Conductivity (ft/day)	LNAPL Transmissivity (ft2/day)
GAL-01R	5.42E-02	1.38×10^{-1}
GAL-02	7.35E-03	1.22×10^{-1}
GAL-03	3.62E-02	9.23×10^{-2}
GAL-04	1.34E-03	8.61×10^{-2}
GAL-05	1.47E-01	8.25×10^{-2}
GAL-06	3.59E-02	6.97×10^{-2}
GAL-07	2.13E-01	2.98×10^{-1}
GAL-09	3.96E-01	4.36×10^{-1}
GAL-10	2.10E-01	2.05×10^{-2}
GAL-11	2.59E-01	2.64×10^{-2}
GAL-12	5.70E-02	1.1×10^{-1}
GAL-13	2.34E-01	2.0×10^{-2}
GAL-16	7.23E-02	2.11×10^{-1}
GAL-18	1.63E-01	2.32×10^{-2}
GAL-20	2.69E-02	1.15×10^{-1}
GAL-21	3.96E-01	1.95×10^{-1}
GAL-22	5.65E-01	6.38×10^{-2}
GAL-23	4.24E-01	6.36×10^{-2}
GAL-24	2.29E-01	5.21×10^{-2}
MW-4R	8.89E-02	2.21×10^{-1}

TABLE 7
SUMMARY OF SLUG TEST RESULTS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

			Analysis Results				Slug Test GeoMean	
			Hvorslev		Bouwer and Rice			
Well	**Method**	**Type**	**K [cm/s]**	**K [ft/d]**	**K [cm/s]**	**K [ft/d]**	**K [cm/s]**	**K [ft/d]**
GAGW-01	Pneumatic	Rising	3.22E-03	9.1	2.82E-03	8.0	3.01E-03	8.6
GAGW-01	Solid Slug	Falling	3.98E-03	11.3	3.62E-03	10.3	4.63E-03	13.1
		Rising	5.58E-03	15.8	5.72E-03	16.2		
GAGW-02	Pneumatic	Rising	1.20E-02	34.1	1.17E-02	33.3	1.18E-02	33.7
GAGW-03	Pneumatic	Rising	5.98E-04	1.7	5.42E-04	1.5	5.69E-04	1.6
GAGW-03	Solid Slug	Falling	4.43E-04	1.3	4.65E-04	1.3	3.37E-04	1.0
		Rising	2.31E-04	0.7	2.71E-04	0.8		
GAGW-05	Pneumatic	Rising	2.20E-02	62.5	1.69E-02	47.9	1.93E-02	54.7
GAGW-07	Pneumatic	Rising	1.20E-02	34.1	1.15E-02	32.6	1.17E-02	33.3
GAGW-08	Pneumatic	Rising	9.36E-04	2.7	9.27E-04	2.6	9.31E-04	2.6
GAGW-06I	Solid Slug	Falling	3.35E-04	0.9	3.56E-04	1.0	4.33E-04	1.2
		Rising	5.53E-04	1.6	5.35E-04	1.5		
GAGW-04D	Solid Slug	Falling	3.07E-04	0.9	3.23E-04	0.9	4.11E-04	1.2
		Rising	5.22E-04	1.5	5.50E-04	1.6		
							2.03E-03	**5.8**

TABLE 8A
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-01**			**GAGW-02**			**FGAGW-02**			**GAGW-03**			**GAGW-04D**		
	Date Sampled:	1/9/2004			1/9/2004			1/9/2004			1/9/2004			8/12/2004		
	Lab ID:	493423			493426			493428			493424			554735		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acetone	50	-	R	5	-	R	5	-	R	5	-	R	5	-	R	5
Benzene	1	-	U	1	-	U	1	-	U	1	-	U	1	-	U	1
Carbon Tetrachloride	5	-	U	2	-	U	2	-	U	2	0.6	JN	2	-	U	2
Chloroethane	5	-	U	5	-	U	5	-	U	5	-	U	5	-	U	5
Chloroform	7	-	U	5	-	U	5	-	U	5	7.9		5	6.8		5
Cyclohexane		-	U	5	2.4		5	2.6	J	5	-	U	5	-	U	5
1,1-Dichloroethane	5	1	JN	5	-	U	5	-	U	5	-	U	5	-	U	5
cis-1,2-Dichloroethene	5	0.7	JN	5	-	U	5	-	U	5	-	U	5	-	U	5
Isopropylbenzene	5	-	U	5	-	U	5	-	U	5	-	U	5	-	U	5
Methyl Cyclohexane		-	U	5	9.6	J	5	9.9	J	5	-	U	5	-	U	5
MTBE	10	170		5	40		5	38		5	1.4	JN	5	1	J	5
Toluene	5	-	U	5	-	U	5	-	U	5	-	U	5	0.9	J	5
Trichloroethene	5	4.5		1	-	U	1	-	U	1	-	U	1	-	U	1
Vinyl Chloride	2	-	U	5	-	U	5	-	U	5	-	U	5	-	U	5
Xylene (Total)	5	-	U	5	-	U	5	1.7	JN	5	-	U	5	-	U	5
Total VOCs		176.2			52			52.2			9.9			8.7		

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. (June 1998 and April 2000 Addendum (MTBE))

▨ indicates that detected value is greater than the NYS AWQS&GV

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8A
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-05**			**GAGW-06I**			**FGAGW-06I**			**GAGW-07**			**GAGW-08**		
	Date Sampled:	1/9/2004			8/12/2004			8/12/2004			8/12/2004			8/12/2004		
	Lab ID:	493425			554731			554732			554734			554733		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acetone	50	-	R	5	34	J	5	29	J	5	-	R	5	-	R	5
Benzene	1	-	U	2	1		1	1.1		1	-	U	2	-	U	2
Carbon Tetrachloride	5	-	U	4	-	UJ	2	-	UJ	2	-	U	4	-	U	4
Chloroethane	5	-	U	10	4.9	J	5	4.2	J	5	-	U	10	-	U	10
Chloroform	7	-	U	10	2.4	J	5	2.7	J	5	1.7	J	10	-	U	10
Cyclohexane		-	U	10	15		5	16		5	-	U	10	-	U	10
1,1-Dichloroethane	5	-	U	10	1.6	J	5	1.5	J	5	-	U	10	-	U	10
cis-1,2-Dichloroethene	5	-	U	10	5		5	5.1		5	-	U	10	1	J	10
Isopropylbenzene	5	-	U	10	1.2	J	5	1.2	J	5	-	U	10	-	U	10
Methyl Cyclohexane		-	U	10	28		5	30		5	-	U	10	-	U	10
MTBE	10	270		10	33		5	32		5	150		10	240		10
Toluene	5	-	U	10	-	U	5	-	U	5	-	U	10	-	U	10
Trichloroethene	5	17		2	-	U	1	-	U	1	9.3		2	21		2
Vinyl Chloride	2	-	U	10	2.1	J	5	2.1	J	5	-	U	10	-	U	10
Xylene (Total)	5	-	U	10	-	U	5	-	U	5	-	U	10	-	U	10
Total VOCs		287			128.2			124.9			161			262		

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. (June 1998 and April 2000 Addendum (MTBE))

▨ indicates that detected value is greater than the NYS AWQS&GV

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8B
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-01**			**GAGW-02**			**FGAGW-02**			**GAGW-03**			**GAGW-04D**		
	Date Sampled:	1/9/2004			1/9/2004			1/9/2004			1/9/2004			8/12/2004		
	Lab ID:	493423			493426			493428			493424			554735		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	20	-	U	11	0.7	J	12	0.6	J	11	-	U	10	-	U	10
Anthracene	50	-	U	11	0.6	J	12	0.6	J	11	-	U	10	-	U	10
Benzo(a)pyrene	0.0	-	U	1.1	-	U	1.2	-	U	1.1	0.3	J	1	-	U	1
Benzo(b)fluoranthene	0.002	-	U	1.1	-	U	1.2	-	U	1.1	0.3	J	1	-	U	1
Benzo(g,h,i)perylene		-	U	11	-	U	12	-	U	11	0.6	J	10	-	U	10
Benzo(k)fluoranthene	0.002	-	U	1.1	-	U	1.2	-	U	1.1	0.4	J	1	-	U	1
bis(2-Ethylhexyl)phthalate	5	-	U	11	-	U	12	-	U	11	3.2	J	10	-	U	10
Chrysene	0.002	0.3	J	11	-	U	12	-	U	11	-	U	10	-	U	10
Di-n-butylphthalate	50	3	J	11	3.2	J	12	3	J	11	-	U	10	-	U	10
Dibenz(a,h)anthracene		-	U	1.1	-	U	1.2	-	U	1.1	0.5	J	1	-	U	1
Fluoranthene	50	0.3	J	11	0.3	J	12	0.3	J	11	-	U	10	-	U	10
Fluorene	50	-	U	1.1	0.7	J	12	0.6	J	11	-	U	1	-	U	1
Indeno(1,2,3-cd)pyrene	0.002	-	U	1.1	-	U	1.2	-	U	1.1	0.3	J	1	-	U	1
2-Methylnaphthalene		-	U	1.1	0.9	J	12	0.8	J	11	-	U	1	-	U	1
Naphthalene	10	-	U	11	-	U	12	-	U	11	-	U	10	-	U	10
Pentachlorophenol	2 *	-	U	11	-	U	12	-	U	11	-	U	10	-	U	10
Phenanthrene	50	0.3	J	11	1.6	J	12	1.5	J	11	-	U	10	-	U	10
Pyrene	50	0.8	J	11	0.8	J	12	0.8	J	11	-	U	10	-	U	10
Total SVOCs		4.7			8.8			8.2			5.6			0		

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

▨ indicates that detected value is greater than the NYS AWQS&GV

* Total phenolic compounds = 2 maximum allowable concentration

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8B
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-05**			**GAGW-06I**			**FGAGW-06I**			**GAGW-07**			**GAGW-08**		
	Date Sampled:	1/9/2004			8/12/2004			8/12/2004			8/12/2004			8/12/2004		
	Lab ID:	493425			554731			554732			554734			554733		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	20	-	U	10	1	J	10	1.4	J	11	-	U	10	-	U	10
Anthracene	50	-	U	10	0.6	J	10	0.8	J	11	-	U	10	-	U	10
Benzo(a)pyrene	0.0	-	U	1	-	U	1	-	U	1.1	-	U	1	-	U	1
Benzo(b)fluoranthene	0.002	-	U	1	-	U	1	-	U	1.1	-	U	1	-	U	1
Benzo(g,h,i)perylene		-	U	10	-	U	10	-	U	11	-	U	10	-	U	10
Benzo(k)fluoranthene	0.002	-	U	1	-	U	1	-	U	1.1	-	U	1	-	U	1
bis(2-Ethylhexyl)phthalate	5	-	U	10	-	U	10	-	U	11	-	U	10	-	U	10
Chrysene	0.002	-	U	10	-	U	10	-	U	11	-	U	10	-	U	10
Di-n-butylphthalate	50	2.2	J	10	-	U	10	-	U	11	-	U	10	-	U	10
Dibenz(a,h)anthracene		-	U	1	-	U	1	-	U	1.1	-	U	1	-	U	1
Fluoranthene	50	-	U	10	-	U	10	-	U	11	-	U	10	-	U	10
Fluorene	50	-	U	1	0.9	J	10	1.1	J	11	-	U	1	-	U	1
Indeno(1,2,3-cd)pyrene	0.002	-	U	1	-	U	1	-	U	1.1	-	U	1	-	U	1
2-Methylnaphthalene		-	U	1	0.2	J	10	-	U	1.1	-	U	1	-	U	1
Naphthalene	10	-	U	10	-	U	10	0.4	J	11	-	U	10	-	U	10
Pentachlorophenol	2 *	-	U	10	-	U	10	0.2	J	42	-	U	10	-	U	10
Phenanthrene	50	0.3	J	10	1.9	J	10	2.2	J	11	-	U	10	-	U	10
Pyrene	50	-	U	10	0.4	J	10	0.4	J	11	-	U	10	-	U	10
Total SVOCs		2.5			5			6.5			0			0		

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

▨ indicates that detected value is greater than the NYS AWQS&GV

* Total phenolic compounds = 2 maximum allowable concentration

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8C
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-01**			**GAGW-02**			**FGAGW-02**			**GAGW-03**			**GAGW-04D**		
	Date Sampled:	1/9/2004			1/9/2004			1/9/2004			1/9/2004			8/12/2004		
	Lab ID:	493423			493426			493428			493424			554735		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1016		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5
Aroclor-1221		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5
Aroclor-1232		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5
Aroclor-1242		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5
Aroclor-1248		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5
Aroclor-1254		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5
Aroclor-1260		-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.5

There were no detections of PCBs

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

Tables checked by A.P.J. on 10/06/2004

TABLE 8C
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-05**			**GAGW-06I**			**FGAGW-06I**			**GAGW-07**			**GAGW-08**		
	Date Sampled:	1/9/2004			8/12/2004			8/12/2004			8/12/2004			8/12/2004		
	Lab ID:	493425			554731			554732			554734			554733		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1016		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5
Aroclor-1221		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5
Aroclor-1232		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5
Aroclor-1242		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5
Aroclor-1248		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5
Aroclor-1254		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5
Aroclor-1260		-	U	0.5	-	U	0.5	-	U	0.51	-	U	0.5	-	U	0.5

There were no detections of PCBs

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS Ambient Water Guidance Value - TOGS 1.1.1.

Tables checked by A.P.J. on 10/06/2004

TABLE 8D
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
INORGANICS - METALS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-01**			**GAGW-02**			**FGAGW-02**			**GAGW-03**			**GAGW-04D**		
	Date Sampled:	1/9/2004			1/9/2004			1/9/2004			1/9/2004			8/12/2004		
	Lab ID:	493423			493426			493428			493424			554735		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum		103	B	62.6	140	B	62.6	135	B	62.6	123	B	62.6	2140		62.6
Arsenic	25	7.4		3.2	-	U	3.2	-	U	3.2	-	U	3.2	-	U	3.2
Barium	1000	59.6	B	1.7	141	B	1.7	142	B	1.7	72.4	B	1.7	146	B	1.7
Calcium		19800		42.5	147000		42.5	146000		42.5	80400		42.5	144000	B	42.5
Chromium	50	-	U	1.6	-	U	1.6	-	U	1.6	-	U	1.6	7.1	B	1.6
Copper	200	-	U	3.7	-	U	3.7	-	U	3.7	3.7	B	3.7	12.5	B	3.7
Iron	300	4590		39.2	464		39.2	421		39.2	266		39.2	4370		39.2
Lead	25	-	U	2.3	3.4		2.3	-	U	2.3	-	U	2.3	5.5		2.6
Magnesium	35000	66600		41.6	46300		41.6	46000		41.6	25500		41.6	55300		41.6
Manganese	300	277		1.2	753		1.2	749		1.2	104		1.2	235		1.2
Nickel	100	2.5	B	1.6	4.6	B	1.6	3.5	B	1.6	2.2	B	1.6	8.7	B	2.4
Potassium		4850	B	315	2970	B	315	2990	B	315	3150	B	315	4040	B	315
Sodium	20000	205000		396	121000		396	122000		396	92800		396	200000		396
Vanadium	14	-	U	1.8	-	U	1.8	3.5	B	1.8	-	U	1.8	2.3	B	2
Zinc	2000	7.3	B	5.8	10.1	B	5.8	9.8	B	5.8	10.2	B	5.8	27	B	5.8

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

▨ indicates that detected value is greater than the NYS AWQS&GV

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8D
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
INORGANICS - METALS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAGW-05**			**GAGW-06I**			**FGAGW-06I**			**GAGW-07**			**GAGW-08**		
	Date Sampled:	1/9/2004			8/12/2004			8/12/2004			8/12/2004			8/12/2004		
	Lab ID:	493425			554731			554732			554734			554733		
Parameter	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum		79.3	B	62.6	-	U	0.5	-	U	0.51	722		62.6	-	U	0.5
Arsenic	25	-	U	3.2	-	U	3.2	-	U	3.2	-	U	3.2	-	U	3.2
Barium	1000	80.1	B	1.7	165	B	1.7	153	B	1.7	127	B	1.7	43.6	B	1.7
Calcium		189000		42.5	56200		42.5	50200		42.5	148000		42.5	196000		42.5
Chromium	50	-	U	1.6	-	U	1.6	-	U	1.6	3.8	B	1.6	-	U	1.6
Copper	200	-	U	3.7	-	U	3.7	-	U	3.7	-	U	3.7	-	U	3.7
Iron	300	4600		39.2	19200		39.2	16300		39.2	1700		39.2	73.9	B	39.2
Lead	25	-	U	2.3	-	U	2.6	-	U	2.6	3.8		2.6	-	U	2.6
Magnesium	35000	61400		41.6	17700		41.6	15900		41.6	48000		41.6	63100		41.6
Manganese	300	807		1.2	1110		1.2	1010		1.2	106		1.2	207		1.2
Nickel	100	3.2	B	1.6	3	B	2.4	3.4	B	2.4	5.8	B	2.4	3.8	B	2.4
Potassium		3440	B	315	7090		315	7400		315	3850	B	315	4110	B	315
Sodium	20000	170000		396	74300		396	81900		396	145000		396	213000		396
Vanadium	14	-	U	1.8	-	U	2	-	U	2	-	U	2	-	U	2
Zinc	2000	6.7	B	5.8	9.4	B	5.8	10.3	B	5.8	17.6	B	5.8	7.3	B	5.8

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

▨ indicates that detected value is greater than the NYS AWQS&GV

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8E
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
NATURAL ATTENUATION PARAMETERS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	**GAGW-01**			**GAGW-02**			**FGAGW-02**			**GAGW-03**			**GAGW-04D**		
		Date Sampled:	1/9/2004			1/9/2004			1/9/2004			1/9/2004			8/12/2004		
		Lab ID:	493423			493426			493428			493424			554735		
Parameter	**Units**	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Alkalinity	mg/L		381		5	401		5	391		5	258		5	306		5
Carbon Dioxide	mg/L		63		5	54.1		5	39.1		5	10		5	42.3	J	5
Chloride	mg/L		500	J	5	262	J	5	263	J	5	100	J	5	402		5
Dissolved Organic Carbon	mg/L		-	R	1	-	R	1	-	R	1	-	R	1	2.2		1
Ethane	ng/L		130		5	350		5	360		5	410		5	360		5
Ethene	ng/L		170		5	58		5	63		5	380		5	280		5
Methane	µg/L		8.5		0.015	590		0.015	640		0.015	1.8		0.015	2.3		0.015
Nitrate	mg/L	10	1.5		0.1	4.2		0.1	4.1		0.1	7.9		0.1	6.7		0.1
Sulfate	mg/L	250	186		5	83		5	82.7		5	101		5	126		5
Total Dissolved Solids	mg/L		1540		10	1030		10	1020		10	619		10	1070		10
Total Organic Carbon	mg/L		-	R	1	-	R	1	-	R	1	-	R	1	2.3		1

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

▨ indicates that detected value is greater than the NYS AWQS&GV

Sample point identification number preceded by "F" is a field duplicate.

TABLE 8E
SUMMARY OF CHEMICAL DETECTIONS
GROUNDWATER SAMPLE ANALYSES
NATURAL ATTENUATION PARAMETERS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	**GAGW-05**			**GAGW-06I**			**FGAGW-06I**			**GAGW-07**			**GAGW-08**		
		Date Sampled:	1/9/2004			8/12/2004			8/12/2004			8/12/2004			8/12/2004		
		Lab ID:	493425			554731			554732			554734			554733		
Parameter	**Units**	**TOGS 1.1.1 GA Criteria**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Alkalinity	mg/L		350		5	326		5	321		5	326		5	372		5
Carbon Dioxide	mg/L		40		5	92	J	5	86.5	J	5	35.8	J	5	52.6	J	5
Chloride	mg/L		431	J	5	34.6		5	34.3		5	277		5	452		5
Dissolved Organic Carbon	mg/L		-	R	1	6.1		1	5.8		1	-	U	1	1.4		1
Ethane	ng/L		96		5	390		5	510		5	160		5	140		5
Ethene	ng/L		88		5	210		5	280		5	140		5	66		5
Methane	µg/L		1.6		0.015	5000		0.015	4800		0.015	3.1		0.015	4.2		0.015
Nitrate	mg/L	10	2.9		0.1	-	U	0.1	-	U	0.1	6		0.1	4.4		0.1
Sulfate	mg/L	250	145		5	53.5		5	58.3		5	126		5	167		5
Total Dissolved Solids	mg/L		1290		10	574		10	544		10	1304		10	1890		10
Total Organic Carbon	mg/L		-	R	1	6.0		1	6.3		1	1.2		1	1.5		1

Notes:

All units are µg / L.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions.

NYS AWQS&GV - New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1.

▨ indicates that detected value is greater than the NYS AWQS&GV

Sample point identification number preceded by "F" is a field duplicate.

Tables checked by A.P.J. on 10/06/2004

TABLE 9
SAMPLING & ANALYSIS SUMMARY FOR PRE-REMEDIAL INVESTIGATION GROUNDWATER DATA
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample ID	Date Sampled	VOCs	SVOCs	PCBs	Metals	Type of Well (1)
QUANTA RESOURCES						
GW-1	12/6/1988	×	×	×		Groundwater
	2/22/1990	×	×	×	×	
GW-2	12/6/1988	×	×	×		LNAPL
	2/22/1990	×	×	×	×	
GW-3	12/6/1988	×	×	×		LNAPL
	2/22/1990	×	×	×	×	
MW-6	10/4/2000	×				LNAPL
MW-11	11/1/2002	×	×			LNAPL
NORTH CAPASSO						
MW-1	10/4/2000	×	×	×	×	Groundwater
MW-2	4/14/1992	×		×	×	Groundwater
	10/4/2000	×	×	×	×	
MW-4R	11/1/2002	×	×			LNAPL
MW-10	11/1/2002					LNAPL
SOUTH CAPASSO						
MW-3R	10/4/2000	×	×		×	Groundwater
	11/1/2002	×	×			
MW-3	4/14/1992	×		×		Groundwater
MW-7	10/4/2000	×	×	×	×	Groundwater
MW-7R	11/1/2002	×	×			Groundwater
PHOENIX BEVERAGES						
MW-8	11/1/2002	×	×			LNAPL
PRINCE PLASTICS						
MW-9	11/1/2002	×	×			Groundwater

Notes:

(1) - LNAPL Well - Screened across the LNAPL/groundwater interface.
Groundwater Well - Well screened below the LNAPL/groundwater interface.

TABLE 10a
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			GW-1		GW-1		GW-2		GW-2		GW-3		GW-3		MW-1	
Date Sampled:			12/6/88		2/22/90		12/6/88		2/22/90		12/6/88		2/90		10/04/00	
Screened Interval (ft.)			28-38		28-38		18-28		28-38		18-28		18-28		15-35	
Screened across the water table			No		No		Yes		Yes		Yes		Yes		Yes	
Purge / Sample device			Teflon Bailer		Centrifugal Pump /bailer		Teflon Bailer		Centrifugal Pump /bailer		Teflon Bailer		Centrifugal Pump /bailer		Unk	
LNAPL Present (ft).			Sheen		Sheen		8.4		7.1		8.45		7.36		No	
Information Source			Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Arcadis	
Sample Description			**Tiny oil droplets - water fairly clear-moderate oil type odor**		**Slightly turbid, sheen, small black particulate matter**		**Oily product**		**Turbid, gray, some product**		**Oily product - Similar oil product characteristics as GW-2**		**Slightly turbid, gray, oily product**			
Parameter	**TOGS 1.1.1 SD Criteria [2]**	**TOGS 1.1.1 GA Criteria[2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Acetone		50	29	B	-		20	B	-		-		9	J	12	
Benzene	10	1	4	J	6		11		15		-		18		11	
Carbon Disulfide			1	J	-		-		-		-		-		3	J
Carbon Tetrachloride		5	-		-		-		-		-		-		-	
Chlorobenzene	50	5	-		-		-		-		-		-		-	
Chloroethane		5	-		-		85		60		-		36		-	
Chloroform		7	1	J	-		-		-		-		-		-	
Cyclohexane			-		-		-		-		-		-		-	
1,1-Dichloroethane		5	-		-		10		10		-		21		-	
cis-1,2-Dichloroethene		5	-		-		-		-		-		-		-	
1,2-Dichloroethene		2	4	J	3	J	-		-		110	J	53		-	
1,2-DCA		0.6	-		-		-		-		-		2	J	-	
1,2-DCP		1	1	J	2	J	-		-		-		-		-	
Ethylbenzene	41	5	-		-		2	J	1	J	130	J	4	J	-	
Isopropylbenzene		5	-		-		-		-		-		-		-	
Methyl Cyclohexane			-		-		-		-		-		-		-	
MTBE		10	-		-		-		-		-		-		-	
Methylene Chloride	200	5	3	J	3	BJ	3	J	4	BJ	-		-		0.5	JB
Toluene	430	5	-		-		2	J	-		160	J	10		-	
Tetrachloroethene	1	5	-		-		-		-		-		-		-	
Trichloroethene	40	5	-		-		-		-		-		-		-	
Vinyl Chloride		2	-		-		-		-		-		20		-	
Xylene (Total)	170	5	17		25		4	J	3	J	390		7		-	
Total VOCs			60		39		137		93		790		180		26.5	
TOTAL TIC's			NA		212		NA		38		NA		191		NA	

Notes:

All units are µg / L.

NA - Not Analyzed

(1) LNAPL and water were collected. Lab instructed to anlyze the water layer only. Sampled by Triegel Associates. Analytical results obtained from the followoing table, prepared by Environ Corporation: "Summary of Ground Water Sampling Results, Quanta and Capasso Properties, Long Island City, New York"

(2) New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

"-" indicates that the constituent was not detected.

▨ indicates that the detected value is greater than one of TOGS criteria.

TABLE 10a
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**MW-2**		**MW-2**		**MW-3**		**MW-3R**		**MW-3R**		**MW-4R**		**MW-6(1)**	
Date Sampled:			4/14/92		10/04/00		4/14/92		10/04/00		11/02		11/02		10/00	
Screened Interval (ft.)			11-31		11-31		9-29		4-16		4-16		8-23		6-26	
Screened across the water table			Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Purge / Sample device			Unk		Unk		unk		Peristaltic Pump		Unk		Unk		Unk	
LNAPL Present (ft).			No		No		no		no		no		yes		yes	
Information Source			ERM Northeast		Arcadis		ERM Northeast		Arcadis		Environ		Environ		Triegel Associates	
Sample Description																
Parameter	**TOGS 1.1.1 SD Criteria [2]**	**TOGS 1.1.1 GA Criteria[2]**			**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Acetone		50			3	J	-		15	J	6	J	-		-	
Benzene	10	1	2		0.8	J	1		530		213		7.9		1,400	
Carbon Disulfide					-		-		-		-		-		-	
Carbon Tetrachloride		5			-		-		-		-		-		-	
Chlorobenzene	50	5			-		-		-		-		5.5		-	
Chloroethane		5			-		-		-		-		-		-	
Chloroform		7			-		6		-		-		-		-	
Cyclohexane					-		-		-		-		-		-	
1,1-Dichloroethane		5			-		-		-		-		0.89	J	-	
cis-1,2-Dichloroethene		5			-		-		-		-		3.4	J	-	
1,2-Dichloroethene		2	12		11		-		-		-		-		-	
1,2-DCA		0.6			-		-		-		-		-		-	
1,2-DCP		1			-		-		-		-		-		-	
Ethylbenzene	41	5	17		-		-		0.5	J	1.1		-		6,800	
Isopropylbenzene		5			-		-		-		-		-		-	
Methyl Cyclohexane					-		-		-		-		-		-	
MTBE		10			-		-		-		-		-		-	
Methylene Chloride	200	5			0.5	JB	-		6	JB	-		9.7		9,900	
Toluene	430	5			-		-		12	J	4.6		9.9		6,500	
Tetrachloroethene	1	5			0.4	J	-		1	J	-		-		560	
Trichloroethene	40	5	10		14		-		-		-		-		-	
Vinyl Chloride		2			1	J	-		-		-		7.9		-	
Xylene (Total)	170	5	7		-		-		14	J	6.7		40.6		75,000	
Total VOCs			48		30.7		7		578.5		231.4		85.79		100,160	
TOTAL TIC's			NA		NA		NA		NA		NA		NA		NA	

Notes:

All units are µg / L.

NA - Not Analyzed

(1) LNAPL and water were collected. Lab instructed to anlyze the water layer only. Sampled by Triegel Associates. Analytical results obtained from the followoing table, prepared by Environ Corporation: "Summary of Ground Water Sampling Results, Quanta and Capasso Properties, Long Island City, New York"

(2) New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

"-" indicates that the constituent was not detected.

▨ indicates that the detected value is greater than one of TOGS criteria.

TABLE 10a
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**MW-7**		**MW-7R**		**MW-8**		**MW-9**	**MW-10**		**MW-11**	
Date Sampled:			10/04/00		11/02		11/02		11/02	11/02		11/02	
Screened Interval (ft.)			6-16		5-17		9-24					12.5-32.5	
Screened across the water table			Yes		Yes		Yes		Yes	Yes		Yes	
Purge / Sample device			Peristaltic Pump		Unk		Unk		Unk	Unk		Unk	
LNAPL Present (ft).			no		no		yes		no	Yes		Yes	
Information Source			Arcadis		Environ		Environ		Environ	Environ		Environ	
Sample Description													
Parameter	**TOGS 1.1.1 SD Criteria** [2]	**TOGS 1.1.1 GA Criteria**[2]	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Result**	**Qual**	**Result**	
Acetone		50	5	J	-		-		-	-		5.4	J
Benzene	10	1	-		2		0.85	J	-	46.4		8.9	
Carbon Disulfide			-		-		-		-	-		-	
Carbon Tetrachloride		5	-		-		-		-	-		-	
Chlorobenzene	50	5	-		-		0.82	J	-	-		-	
Chloroethane		5	-		-		-		-	2.8	J	1.4	J
Chloroform		7	-		7.4		-		-	-		-	
Cyclohexane			-		-		-		-	-		-	
1,1-Dichloroethane		5	-		-		-		-	-		1.3	J
cis-1,2-Dichloroethene		5	-		2.6	J	-		-	1.4	J	-	
1,2-Dichloroethene		2	-		-		-		-	-		-	
1,2-DCA		0.6	-		-		-		-	-		-	
1,2-DCP		1	-		-		-		-	-		-	
Ethylbenzene	41	5	-		-		-		-	90.3		10.3	
Isopropylbenzene		5	-		-		-		-	-		-	
Methyl Cyclohexane			-		-		-		-	-		-	
MTBE		10	-		-		-		-	-		-	
Methylene Chloride	200	5	4	JB	-		-		-	-		-	
Toluene	430	5	-		-		0.8	J	-	9		1.3	
Tetrachloroethene	1	5	-		0.53	J	-		-	-		-	
Trichloroethene	40	5	-		3.5		-		-	-		-	
Vinyl Chloride		2	-		-		-		-	-		-	
Xylene (Total)	170	5	-		-		3.6		-	398		54.5	
Total VOCs			9		16.03		6.07		0	547.9		83.1	
TOTAL TIC's			NA		NA		NA		NA	NA		NA	

Notes:

All units are µg / L.

NA - Not Analyzed

[1] LNAPL and water were collected. Lab instructed to anlyze the water layer only. Sampled by Triegel Associates. Analytical results obtained from the followoing table, prepared by Environ Corporation: "Summary of Ground Water Sampling Results, Quanta and Capasso Properties, Long Island City, New York"

[2] New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

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▨ indicates that the detected value is greater than one of TOGS criteria.

TABLE 10b
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			Solubility @ 20°C	GW-1		GW-1		GW-2		GW-2		GW-3		GW-3	
Date Sampled:				12/6/88		2/22/90		12/6/88		2/22/90		12/6/88		2/22/90	
Screened Interval (ft.)				28-38		28-38		18-28		28-38		18-28		28-38	
Screened across the water table				No		No		Yes		Yes		Yes		Yes	
Purge / Sample device				Teflon Bailer		Centrifugal Pump /bailer		Teflon Bailer		Centrifugal Pump /bailer		Teflon Bailer		Centrifugal Pump /bailer	
LNAPL Present (ft).				no		Sheen		Unk		7.1		8.45		7.36	
Information Source				Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.	
Sample Description				**Tiny oil droplets - water fairly clear-moderate oil type odor**		**Slightly turbid, sheen, small black particulate matter**		**Oily product**		**Turbid, gray, some product**		**Oily product - Similar oil product characteristics as GW-2**		**Slightly turbid, gray, oily product**	
Parameter	**TOGS 1.1.1 SD Criteria[2]**	**TOGS 1.1.1 GA Criteria[2]**	**ug/l (ppb)**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**		**Result**	
Acenaphthene	60	20	3,470	3	J	-		-		47		3	J	21	J
Anthracene		50	43	10		3	J	8	J	170		-		51	J
Benzoic Acid				4	J	-		-		-		-		-	
Benzo(a)anthracene		0.02	14	27		15		-		330		16		170	
Benzo(a)pyrene	0.0006	0.0	3.8	4	J	3	J	5	J	86		6	J	62	J
Benzo(b)fluoranthene		0.002	1.2	5	J	-		6	J	110	X	3	J	51	JX
Benzo(g,h,i)perylene			0.26	-		-		-		-		-		-	
Benzo(k)fluoranthene		0.002	0.55	5	J	-		6	J	110	X	3		51	JX
bis(2-Ethylhexyl)phthalate		5		-		4	J	-		-		-		-	
Carbazole														-	
Chrysene		0.002	1.8	33		19		38		500		13		220	
Di-n-butylphthalate		50		3	J	-		-		-		-		-	
Dibenz(a,h)anthracene			0.5	-		-		-		-		-		-	
Dibenzofuran			<1,000,000	-		-		-		-		-		-	
Diethylphthalate		50		-		-		-		-		-		-	
2,4-Dimethylphenol	1,000	1*		-		-		-		-		120		-	
Fluoranthene		50	265	8	J	4	J	6	J	110		3	J	49	J
Fluorene	23	50	190	4	J	-		-		71		-		37	J
Indeno(1,2,3-cd)pyrene		0.002	No Data	-		-		-		-		-		-	
2-Methylnaphthalene	38		24,600	15		3	J	-		-		12		22	J
Naphthalene	140	10	31,000	-		-		-		-		10		-	
Phenanthrene	14	50	1,180	10		6	J	19	J	430		8	J	160	
Pyrene		50	13	16		14		12	J	440		10		100	
Total SVOCs				147		71		100		2,404		207		994	
Total TIC's				NA		434		NA		57,100		NA		25,100	

Notes:

All units are ug / L.

NA - Not Analyzed

(1) LNAPL and water were collected. Lab instructed to anlyze the water layer only. Sampled by Triegel Associates. Analytical results obtained from the following table prepated by Environ Corporation: "Summary of Ground Water Sampling Results, Quanta and Capasso Properties, Long Island City, NY."

(2) New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

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▨ indicates that the detected value is greater than one of TOGS criteria.

* Total phenolic compounds = 1 maximum allowable concentration

TABLE 10b
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			Solubility @ 20^oC	**MW-1**		**MW-2**		**MW-3R**		**MW-3R**		**MW-4R**		**MW-7**	
Date Sampled:				10/04/00		10/04/00		10/04/00		11/02		11/02		10/04/00	
Screened Interval (ft.)				15 - 35		11-31		4-16		4-16		8-23		6-16	
Screened across the water table				Yes		Yes		Yes		Yes		Yes		Yes	
Purge / Sample device				Unk		Unk		Unk		Peristaltic Pump		Unk		Peristaltic Pump	
LNAPL Present (ft).				no		no		no		no		yes		no	
Information Source				Arcadis		Arcadis		Arcadis		Environ		Environ		Arcadis	
Sample Description															
Parameter	**TOGS 1.1.1 SD Criteria^2**	**TOGS 1.1.1 GA Criteria^2**	**ug/l (ppb)**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Acenaphthene	60	20	3,470	1	J	1	J	0.8	J	0.76	J	1,950		-	
Anthracene		50	43	-		-		0.5	J	-		4,290		0.1	J
Benzoic Acid				-		-		-		-		-		-	
Benzo(a)anthracene		0.02	14	1	J	0.2	J	0.4	J	-		13,000		-	
Benzo(a)pyrene	0.0006	0.0	3.8	0.2	J	-		0.2	J	-		5,240		-	
Benzo(b)fluoranthene		0.002	1.2	-		-		0.1	J	-		4,240		-	
Benzo(g,h,i)perylene			0.26	-		-		-		-		1,680	J	0.2	J
Benzo(k)fluoranthene		0.002	0.55	-		-		0.08	J	-		871	J	-	
bis(2-Ethylhexyl)phthalate		5		2	JB	0.6	JB	1	JB	-		-		0.6	JB
Carbazole				1	J			-		-		-		-	
Chrysene		0.002	1.8	1	J	0.2	J	0.5	J	-		13,700		-	
Di-n-butylphthalate		50		-		0.2	JB	-		-		-		0.2	JB
Dibenz(a,h)anthracene			0.5	-		-		-		-		1,330	J	-	
Dibenzofuran			<1,000,000	-		0.2	J	0.2	J	-		685	J	-	
Diethylphthalate		50		-		-		2	J	-		-		0.3	J
2,4-Dimethylphenol	1,000	1*		-		-		-		-		-		-	
Fluoranthene		50	265	0.2	J	0.4	J	0.4	J	-		2,910		-	
Fluorene	23	50	190	1	J	2	J	0.8	J	-		492	J	-	
Indeno(1,2,3-cd)pyrene		0.002	No Data	-		-		-		-		911	J	-	
2-Methylnaphthalene	38		24,600	4	J	-		0.2	J	-		4,420		-	
Naphthalene	140	10	31,000	-		-		0.3	J	-		-		-	
Phenanthrene	14	50	1,180	2	J	0.9	J	0.6	J	-		13,300		0.2	J
Pyrene		50	13	1	J	0.8	J	1	J	-		11,900		0.4	J
Total SVOCs				14.4		6.5		9.08		0.76		80,919		2	
Total TIC's				NA		NA		NA		NA		NA		NA	

Notes:

All units are ug / L.

NA - Not Analyzed

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* Total phenolic compounds = 1 maximum allowable concentration

TABLE 10b
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:				**MW-7R**		**MW-8**		**MW-9**		**MW-10**		**MW-11**	
Date Sampled:				11/02		11/02		11/02		11/02		11/02	
Screened Interval (ft.)				5-17		9-24						12.5-32.5	
Screened across the water table				Yes		Yes		Yes		Yes		Yes	
Purge / Sample device			**Solubility @ 20°C**	Unk		Unk		Unk		Unk		Unk	
LNAPL Present (ft).				no		yes		no		Yes		Yes	
Information Source				Environ		Environ		Environ		Environ		Environ	
Sample Description													
Parameter	**TOGS 1.1.1 SD Criteria[2]**	**TOGS 1.1.1 GA Criteria[2]**	**ug/l (ppb)**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**		**Result**	
Acenaphthene	60	20	3,470	-		1.4	J	1.6	J	2.9		1.6	J
Anthracene		50	43	-		2.6		-		3.4		3.8	
Benzoic Acid				-		-		-		-		-	
Benzo(a)anthracene		0.02	14	-		4.6		-		13.2		9.4	
Benzo(a)pyrene	0.0006	0.0	3.8	-		1.4	J	-		1.9	J	-	
Benzo(b)fluoranthene		0.002	1.2	-		0.88	J	-		2.1		-	
Benzo(g,h,i)perylene			0.26	-		0.69	J	-		-		-	
Benzo(k)fluoranthene		0.002	0.55	-		-		-		-		-	
bis(2-Ethylhexyl)phthalate		5		-		2		-		-		-	
Carbazole													
Chrysene		0.002	1.8	2.2		5.5		-		14		11.9	
Di-n-butylphthalate		50		-		-		-		-		-	
Dibenz(a,h)anthracene			0.5	-		0.53	J	-		0.74	J	-	
Dibenzofuran			<1,000,000	-		0.66	J	-		-		1.2	J
Diethylphthalate		50		-		-		-		-		-	
2,4-Dimethylphenol	1,000	1*		-		-		-		-		-	
Fluoranthene		50	265	-		1.1	J	-		2.7		1.6	J
Fluorene	23	50	190	-		-		-		-		-	
Indeno(1,2,3-cd)pyrene		0.002	No Data	-		-		-		-		-	
2-Methylnaphthalene	38		24,600	-		-		-		15.1		-	
Naphthalene	140	10	31,000	-		-		-		46.9		-	
Phenanthrene	14	50	1,180	-		10.4		-		10.9		16.9	
Pyrene		50	13	-		5.1		-		10		9.6	
Total SVOCs				2.2		36.9		1.6		123.8		56	
Total TIC's				NA		NA		NA		NA		NA	

Notes:

All units are ug / L.

NA - Not Analyzed

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* Total phenolic compounds = 1 maximum allowable concentration

TABLE 10c
SUMMARY OF CHEMICAL DETECTIONS
HISTORICAL GROUNDWATER SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**GW-1**		**GW-1**		**GW-2**		**GW-2**		**GW-3**		**GW-3**	
Date Sampled:			12/6/88		2/22/90		12/6/88		2/22/90		12/6/88		2/22/90	
Screened Interval (ft.)			28-38		28-38		18-28		28-38		18-28		28-38	
Screened across the water table			no		no		yes		no		yes		no	
Purge / Sample device			Teflon Bailer		Centrifugal Pump /bailer		Teflon Bailer		Centrifugal Pump /bailer		Teflon Bailer		Centrifugal Pump /bailer	
LNAPL Present (ft).			No		Sheen		Unk		7.1		8.45		7.36	
Information Source			Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.	
Sample Description			**Tiny oil droplets - water fairly clear-moderate oil type odor**		**Slightly turbid, sheen, small black particulate matter**		**Oily product**		**Turbid, gray, some product**		**Oily product - Similar oil product characteristics as GW-2**		**Slightly turbid, gray, oily product**	
Parameter	**TOGS 1.1.1 SD Criteria[1]**	**TOGS 1.1.1 GA Criteria[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Aroclor-1016			-		-		-		-		-		-	
Aroclor-1221			-		-		-		-		-		-	
Aroclor-1232			-		-		-		-		-		-	
Aroclor-1242			-		-		-		-		-		-	
Aroclor-1248			-		-		-		-		-		-	
Aroclor-1254			-		-		-		-		-		-	
Aroclor-1260			-		-		-		-		-		-	
Total PCBs	0.00012	0.09	0		0		0		0		0		0	

Notes:

All units are µg/L.

NA - Not Analyzed

(1) New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

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▨ indicates that the detected value is greater than one of TOGS criteria.

TABLE 10c
SUMMARY OF CHEMICAL DETECTIONS
HISTORICAL GROUNDWATER SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**MW-1**		**MW-2**		**MW-2**		**MW-3**		**MW-3R**		**MW-7**	
Date Sampled:			10/04/00		4/14/92		10/04/00		4/14/92		10/04/00		10/04/00	
Screened Interval (ft.)			15-35		11-31		11-31		9-29		4-16		6-16	
Screened across the water table			yes		yes		yes		yes		yes		yes	
Purge / Sample device			Unk		Unk		Unk		unk		Peristaltic Pump		Peristaltic Pump	
LNAPL Present (ft).			No		No		No		No		No		No	
Information Source			Arcadis		ERM Northeast		Arcadis		ERM Northeast		Arcadis		Arcadis	
Sample Description														
Parameter	**TOGS 1.1.1 SD Criteria[1]**	**TOGS 1.1.1 GA Criteria[1]**	**Result**	**Qual**			**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Aroclor-1016			-		-		-		-		-		-	
Aroclor-1221			-		-		-		-		-		-	
Aroclor-1232			-		-		-		-		-		-	
Aroclor-1242			-		-		-		-		-		-	
Aroclor-1248			-		-		-		-		-		-	
Aroclor-1254			-		-		-		-		-		-	
Aroclor-1260			-		-		-		-		-		-	
Total PCBs	0.00012	0.09	0		0		0		0		0		0	

Notes:

All units are µg/L.

NA - Not Analyzed

(1) New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

"-" indicates that the constituent was not detected.

▨ indicates that the detected indicates that the detected value is greater than one of TOGS criteria.

TABLE 10d
SUMMARY OF CHEMICAL DETECTIONS
PRE-REMEDIAL INVESTIGATION GROUNDWATER SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**GW-1**		**GW-2**		**GW-3**		**MW-1**		**MW-2**		**MW-3R**		**MW-7**	
Date Sampled:			2/22/90		2/22/90		12/6/88		10/04/00		10/04/00		10/04/00		10/04/00	
Screened Interval (ft.)			28-38		18-28		18-28		15-35		11-31		4-16		6-16	
Screened across the water table			No		Yes		Yes		Yes		Yes		Yes		Yes	
Purge / Sample device			Centrifugal Pump /bailer		Centrifugal Pump /bailer		Teflon Bailer		Unk		Unk		Peristaltic Pump		Peristaltic Pump	
LNAPL Present (ft).			Sheen		7.2		8.45		No		No		No		No	
Information Source			Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Lawler, Matusky Skelly Eng.		Arcadis		Arcadis		Arcadis		Arcadis	
Sample Description			**Slightly turbid, sheen, small black particulate matter**		**Turbid, gray, some product**		**Oily product - Similar oil product characteristics as GW-2**									
Parameter	**TOGS 1.1.1 SD Criteria[1]**	**TOGS 1.1.1 GA Criteria[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Aluminum			4,130		2,450		3,220		1,910		382		5,710		11,700	
Antimony		3	28.7	B	38.2	B	-		-		-		-		5.1	B
Arsenic	120	25	3.7	BN	-	N	3	BN	4.9	B	3.6	B	5	B	61.9	
Barium		1,000	200	B	927		881		684		118	B	194	B	667	
Calcium			85,600		269,000		188,000		132,000		70,700		170,000		123,000	
Chromium		50	11.3		31.1		8.6	B	5.5	B	1.1	B	8.8	B	20.8	
Cobalt			19.8	B	10.4	B	6	B	1.8	B	-		3	B	8.4	B
Copper	4.8	200	31.7		-		-		36.7		4.7	B	12.7	B	308	
Iron		300	62,400	R	18,400	R	22,900	R	39,300		24,200		12,800		31,400	
Lead	204	25	10.6	N	15.5	N	12	SA N	21.8		-		40.5		234	
Magnesium		35,000	27,100		40,000		46,700		30,900		20,600		18,900		49,000	
Manganese		300	2,550		2,260		2,130		812		1,250		1,570		1,810	
Nickel	74	100	-		-		-		8	B	2	B	8.3	B	42	
Potassium			3,030	B	47,000		144,000		11,900		6,910		64,100		102,000	
Silver	2.3	50	-		5.7	B	-		-		-		-		-	
Sodium		20,000	42,400		89,600		147,000		200,000		59,900		109,000		226,000	
Vanadium		14	21.7	B	23.6	B	21.5	B	7.2	B	1.2	B	14	B	24.3	B
Zinc	95	2,000	55.3		34.9		44		71.3		29.7		44.6		226	
Cyanide	9,000	200	-		-		-		NA		NA		NA		NA	

Notes:

All units are µg / L.

NA - Not Analyzed

[1] New York State Ambient Water Quality Standards and Guidance Values - TOGS 1.1.1. SD Criteria refer to Surface Water Protection, GA Criteria refer to drinking water protection.

"-" indicates that the constituent was not detected.

▨ indicates that the detected value is greater than one of TOGS criteria.

TABLE 11a
SUMMARY OF PAHs DETECTED IN SURFICIAL URBAN FILL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	SS-01			DSS-01			SS-02			SS-03			SS-04			SS-05		
		Date Sampled:	4/9/2005			4/9/2005			4/9/2005			4/9/2005			4/9/2005			4/9/2005		
		Lab ID:	623178			623179			623180			623181			623182			623183		
Parameter	TAGM		Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
	GW	HB																		
Acenaphthene	90	5000	0.045	J	1.8	-		1.9	-		2	1.5	J	1.9	-		1.8	-		1.8
Acenaphthylene	41	N/A	0.1	J	1.8	0.08	J	1.9	0.068	J	2	0.42	J	1.9	0.16	J	1.8	0.04	J	1.8
Anthracene	700	20000	0.14	J	1.8	0.11	J	1.9	0.14	J	2	1.5	J	1.9	0.1	J	1.8	0.19	J	1.8
Benzo(a)anthracene	3	0.224	***0.25***		0.18	***0.23***		0.19	***0.61***		0.2	***1.4***		0.19	***0.48***		0.18	***0.71***		0.18
Benzo(a)pyrene	11.0	0.0609	***0.28***		0.18	***0.23***		0.19	***0.56***		0.2	***0.94***		0.19	***0.46***		0.18	***0.62***		0.18
Benzo(b)fluoranthene	1.1	N/A	0.26	J	0.18	0.24	J	0.19	0.5	J	0.2	0.93	J	0.19	0.41	J	0.18	0.62	J	0.18
Benzo(g,h,i)perylene	800	N/A	0.27	J	1.8	0.2	J	1.9	0.3	J	2	0.46	J	1.9	0.19	J	1.8	0.22	J	1.8
Benzo(k)fluoranthene	1.1	N/A	0.29		0.18	0.3		0.19	0.61		0.2	1.2		0.19	0.48		0.18	0.78		0.18
Chrysene	0.4	N/A	0.3	J	1.8	0.3	J	1.9	0.65	J	2	1.3	J	1.9	0.46	J	1.8	0.79	J	1.8
Dibenz(a,h)anthracene	165000.0	0.0143	-		0.18	-		0.19	-		0.2	-		0.19	-		0.18	***0.14***	J	0.18
Fluoranthene	1900.0	3000	0.48	J	1.8	0.46	J	1.9	1	J	2	4.4		1.9	0.67	J	1.8	1.5	J	1.8
Fluorene	350	3000	0.044	J	1.8	0.04	J	1.9	-		2	1.8	J	1.9	-		1.8	0.038	J	1.8
Indeno(1,2,3-cd)pyrene	3.2	N/A	0.18	J	0.18	0.13	J	0.19	0.27		0.2	0.37		0.19	0.16	J	0.18	0.25		0.18
Naphthalene	13.0	300	0.092	J	1.8	0.075	J	1.9	0.08	J	2	3.6		1.9	0.038	J	1.8	-		1.8
Phenanthrene	220.00	N/A	0.33	J	1.8	0.28	J	1.9	0.46	J	2	5.9		1.9	0.24	J	1.8	0.5	J	1.8
Pyrene	665.0	2000	0.49	J	1.8	0.5	J	1.9	1.1	J	2	3.8		1.9	0.7	J	1.8	1.4	J	1.8
Total SVOCs		500*	3.56			3.18			6.35			29.52			4.55			7.80		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

Sample point identification number preceded by "D" is a field duplicate.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water (Drinking Water) Quality (ppm).

▒ Indicates that the detected value is greater than the GW.

HB: The Lower of the TAGM 4046 Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

░ Indicates Total Concentrations Exceed the Maximum Values.

Qual - Qualifier applied as a result of data validation

RL - Laboratory Reporting Limit

Tables checked by: J.L.H. on 2/18/2005

TABLE 11b
SUMMARY OF PCBs DETECTED IN SURFICIAL URBAN FILL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point ID:		SS-01			DSS-01			SS-02			SS-03			SS-04			SS-05		
Date Sampled:		4/9/2005			4/9/2005			4/9/2005			4/9/2005			4/9/2005			4/9/2005		
Lab ID:		623178			623179			623180			623181			623182			623183		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1016		-		0.74	-		0.75	-		0.078	-		0.077	-		0.073	-		0.074
Aroclor-1221		-		0.74	-		0.75	-		0.078	-		0.077	-		0.073	-		0.074
Aroclor-1232		-		0.74	-		0.75	-		0.078	-		0.077	-		0.073	-		0.074
Aroclor-1242		-		0.74	-		0.75	-		0.078	-		0.077	-		0.073	-		0.074
Aroclor-1248		-		0.74	-		0.75	-		0.078	-		0.077	-		0.073	-		0.074
Aroclor-1254		-		0.74	-		0.75	-		0.078	-		0.077	-		0.073	-		0.074
Aroclor-1260		15	J	0.74	14	J	0.75	0.38	J	0.078	0.23	J	0.077	-		0.073	-		0.074
Total PCB	1	15			14			0.38			0.23			0			0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

Sample point identification number preceded by "D" is a field duplicate.

▨ Indicates that the detected value is greater than the TAGM.

Tables checked by: J.L.H. on 5/18/2005

TABLE 11c
SUMMARY OF INORGANICS DETECTED IN SURFICIAL URBAN FILL
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point ID:	SS-01			DSS-01			SS-02			SS-03			SS-04			SS-05		
	Date Sampled:	4/9/2005			4/9/2005			4/9/2005			4/9/2005			4/9/2005			4/9/2005		
	Lab ID:	623178			623179			623180			623181			623182			623183		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	3970		13.9	5090		14	4570		13.3	4390		32.8	6210		13.6	5670		13.8
Antimony	0.6	--		1.3	--		1.3	--		1.2	--		3	--		1.3	--		1.3
Arsenic	15.5	5.1		0.71	5		0.72	3.9		0.68	4.5		1.7	1.7		0.7	1.9		0.71
Barium	600	106		0.38	124		0.38	98		0.36	87.4	B	0.89	61.3		0.37	40.3	B	0.38
Beryllium	1.75	0.23	B	0.067	0.23	B	0.067	0.25	B	0.064	0.23	B	0.16	0.28	B	0.065	0.32	B	0.066
Cadmium	1	0.47	J	0.089	0.54	J	0.089	0.43	J	0.085	0.65	J	0.21	--		0.087	0.46	J	0.088
Calcium	35000	42200		9.5	54400		9.5	32900		9.1	76100		22.3	29500		9.2	1640		9.4
Chromium	40	38	J	0.36	43.3	J	0.36	20.3	J	0.34	27.1	J	0.84	15	J	0.35	13.6	J	0.35
Cobalt	60	12.2	J	0.38	11.7	J	0.38	4.2	J	0.36	5.4	J	0.89	4.2	J	0.37	4.5	J	0.38
Copper	50	59.5	J	0.82	66.8	J	0.83	43.4	J	0.79	67.5	J	1.9	25.3	J	0.8	388	J	0.82
Iron	550000	26600	J	8.7	21400	J	8.8	10100	J	8.4	55600	J	20.6	10600	J	8.5	13500	J	8.7
Lead	608	913	J	0.58	894	J	0.58	245	J	0.55	475	J	1.4	46.1	J	0.57	64.4	J	0.57
Magnesium	5000	8680		9.3	6880		9.3	4260		8.9	22000		21.8	12100		9	1520		9.2
Manganese	5000	231		0.27	586		0.27	172		0.26	376		0.63	202		0.26	303		0.27
Mercury	0.2	0.1		0.019	0.19		0.019	0.16		0.02	0.15		0.019	0.04		0.018	0.07		0.018
Nickel	25	27.3	J	0.53	24.6	J	0.54	14.8	J	0.51	25.8	J	1.3	11.7	J	0.52	13.4	J	0.53
Potassium	43000	621	B	70.2	676	B	70.6	671	B	67.2	580	B	165	796	B	68.6	409	B	69.7
Selenium	3.9	--		0.93	--		0.94	--		0.9	--		2.2	--		0.91	--		0.93
Silver	--	--		0.31	--		0.31	--		0.3	--		0.73	--		0.3	--		0.31
Sodium	8000	232	B	88	391	B	88.5	161	B	84.3	--		207	134	B	86	--		87.4
Thallium	--	--		1	--		1.1	--		1	--		0.99	--		1	--		1
Vanadium	300	21		0.44	19.9		0.45	21.1		0.43	18.2	B	1	24.9		0.43	20		0.44
Zinc	50	145	J	1.3	148	J	1.3	162	J	1.2	294	J	3	66.2	J	1.3	334	J	1.3

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

Sample point identification number preceded by "D" is a field duplicate.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

▨ Indicates that the detected value is greater than the TAGM objective.

Tables checked by: J.L.H. on 5/18/2005

TABLE 12A
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-05**			**SB-05**			**SB-05**			**SB-05**			**SB-06**			**SB-06**			**SB-06**		
Sample Point ID:			SB050207			SB050411			SB050616			SB050922			SBSB060307			SBSB060412			SBSB060517		
Date Sampled:			12/29/2003			12/29/2003			12/29/2003			12/29/2003			11/6/2003			11/6/2003			11/6/2003		
Lab ID:			491750			491752			491754			491757			478847			478848			478849		
Depth (Ft.- BGS):			6			10			15			21.5			6.5			11			15		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																					
Acetone	0.11	8000	-	U	0.56	-	U	0.52	4.3	J	0.52	-	U	0.5	-	U	0.54	-	UJ	1.1	-	U	0.59
Benzene	0.06	24	0.046		0.11	-	U	0.1	-	U	0.1	-	U	0.1	0.058	JN	0.11	-	U	0.22	-	U	0.12
Carbon Disulfide	2.7	8000	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	UJ	1.1	-	U	0.59
Chlorobenzene	1.7	2000	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
Chloromethane			-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	UJ	0.54	-	U	1.1	-	UJ	0.59
cis-1,2-Dichloroethene			0.14		0.56	-	U	0.52	-	U	0.52	-	U	0.5	1.2		0.54	-	U	1.1	-	U	0.59
Cyclohexane			0.066		0.56	0.17	J	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
1,2-Dichlorobenzene	7.9	N/A	0.054	JN	0.56	0.22		0.52	0.14		0.52	0.12	JN	0.5	-	U	0.54	1.6		1.1	0.09	J	0.59
1,3-Dichlorobenzene	1.55	N/A	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
1,4-Dichlorobenzene	8.5	N/A	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	0.31		1.1	-	U	0.59
Dichlorodifluoromethane			-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	UJ	1.1	0.59		0.59
1,1-Dichloroethane	0.2	N/A	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
1,1-Dichloroethene	0.4	12	-	U	0.22	-	U	0.21	-	U	0.21	-	U	0.2	-	U	0.22	-	U	0.44	-	U	0.24
Ethylbenzene	5.5	8000	0.056	J	0.44	0.22	J	0.42	0.09	J	0.42	0.31	J	0.4	0.32	J	0.44	0.38	JN	0.88	-	U	0.48
Isopropylbenzene			0.11	J	0.56	0.39	J	0.52	0.22	J	0.52	0.45	J	0.5	0.28	J	0.54	10		1.1	0.13	JN	0.59
Methyl Acetate			-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
Methyl Cyclohexane			0.27	J	0.56	1		0.52	0.23	J	0.52	0.18	J	0.5	-	U	0.54	3.1		1.1	-	U	0.59
Methylene Chloride	0.1	93	-	U	0.33	-	U	0.31	-	U	0.32	-	U	0.3	-	U	0.33	-	U	0.66	-	U	0.36
MTBE			0.11	J	0.56	0.055	J	0.52	-	U	0.52	-	U	0.5	0.1	J	0.54	-	U	1.1	-	U	0.59
Styrene			-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	0.11		0.11	-	U	0.22	-	U	0.12
Tetrachloroethene	1.4	14	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.22	-	U	0.12
Toluene	1.5	20000	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	0.11	J	0.54	-	U	1.1	-	U	0.59
trans-1,2-Dichloroethene	0.3	2000	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
1,2,4-Trichlorobenzene	3.4	N/A	-	UJ	0.56	-	UJ	0.52	-	U	0.52	-	UJ	0.5	-	UJ	0.54	-	U	1.1	-	UJ	0.59
1,1,1-Trichloroethane	0.76	7000	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	-	U	0.54	-	U	1.1	-	U	0.59
Trichloroethene	0.7	64	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	1.2		0.11	-	U	0.22	-	U	0.12
Vinyl Chloride	0.12	N/A	-	U	0.56	-	U	0.52	-	U	0.52	-	U	0.5	0.3	JN	0.54	-	U	1.1	-	U	0.59
Xylene (Total)	1.2	200000	0.23	J	0.56	1		0.52	0.46	J	0.52	1.8		0.5	0.43	J	0.54	0.14	JN	1.1	-	U	0.59
Total VOCs		*	1.1			3.1			5.4			2.9			4.1			15.5			0.8		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 1

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (mg/kg or ppm).

▨ indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for total VOCs of 10 (ppm or mg/kg) based on aesthetic and other concerns.

░ Indicates Total VOC Concentrations Exceed the Maximum Value

TABLE 12A
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-06**			**SB-07**			**SB-07**			**SB-07**			**SB-07**			**SB-09**			**SB-09**			**SB-09**		
Sample Point ID:			SBSB060622			SB070208			SB070412			SB070617			SB070923			SB090207			SB090410			SB090617		
Date Sampled:			11/6/2003			12/31/2003			12/31/2003			12/23/2003			12/31/2003			12/23/2003			12/23/2003			12/23/2003		
Lab ID:			478850			491763			491765			491767			491770			490832			490834			490836		
Depth (Ft.- BGS):			20			6			11			16.5			22			5.5			9.5			16.5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																								
Acetone	0.11	8000	-	U	0.56	0.73	J	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	5.2	J	0.56	1.3	J	0.51
Benzene	0.06	24	-	U	0.11	-	U	0.11	-	U	0.12	-	U	0.44	-	U	1.1	-	U	0.12	-	U	0.11	-	U	0.1
Carbon Disulfide	2.7	8000	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	0.12	J	0.59	0.078	J	0.56	-	U	0.51
Chlorobenzene	1.7	2000	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
Chloromethane			-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
cis-1,2-Dichloroethene			-	U	0.56	-	U	0.53	0.088	JN	0.62	-	U	2.2	-	U	5.4	0.061	JN	0.59	-	U	0.56	0.043	JN	0.51
Cyclohexane			-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	1.1		5.4	0.18		0.59	0.26	J	0.56	0.37	J	0.51
1,2-Dichlorobenzene	7.9	N/A	0.075	JN	0.56	-	U	0.53	0.24	JN	0.62	0.3	JN	2.2	1.1	JN	5.4	-	U	0.59	-	U	0.56	-	U	0.51
1,3-Dichlorobenzene	1.55	N/A	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
1,4-Dichlorobenzene	8.5	N/A	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
Dichlorodifluoromethane			-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
1,1-Dichloroethane	0.2	N/A	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
1,1-Dichloroethene	0.4	12	-	U	0.22	-	U	0.21	-	U	0.25	-	U	0.88	-	U	2.2	-	U	0.24	-	U	0.22	-	U	0.2
Ethylbenzene	5.5	8000	0.061	J	0.45	-	U	0.42	0.085	J	0.5	1.7	J	1.8	6.7		4.3	0.03	J	0.47	0.042	J	0.44	0.45		0.41
Isopropylbenzene			0.17	J	0.56	-	U	0.53	1.3		0.62	2.1	J	2.2	6.5		5.4	-	U	0.59	0.03	J	0.56	0.42	J	0.51
Methyl Acetate			-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
Methyl Cyclohexane			-	U	0.56	-	U	0.53	0.87		0.62	1.3	J	2.2	5.3	J	5.4	0.47	J	0.59	1.3		0.56	3		0.51
Methylene Chloride	0.1	93	-	U	0.34	-	U	0.32	-	U	0.37	-	U	1.3	-	U	3.2	-	U	0.35	-	U	0.33	-	U	0.31
MTBE			-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	0.043		0.59	-	U	0.56	-	U	0.51
Styrene			-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	0.59		0.59	-	U	0.56	-	U	0.51
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.11	-	U	0.11	-	U	0.12	-	U	0.44	-	U	1.1	-	U	0.12	-	U	0.11	-	U	0.1
Tetrachloroethene	1.4	14	-	U	0.11	-	U	0.11	-	U	0.12	-	U	0.44	-	U	1.1	-	U	0.12	-	U	0.11	-	U	0.1
Toluene	1.5	20000	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	0.62		0.51
trans-1,2-Dichloroethene	0.3	2000	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
1,2,4-Trichlorobenzene	3.4	N/A	-	UJ	0.56	-	U	0.53	-	UJ	0.62	-	UJ	2.2	-	UJ	5.4	-	U	0.59	-	U	0.56	-	U	0.51
1,1,1-Trichloroethane	0.76	7000	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
Trichloroethene	0.7	64	-	U	0.11	-	U	0.11	0.15		0.12	-	U	0.44	-	U	1.1	-	U	0.12	-	U	0.11	-	U	0.1
Vinyl Chloride	0.12	N/A	-	U	0.56	-	U	0.53	-	U	0.62	-	U	2.2	-	U	5.4	-	U	0.59	-	U	0.56	-	U	0.51
Xylene (Total)	1.2	200000	0.36		0.56	-	U	0.53	0.29	J	0.62	10		2.2	33		5.4	0.12	J	0.59	0.52	J	0.56	4.7		0.51
Total VOCs		*	0.7			0.7			3.0			**15.4**			**53.7**			1.6			7.4			**10.9**		

Notes:

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TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 1

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (mg/kg or ppm).

▒ indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for total VOCs of 10 (ppm or mg/kg) based on aesthetic and other concerns.

░ Indicates Total VOC Concentrations Exceed the Maximum Value

TABLE 12A
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	SB-09			SB-10			SB-10			SB-10			SB-10			SB-11			SB-11			SB-11		
		Sample Point ID:	SB090821			SB100206			SB100411			SB100716			SB100920			SB110207			SB110411			SB110717		
		Date Sampled:	12/23/2003			12/19/2003			12/19/2003			12/22/2003			12/22/2003			12/29/2003			12/29/2003			12/29/2003		
		Lab ID:	490838			489716			489718			490758			490760			491782			491784			491787		
		Depth (Ft.- BGS):	20			5.5			10			15.5			19			5			10			16		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																								
Acetone	0.11	8000	-	U	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	8.4	J	0.59	-	U	0.52	-	U	0.51
Benzene	0.06	24	0.093	J	0.11	0.16		0.11	0.63		0.11	-	U	0.1	-	U	0.098	0.04	J	0.12	-	U	0.1	-	U	0.1
Carbon Disulfide	2.7	8000	-	U	0.54	0.064	J	0.55	-	U	0.54	-	U	0.51	-	U	0.49	0.081	JN	0.59	-	U	0.52	-	U	0.51
Chlorobenzene	1.7	2000	-	U	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
Chloromethane			-	U	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
cis-1,2-Dichloroethene			1.5		0.54	0.2		0.55	0.4	JN	0.54	-	U	0.51	-	U	0.49	0.4	J	0.59	-	U	0.52	-	U	0.51
Cyclohexane			-	U	0.54	0.95		0.55	0.4	J	0.54	0.071	J	0.51	-	U	0.49	0.055		0.59	0.054	J	0.52	-	U	0.51
1,2-Dichlorobenzene	7.9	N/A	-	U	0.54	11		0.55	5.2		0.54	0.86		0.51	0.52		0.49	0.064	J	0.59	0.28	JN	0.52	0.91		0.51
1,3-Dichlorobenzene	1.55	N/A	-	U	0.54	-	U	0.55	-	U	0.54	0.063	JN	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
1,4-Dichlorobenzene	8.5	N/A	-	U	0.54	-	U	0.55	-	U	0.54	0.074	JN	0.51	0.054	JN	0.49	-	U	0.59	-	U	0.52	0.14	JN	0.51
Dichlorodifluoromethane			-	U	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
1,1-Dichloroethane	0.2	N/A	0.073	J	0.54	-	U	0.55	0.077	J	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
1,1-Dichloroethene	0.4	12	0.21	JN	0.21	-	U	0.22	-	U	0.22	-	U	0.2	-	U	0.2	-	U	0.24	-	U	0.21	-	U	0.2
Ethylbenzene	5.5	8000	0.9		0.43	11		0.44	6.1		0.43	0.49		0.4	0.25	J	0.39	0.056	J	0.47	-	U	0.41	-	U	0.41
Isopropylbenzene			0.64		0.54	1.3		0.55	1.4		0.54	0.34	J	0.51	0.15	J	0.49	-	U	0.59	0.1	J	0.52	0.41	J	0.51
Methyl Acetate			-	U	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	8.5		0.59	-	U	0.52	-	U	0.51
Methyl Cyclohexane			14		0.54	1.9		0.55	1.2		0.54	0.31	J	0.51	0.14	J	0.49	0.12	J	0.59	0.31	J	0.52	-	U	0.51
Methylene Chloride	0.1	93	-	U	0.32	-	U	0.33	-	U	0.32	-	U	0.3	-	U	0.3	-	U	0.36	-	U	0.31	-	U	0.3
MTBE			0.045	J	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
Styrene			-	U	0.54	0.6		0.55	-	U	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.098	-	U	0.12	-	U	0.1	-	U	0.1
Tetrachloroethene	1.4	14	0.051	J	0.11	0.37		0.11	0.12		0.11	-	U	0.1	-	U	0.098	-	U	0.12	-	U	0.1	-	U	0.1
Toluene	1.5	20000	1.1		0.54	3.3		0.55	5.1		0.54	-	U	0.51	-	U	0.49	0.1	J	0.59	-	U	0.52	-	U	0.51
trans-1,2-Dichloroethene	0.3	2000	-	U	0.54	-	U	0.55	-	U	0.54	-	U	0.51	-	U	0.49	0.06	J	0.59	-	U	0.52	-	U	0.51
1,2,4-Trichlorobenzene	3.4	N/A	-	U	0.54	0.81		0.55	0.96		0.54	0.34	JN	0.51	0.16	JN	0.49	-	U	0.59	-	UJ	0.52	-	UJ	0.51
1,1,1-Trichloroethane	0.76	7000	0.089	JN	0.54	0.12	J	0.55	-	U	0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
Trichloroethene	0.7	64	0.19		0.11	1		0.11	0.13		0.11	-	U	0.1	-	U	0.098	0.074		0.12	-	U	0.1	-	U	0.1
Vinyl Chloride	0.12	N/A	-	U	0.54	-	U	0.55	1.7		0.54	-	U	0.51	-	U	0.49	-	U	0.59	-	U	0.52	-	U	0.51
Xylene (Total)	1.2	200000	11		0.54	31		0.55	25		0.54	1.6		0.51	0.71		0.49	0.19	J	0.59	0.19	J	0.52	0.64		0.51
Total VOCs		*	**29.9**			**63.8**			**48.4**			4.1			2.0			**18.1**			0.9			2.1		

Notes:

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TABLE 12A
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SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-11**			**SB-12**			**SB-12**			**SB-12**			**SB-12**			**SB-14**			**SB-14**			**SB-14**		
Sample Point ID:			SB110921			SB120107			SB120311			SB120617			SB120821			SB140107			SB140512			SB140717		
Date Sampled:			12/30/2003			12/18/2003			12/18/2003			12/18/2003			12/18/2003			12/17/2003			12/17/2003			12/17/2003		
Lab ID:			491789			489748			489750			489753			489755			488620			488624			488626		
Depth (Ft.- BGS):			20.5			6.5			10			16.5			20.5			5			11			16.5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																								
Acetone	0.11	8000	-	U	0.5	1.9	J	0.61	0.73	J	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
Benzene	0.06	24	0.045	J	0.1	0.11	J	0.12	-	U	0.1	-	U	0.11	-	U	0.1	-	U	0.1	0.38		0.1	0.22		0.1
Carbon Disulfide	2.7	8000	-	U	0.5	0.053	J	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	0.098	J	0.52	-	U	0.51
Chlorobenzene	1.7	2000	-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
Chloromethane			-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
cis-1,2-Dichloroethene			-	U	0.5	0.091	JN	0.61	0.51	JN	0.51	-	U	0.54	-	U	0.5	-	U	0.53	5.6		0.52	0.31	J	0.51
Cyclohexane			0.31	J	0.5	-	U	0.61	-	U	0.51	0.35	J	0.54	0.52		0.5	-	U	0.53	0.42	J	0.52	3.1		0.51
1,2-Dichlorobenzene	7.9	N/A	1.5		0.5	-	U	0.61	-	U	0.51	0.37	J	0.54	-	U	0.5	-	U	0.53	5.2		0.52	1.6		0.51
1,3-Dichlorobenzene	1.55	N/A	-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
1,4-Dichlorobenzene	8.5	N/A	0.22	JN	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	5.1		0.52	-	U	0.51
Dichlorodifluoromethane			-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
1,1-Dichloroethane	0.2	N/A	-	U	0.5	0.32	J	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	13		0.52	-	U	0.51
1,1-Dichloroethene	0.4	12	-	U	0.2	-	U	0.24	-	U	0.2	-	U	0.22	-	U	0.2	-	U	0.21	-	U	0.21	-	U	0.2
Ethylbenzene	5.5	8000	0.28	J	0.4	-	U	0.49	-	U	0.41	3.2		0.44	3.6		0.4	-	U	0.42	5		0.42	2		0.41
Isopropylbenzene			0.68		0.5	-	U	0.61	-	U	0.51	0.71		0.54	0.31	J	0.5	-	U	0.53	1.5		0.52	1.5		0.51
Methyl Acetate			-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
Methyl Cyclohexane			1.4		0.5	0.071	JN	0.61	-	U	0.51	1.3		0.54	2.8		0.5	-	U	0.53	1.7		0.52	13		0.51
Methylene Chloride	0.1	93	-	U	0.3	-	U	0.37	-	U	0.31	-	U	0.33	-	U	0.3	-	U	0.32	1.1		0.32	-	U	0.3
MTBE			-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-		0.52	-	U	0.51
Styrene			-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.1	-	U	0.12	-	U	0.1	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	-	U	0.1
Tetrachloroethene	1.4	14	-	U	0.1	-	U	0.12	-	U	0.1	-	U	0.11	-	U	0.1	-	U	0.1	5.5		0.1	0.16		0.1
Toluene	1.5	20000	0.1	J	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	6.9		0.52	1.8		0.51
trans-1,2-Dichloroethene	0.3	2000	-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
1,2,4-Trichlorobenzene	3.4	N/A	0.13	JN	0.5	-	U	0.61	-	U	0.51	0.073	JN	0.54	-	U	0.5	-	U	0.53	0.52	JN	0.52	0.21	JN	0.51
1,1,1-Trichloroethane	0.76	7000	-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	-	U	0.52	-	U	0.51
Trichloroethene	0.7	64	-	U	0.1	-	U	0.12	-	U	0.1	-	U	0.11	-	U	0.1	-	U	0.1	3.5		0.1	-	U	0.1
Vinyl Chloride	0.12	N/A	-	U	0.5	-	U	0.61	-	U	0.51	-	U	0.54	-	U	0.5	-	U	0.53	0.15	J	0.52	-	U	0.51
Xylene (Total)	1.2	200000	1.9		0.5	-	U	0.61	-	U	0.51	-	U	0.54	0.82		0.5	-	U	0.53	14		0.52	7.8		0.51
Total VOCs		*	6.6			2.5			1.2			6.0			8.1			0.0			**69.7**			**31.7**		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 1

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (mg/kg or ppm).

▒ indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for total VOCs of 10 (ppm or mg/kg) based on aesthetic and other concerns.

░ Indicates Total VOC Concentrations Exceed the Maximum Value

TABLE 12A
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-14**			**GAGW-04**			**GAGW-04**			**GAGW-04**			**GAGW-04**			**GAGW-07**			**GAGW-07**			**GAL-01**		
Sample Point ID:			SB140922			SBGAGW040102			SBGAGW040206			SBGAGW040312			SBGAGW040418			GAGW-070211			GAGW-070516			SBGAL010306		
Date Sampled:			12/17/2003			11/10/2003			11/10/2003			11/10/2003			11/10/2003			6/21/2004			6/21/2004			10/17/2003		
Lab ID:			488628			479535			479536			479537			479538			540797			540800			472676		
Depth (Ft.- BGS):			21			1			5			11			16			10.5			15.5			5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																								
Acetone	0.11	8000	-	U	0.5	-	UJ	0.56	-	UJ	0.56	-	UJ	0.5	-	UJ	0.51	-	UJ	1	-	UJ	1	-	R	0.6
Benzene	0.06	24	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.2	-	U	0.21	0.41		0.12
Carbon Disulfide	2.7	8000	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	0.099	J	0.6
Chlorobenzene	1.7	2000	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
Chloromethane			-	U	0.5	-	UJ	0.56	-	UJ	0.56	-	UJ	0.5	-	UJ	0.51	-	U	1	-	U	1	-	U	0.6
cis-1,2-Dichloroethene			-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	0.66		0.6
Cyclohexane			-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	0.63		0.6
1,2-Dichlorobenzene	7.9	N/A	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	0.28	JN	1	0.29	JN	1	0.72	J	0.6
1,3-Dichlorobenzene	1.55	N/A	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
1,4-Dichlorobenzene	8.5	N/A	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
Dichlorodifluoromethane			-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	UJ	1	-	UJ	1	-	U	0.6
1,1-Dichloroethane	0.2	N/A	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
1,1-Dichloroethene	0.4	12	-	U	0.2	-	U	0.22	-	U	0.22	-	U	0.2	-	U	0.2	-	U	0.4	-	U	0.41	-	U	0.24
Ethylbenzene	5.5	8000	0.15	J	0.4	-	U	0.44	-	U	0.44	-	U	0.4	-	U	0.41	0.2	J	0.81	0.7	J	0.83	0.7		0.48
Isopropylbenzene			0.3	J	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	1.5		1	1.5		1	1.9	J	0.6
Methyl Acetate			-	U	0.5	-	UJ	0.56	-	UJ	0.56	-	UJ	0.5	-	UJ	0.51	-	U	1	-	U	1	-	UJ	0.6
Methyl Cyclohexane			3.4		0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	0.42	J	1	0.15	J	1	3.1		0.6
Methylene Chloride	0.1	93	-	U	0.3	-	U	0.33	-	U	0.33	-	U	0.3	-	U	0.31	-	U	0.6	-	U	0.62	-	U	0.36
MTBE			-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
Styrene			-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.2	-	U	0.21	-	U	0.12
Tetrachloroethene	1.4	14	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.2	-	U	0.21	-	U	0.12
Toluene	1.5	20000	0.094	J	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	0.31	J	0.6
trans-1,2-Dichloroethene	0.3	2000	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
1,2,4-Trichlorobenzene	3.4	N/A	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	UJ	0.6
1,1,1-Trichloroethane	0.76	7000	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
Trichloroethene	0.7	64	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.2	-	U	0.21	0.5		0.12
Vinyl Chloride	0.12	N/A	-	U	0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	-	U	1	-	U	1	-	U	0.6
Xylene (Total)	1.2	200000	0.31		0.5	-	U	0.56	-	U	0.56	-	U	0.5	-	U	0.51	3		1	4.4		1	1.2		0.6
Total VOCs		*	4.3			0.0			0.0			0.0			0.0			5.4			7.0			**10.2**		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 1

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (mg/kg or ppm).

■ indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for total VOCs of 10 (ppm or mg/kg) based on aesthetic and other concerns.

▨ Indicates Total VOC Concentrations Exceed the Maximum Value

TABLE 12A
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**GAL-01**			**GAL-02**			**GAL-02**			**GAL-02 (Duplicate)**			**GAL-02**			**GAL-03**			**GAL-03**			**GAL-03**			**GAL-03**		
Sample Point ID:			SBGAL010512			SBGAL020407			SBGAL022011			DSBGAL022011			SBGAL020817			SBGAL030307			SBGAL030512			SBGAL030716			SBGAL030920		
Date Sampled:			10/20/2003			10/28/2003			10/29/2003			10/29/2003			10/28/2003			10/31/2003			10/31/2003			11/3/2003			11/3/2003		
Lab ID:			473290			475734			475747			475748			475738			476806			476808			477462			477464		
Depth (Ft.- BGS):			11			6.5			10			10			16.5			6.5			11			14.5			19		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																											
Acetone	0.11	8000	-	U	1	2.4	J	0.59	-	U	0.52	-	U	0.54	2	J	0.53	1.4	J	0.57	2.5	J	0.54	-	UJ	0.51	-	UJ	0.49
Benzene	0.06	24	-	U	0.21	0.07	J	0.12	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.099
Carbon Disulfide	2.7	8000	-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Chlorobenzene	1.7	2000	-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Chloromethane			-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	***0.68***		0.49
cis-1,2-Dichloroethene			-	U	1	0.2	J	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Cyclohexane			0.51	J	1	0.7		0.59	0.13	JN	0.52	0.26	JN	0.54	0.53	J	0.53	-	U	0.57	-	U	0.54	-	U	0.51	0.096	J	0.49
1,2-Dichlorobenzene	7.9	N/A	3.6		1	0.26	JN	0.59	0.28	J	0.52	0.46	J	0.54	-	U	0.53	-	U	0.57	0.15	J	0.54	0.27	J	0.51	0.26	J	0.49
1,3-Dichlorobenzene	1.55	N/A	-	UJ	1	-	UJ	0.59	-	UJ	0.52	-	UJ	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
1,4-Dichlorobenzene	8.5	N/A	0.12	JN	1	-	U	0.59	0.022	J	0.52	0.037	JN	0.54	-	U	0.53	-	U	0.57	-	U	0.54	0.081		0.51	0.056		0.49
Dichlorodifluoromethane			-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
1,1-Dichloroethane	0.2	N/A	-	U	1	0.36	J	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
1,1-Dichloroethene	0.4	12	-	U	0.42	-	U	0.24	-	U	0.21	-	U	0.21	-	U	0.21	-	U	0.23	-	U	0.22	-	U	0.2	-	U	0.2
Ethylbenzene	5.5	8000	2.5		0.84	-	U	0.47	-	U	0.42	-	U	0.43	-	U	0.42	-	U	0.46	-	U	0.43	-	U	0.41	-	U	0.4
Isopropylbenzene			2.9		1	0.066	J	0.59	-	U	0.52	0.061		0.54	0.18	J	0.53	-	U	0.57	0.35	J	0.54	0.076	JN	0.51	0.08	JN	0.49
Methyl Acetate			-	U	1	-	U	0.59	-	U	0.52	0.95		0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Methyl Cyclohexane			2.8		1	0.47		0.59	-	U	0.52	-	U	0.54	1.2		0.53	-	U	0.57	0.76		0.54	0.34	J	0.51	0.38	J	0.49
Methylene Chloride	0.1	93	-	U	0.63	-	U	0.36	-	U	0.31	-	U	0.32	-	U	0.32	-	U	0.34	-	U	0.32	-	U	0.3	-	U	0.3
MTBE			-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Styrene			-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.21	-	U	0.12	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.099
Tetrachloroethene	1.4	14	-	U	0.21	-	U	0.12	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.099
Toluene	1.5	20000	0.58	J	1	0.099	J	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
trans-1,2-Dichloroethene	0.3	2000	-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
1,2,4-Trichlorobenzene	3.4	N/A	-	U	1	-	U	0.59	-	U	0.52	0.14	J	0.54	-	U	0.53	-	UJ	0.57	-	UJ	0.54	-	U	0.51	-	U	0.49
1,1,1-Trichloroethane	0.76	7000	-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Trichloroethene	0.7	64	-	U	0.21	0.055	JN	0.12	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.099
Vinyl Chloride	0.12	N/A	-	U	1	-	U	0.59	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.57	-	U	0.54	-	U	0.51	-	U	0.49
Xylene (Total)	1.2	200000	5.5		1	-	U	0.59	-	U	0.52	-	U	0.54	0.15	J	0.53	-	U	0.57	0.11		0.54	0.15	J	0.51	0.29	J	0.49
Total VOCs		*	**18.5**			4.7			0.4			1.9			4.1			1.4			3.9			0.9			1.8		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 1

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (mg/kg or ppm).

■ indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for total VOCs of 10 (ppm or mg/kg) based on aesthetic and other concerns.

░ Indicates Total VOC Concentrations Exceed the Maximum Value

TABLE 12A
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**GAL-03**			**GAL-04**			**GAL-04**			**GAL-15**			**GAL-18**			**GAL-18**			**GAL-18**			**SB-16 (GAL-19)**			**SB-17 (GAL20)**		
Sample Point ID:			SBGAL031124			SBGAL040207			SBGAL040411			GAL150313			GAL-180111			GAL-180314			GAL-180417			SB16GAL19.0117			SB17GAL20-0217		
Date Sampled:			11/3/2003			10/22/2003			10/22/2003			6/26/2004			7/14/2004			7/14/2004			7/14/2004			2/24/2005			3/1/2005		
Lab ID:			477466			474678			474680			542182			547021			547023			547024			610388			611404		
Depth (Ft.- BGS):			23.5			6			9			12.5			10.5			13.5			16.5			17			17		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																											
Acetone	0.11	8000	-	UJ	0.52	-	U	0.52	3.3	J	0.54	1.8		0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
Benzene	0.06	24	0.086	J	0.1	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.2
Carbon Disulfide	2.7	8000	-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	UJ	0.55	-	UJ	1
Chlorobenzene	1.7	2000	-	U	0.52	0.36	J	0.52	0.22		0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
Chloromethane			1.1		0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	UJ	0.55	-	UJ	1
cis-1,2-Dichloroethene			-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	UJ	0.51	-	UJ	0.5	-	UJ	0.52	0.28	J	0.55	-	U	1
Cyclohexane			0.93		0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	UJ	0.55	-	UJ	1
1,2-Dichlorobenzene	7.9	N/A	0.39	J	0.52	0.47	J	0.52	0.93		0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	0.56		0.55	-	U	1
1,3-Dichlorobenzene	1.55	N/A	-	U	0.52	0.13		0.52	0.088	J	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
1,4-Dichlorobenzene	8.5	N/A	0.078		0.52	0.25		0.52	0.19		0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
Dichlorodifluoromethane			-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	UJ	0.55	-	UJ	1
1,1-Dichloroethane	0.2	N/A	-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
1,1-Dichloroethene	0.4	12	-	U	0.21	-	U	0.21	-	U	0.22	-	U	0.22	-	U	0.2	-	U	0.2	-	U	0.21	-	U	0.22	-	U	0.41
Ethylbenzene	5.5	8000	0.28	J	0.42	0.038	J	0.41	0.18	J	0.43	-	U	0.45	-	U	0.41	-	U	0.4	-	U	0.41	1.5		0.44	2.1		0.82
Isopropylbenzene			0.25	J	0.52	0.53		0.52	0.48	J	0.54	-	U	0.56	1.1		0.51	1.1		0.5	2		0.52	1.4		0.55	2.5		1
Methyl Acetate			-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	UJ	0.51	-	UJ	0.5	-	UJ	0.52	-	U	0.55	-	U	1
Methyl Cyclohexane			2.6		0.52	0.12	J	0.52	0.22	J	0.54	-	U	0.56	1		0.51	0.54		0.5	1.3		0.52	-	U	0.55	4.8	J	1
Methylene Chloride	0.1	93	-	U	0.31	-	U	0.31	-	U	0.32	-	U	0.33	-	U	0.31	-	U	0.3	-	U	0.31	0.65		0.33	-	U	0.62
MTBE			-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
Styrene			-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
1,1,2,2-Tetrachloroethane	0.6	35	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.2
Tetrachloroethene	1.4	14	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.2
Toluene	1.5	20000	0.13		0.52	-	U	0.52	0.2	J	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	0.46	J	0.55	-	U	1
trans-1,2-Dichloroethene	0.3	2000	-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
1,2,4-Trichlorobenzene	3.4	N/A	-	U	0.52	-	U	0.52	0.12	JN	0.54	-	U	0.56	-	UJ	0.51	-	UJ	0.5	-	UJ	0.52	-	U	0.55	-	U	1
1,1,1-Trichloroethane	0.76	7000	-	U	0.52	-	U	0.52	-	JN	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
Trichloroethene	0.7	64	-	U	0.1	-	U	0.1	-	U	0.11	-	U	0.11	-	U	0.1	-	U	0.1	-	U	0.1	0.57		0.11	-	U	0.2
Vinyl Chloride	0.12	N/A	-	U	0.52	-	U	0.52	-	U	0.54	-	U	0.56	-	U	0.51	-	U	0.5	-	U	0.52	-	U	0.55	-	U	1
Xylene (Total)	1.2	200000	1.6		0.52	0.35		0.52	1.5		0.54	-			0.85		0.51	2.8		0.5	5.7		0.52	3.4		0.55	4.8		1
Total VOCs		*	7.4			2.2			7.4			1.8			3.0			4.4			9.0			8.8			**14.2**		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 1

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (mg/kg or ppm).

▨ indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for total VOCs of 10 (ppm or mg/kg) based on aesthetic and other concerns.

▒ Indicates Total VOC Concentrations Exceed the Maximum Value

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	**SB-05**			**SB-05**			**SB-05**			**SB-05**			**SB-06**			**SB-06**			**SB-06**		
		Sample Point ID:	SB050207			SB050411			SB050616			SB050922			SBSB060307			SBSB060412			SBSB060517		
		Date Sampled:	12/29/2003			12/29/2003			12/29/2003			12/29/2003			11/6/2003			11/6/2003			11/6/2003		
		Lab ID:	491750			491752			491754			491757			478847			478848			478849		
		Depth (Ft.- BGS):	6			10			15			21.5			6.5			11			15		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																					
2,4-Dimethylphenol	--	--	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
2-Methylnaphthalene	36.4	N/A	1.3		0.74	1	J	1.8	0.091	J	0.68	0.7	J	0.69	0.15	J	7.3	2.5	J	3.9	1.5	J	8.3
4-Chloro-3-methylphenol	0.24	N/A	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
4-Methylphenol	0.9	4000	0.8		0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Acenaphthene	90.0	5000	0.16	J	0.74	0.063	J	1.8	0.022	J	0.2	0.7	J	0.69	0.47	J	7.3	0.097	J	3.9	-	U	8.3
Acenaphthylene	41.0	N/A	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	0.15	J	7.3	-	U	3.9	-	U	8.3
Acetophenone	--	--	-	J	0.74	-	J	1.8	-	J	0.7	-	J	0.69	0.17	J	7.3	-	J	3.9	-	U	33
Anthracene	700.0	20000	0.3	J	0.74	0.41	J	1.8	0.2	J	0.68	0.7	J	0.69	0.82	J	7.3	0.19	J	3.9	0.77	J	8.3
Benzo(a)anthracene	3.0	0.224	***0.69***	JN	0.074	***4.1***	JN	0.18	***2***	JN	1	0.07	JN	0.069	***5.5***	JN	0.73	***0.74***	JN	0.39	***2.9***	JN	0.83
Benzo(a)pyrene	11.0	0.0609	-	U	0.074	-	U	0.18	-	U	0.07	-	U	0.069	***5.4***		0.73	***0.3***	J	0.39	-	U	0.83
Benzo(b)fluoranthene	1.1	N/A	-	U	0.074	-	U	0.18	-	U	0.07	-	U	0.069	3		0.73	0.18	J	0.39	-	U	0.83
Benzo(g,h,i)perylene	800	N/A	0.6	J	0.74	-	U	1.8	-		0.032	-	JN	0.69	5.2	J	7.3	0.3	J	3.9	-	U	8.3
Benzo(k)fluoranthene	1.1	N/A	-	J	0.74	-	U	0.18	-	U	0.07	-	U	0.069	-	U	0.73	-	U	0.39	-	U	0.83
bis(2-Ethylhexyl)phthalate	435.0	50	1.1		0.74	-	U	1.8	0.34	J		0.7			-	U	7.3	1.5	JN	3.9	-	U	8.3
Butylbenzylphthalate	122.0	20000	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Carbazole	--	--	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Chrysene	0.4	N/A	1.2		0.74	5.2		1.8	2.9		1.5	0.7		0.69	8.1		7.3	1	J	3.9	3.8	J	8.3
Dibenzo(a,h)anthracene	165000	0.0143	-	U	0.074	-	U	0.18	-	U	0.07	***0.036***	J	0.069	***2.7***		0.73	***0.13***	J	0.39	-	U	0.83
Dibenzofuran	6.2	N/A	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	0.19	J	7.3	-	U	3.9	-	U	8.3
Di-n-octylphthalate	120.0	2000	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Diphenyl	--	--	0.21	J	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Fluoranthene	1900.0	3000	-	U	0.74	1.2	J	1.8	0.82		0.52	0.7	J	0.69	2.2	J	7.3	0.35	J	3.9	0.76	J	8.3
Fluorene	350.0	3000	0.31	J	0.74	0.15	J	1.8	0.07	J	0.36	0.7	J	0.69	0.43	J	7.3	0.084	J	3.9	0.22	J	8.3
Indeno(1,2,3-cd)pyrene	3.2	N/A	0.25		0.074	-	U	0.18	-	U	0.07	-	U	0.069	2.2		0.73	0.14	J	0.39	-	U	0.83
Naphthalene	13.0	300	0.62	J	0.74	0.23	J	1.8	0.063	J	0.64	0.7	J	0.69	0.18	J	7.3	-	U	3.9	-	U	8.3
N-Nitrosodiphenylamine	--	--	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Phenanthrene	220.0	N/A	0.75		0.74	0.18	J	1.8	0.097	J	2.2	0.7		0.69	3.3	J	7.3	0.42	J	3.9	0.46	J	8.3
Phenol	0.03	50000	-	U	0.74	-	U	1.8	-	U	0.7	-	U	0.69	-	U	7.3	-	U	3.9	-	U	8.3
Pyrene	665.0	2000	0.55	J	0.74	0.54	J	1.8	0.4	JN		0.7			4.8	J	7.3	0.6	J	3.9	1.8	J	8.3
Total SVOCs		500*	8.8			13.1			7.0			7.1			45.0			8.5			12.2		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

▨ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

░ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-06**			**SB-07**			**SB-07**			**SB-07**			**SB-07**			**SB-09**			**SB-09**		
Sample Point ID:			SBSB060622			SB070310			SB070412			SB070617			SB070923			SB090207			SB090410		
Date Sampled:			11/6/2003			12/31/2003			12/31/2003			12/23/2003			12/31/2003			12/23/2003			12/23/2003		
Lab ID:			478850			491764			491765			491767			491770			490832			490834		
Depth (Ft.- BGS):			20			8			11			16.5			22			5.5			9.5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																					
2,4-Dimethylphenol	--	--	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
2-Methylnaphthalene	36.4	N/A	0.4	J	1.9	0.21	J	1.9	0.31	J	2.1	0.85	J	3.7	4.8	J	9.1	-	U	8.3	-	U	7.5
4-Chloro-3-methylphenol	0.24	N/A	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
4-Methylphenol	0.9	4000	-	U	1.9	0.14	J	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Acenaphthene	90.0	5000	0.11	J	1.9	-	U	1.9	0.26	J	2.1	0.21	J	3.7	0.96	J	9.1	-	U	8.3	0.23	J	7.5
Acenaphthylene	41.0	N/A	-	U	1.9	0.24	J	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Acetophenone	--	--	-	U	7.6	-	U	1.9	-	J	2.1	-	J	3.7	-	J	9.1	-	U	8.3	-	J	7.5
Anthracene	700.0	20000	0.63	J	1.9	0.38	J	1.9	0.37	J	2.1	1.4	J	3.7	3.8	J	9.1	0.49	J	8.3	1.6	J	7.5
Benzo(a)anthracene	3.0	0.224	***1.8***	JN	0.19	***0.74***	JN	0.19	***0.41***	JN	0.21	***3.6***	JN	0.37	***4.6***	JN	0.91	***7.3***	JN	0.83	***13***	JN	0.75
Benzo(a)pyrene	11.0	0.0609	***0.27***		0.19	-	U	0.19	-	U	0.21	***0.97***		0.37	***0.96***		0.91	***1.3***		0.83	***1.2***		0.75
Benzo(b)fluoranthene	1.1	N/A	0.23		0.19	-	U	0.19	-	U	0.21	0.58	J	0.37	-	U	0.91	-	U	0.83	-	U	0.75
Benzo(g,h,i)perylene	800	N/A	0.22	J	1.9	0.37	J	1.9	0.5	J	2.1	0.49	J	3.7	-	U	9.1	1.1	J	8.3	0.52	J	7.5
Benzo(k)fluoranthene	1.1	N/A	-	U	0.19	-	U	0.19	-	U	0.21	-	U	0.37	-	U	0.91	-	U	0.83	-	U	0.75
bis(2-Ethylhexyl)phthalate	435.0	50	1.8	JN	1.9	3.3		1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Butylbenzylphthalate	122.0	20000	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Carbazole	--	--	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Chrysene	0.4	N/A	2.3		1.9	1.1	J	1.9	0.74	J	2.1	5		3.7	7.3	J	9.1	12		8.3	18		7.5
Dibenzo(a,h)anthracene	165000	0.0143	***0.19***	JN	0.19	-	U	0.19	***0.14***	J	0.21	***0.28***	J	0.37	-	U	0.91	***1.1***		0.83	***1.1***		0.75
Dibenzofuran	6.2	N/A	-	U	1.9	-	U	1.9	0.27	J	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Di-n-octylphthalate	120.0	2000	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Diphenyl	--	--	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Fluoranthene	1900.0	3000	0.48	J	1.9	1.3	J	1.9	1.2	J	2.1	1.2	J	3.7	1.9	J	9.1	1.4	J	8.3	1.8	J	7.5
Fluorene	350.0	3000	0.32	J	1.9	-	U	1.9	0.51	J	2.1	0.23	J	3.7	1.6	J	9.1	0.18	J	8.3	0.24	J	7.5
Indeno(1,2,3-cd)pyrene	3.2	N/A	0.12	J	0.19	0.21		0.19	0.28		0.21	0.18	J	0.37	-	U	0.91	0.59	J	0.83	-	U	0.75
Naphthalene	13.0	300	-	U	1.9	0.17	J	1.9	0.45	J	2.1	3.1	J	3.7	2.5	J	9.1	-	U	8.3	-	U	7.5
N-Nitrosodiphenylamine	--	--	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Phenanthrene	220.0	N/A	1.7	J	1.9	0.9	J	1.9	0.76	J	2.1	2	J	3.7	11		9.1	1.3	J	8.3	4.1	J	7.5
Phenol	0.03	50000	-	U	1.9	-	U	1.9	-	U	2.1	-	U	3.7	-	U	9.1	-	U	8.3	-	U	7.5
Pyrene	665.0	2000	1.5	J	1.9	1.8	J	1.9	0.88	J	2.1	3.3	J	3.7	5.1	J	9.1	8	J	8.3	10		7.5
Total SVOCs		500*	12.1			10.9			7.1			23.4			44.5			34.8			51.8		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

▨ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

░ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-09**			**SB-09**			**SB-10**			**SB-10**			**SB-10**			**SB-10**			**SB-11**		
Sample Point ID:			SB090617			SB090821			SB100206			SB100411			SB100716			SB100920			SB110207		
Date Sampled:			12/23/2003			12/23/2003			12/19/2003			12/19/2003			12/22/2003			12/22/2003			12/29/2003		
Lab ID:			490836			490838			489716			489718			490758			490760			491782		
Depth (Ft.- BGS):			16.5			20			5.5			10			15.5			19			5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																					
2,4-Dimethylphenol	--	--	-	U	7.1	-	U	36	0.49	JN	19	2.7	J	7.6	-	U	3.5	-	U	1.7	-	U	0.8
2-Methylnaphthalene	36.4	N/A	1.2	J	7.1	8.7	J	36	47		19	56		7.6	21		3.5	7.2		1.7	0.14	J	0.8
4-Chloro-3-methylphenol	0.24	N/A	-	U	7.1	-	U	36	-	U	19	-	U	7.6	-	U	3.5	-	U	1.7	-	U	0.8
4-Methylphenol	0.9	4000	-	U	7.1	-	U	36	2.3	J	19	-	U	7.6	-	U	3.5	-	U	1.7	0.067	J	0.8
Acenaphthene	90.0	5000	-	U	7.1	-	U	36	2	J	19	1.2	J	7.6	0.43	J	3.5	0.18	J	1.7	0.082	J	0.8
Acenaphthylene	41.0	N/A	-	U	7.1	-	U	36	-	U	19	-	U	7.6	-	U	3.5	-	U	1.7	-	U	0.8
Acetophenone	--	--	-	U	7.1	-	U	36	-	J	19	-	J	7.6	-	J	3.5	-	J	1.7	-	J	0.8
Anthracene	700.0	20000	1.8	J	7.1	5.5	J	36	2	J	19	1.3	J	7.6	0.3	J	3.5	0.13	J	1.7	0.18	J	0.8
Benzo(a)anthracene	3.0	0.224	***16***	JN	0.71	***21***	JN	3.6	***1.6***	JN	1.9	***2.5***	JN	0.76	***0.38***	JN	0.35	0.19	JN	0.17	-	J	0.8
Benzo(a)pyrene	11.0	0.0609	***1.8***		0.71	***3.5***	J	3.6	***0.6***	J	1.9	-	U	0.76	-	U	0.35	-	U	0.17	-	U	0.08
Benzo(b)fluoranthene	1.1	N/A	2		0.71	-	U	3.6	-	U	1.9	-	U	0.76	-	U	0.35	-	U	0.17	-	U	0.08
Benzo(g,h,i)perylene	800	N/A	0.72	J	7.1	1.1	J	36	-	U	19	18		7.6	0.45	J	3.5	0.35	J	1.7	-	U	0.8
Benzo(k)fluoranthene	1.1	N/A	-	U	0.71	-	U	3.6	-	U	1.9	-	U	0.76	-	U	0.35	-	U	0.17	-	U	0.08
bis(2-Ethylhexyl)phthalate	435.0	50	-	U	7.1	-	U	36	***120***		19	7.5	J	7.6	1.5	J	3.5	0.6	J	1.7	1.6		0.8
Butylbenzylphthalate	122.0	20000	-	U	7.1	-	U	36	-	UJ	19	-	UJ	7.6	-	UJ	3.5	-	U	1.7	0.22	J	0.8
Carbazole	--	--	-	U	7.1	-	U	36	0.75	J	19	-	U	7.6	-	U	3.5	-	U	1.7	-	U	0.8
Chrysene	0.4	N/A	20		7.1	29	J	36	1.8	JN	19	3.7	J	7.6	0.55	JN	3.5	0.44	J	1.7	0.81		0.8
Dibenzo(a,h)anthracene	165000	0.0143	***0.91***		0.71	-	U	3.6	-	U	1.9	***6.4***		0.76	-	U	0.35	-	U	0.17	-	U	0.08
Dibenzofuran	6.2	N/A	-	U	7.1	-	U	36	-	U	19	-	U	7.6	-	U	3.5	-	U	1.7	-	U	0.8
Di-n-octylphthalate	120.0	2000	-	U	7.1	-	U	36	5.7	J	19	-	U	7.6	-	U	3.5	-	U	1.7	-	U	0.8
Diphenyl	--	--	-	U	7.1	-	U	36	-	U	19	-	U	7.6	0.51	JN	3.5	-	U	1.7	-	U	0.8
Fluoranthene	1900.0	3000	1.8	J	7.1	-	U	36	2.1	J	19	1	J	7.6	0.33	J	3.5	0.19	J	1.7	0.43	J	0.8
Fluorene	350.0	3000	0.24	J	7.1	2.4	J	36	4.4	J	19	2.9	J	7.6	0.94	J	3.5	0.32	J	1.7	0.14	J	0.8
Indeno(1,2,3-cd)pyrene	3.2	N/A	-	U	0.71	-	U	3.6	-	U	1.9	5.9		0.76	-	U	0.35	0.11	J	0.17	0.066	J	0.08
Naphthalene	13.0	300	0.45	JN	7.1	3	J	36	27		19	36		7.6	9.4		3.5	3.4		1.7	0.079	J	0.8
N-Nitrosodiphenylamine	--	--	-	U	7.1	-	U	36	-	U	19	-	U	7.6	-	U	3.5	-	U	1.7	-	U	0.8
Phenanthrene	220.0	N/A	4.9	J	7.1	19	J	36	12	J	19	8.8		7.6	2.5	J	3.5	0.8	J	1.7	0.44	J	0.8
Phenol	0.03	50000	-	U	7.1	-	U	36	3.7	J	19	1	J	7.6	-	U	3.5	-	U	1.7	-	U	0.8
Pyrene	665.0	2000	12		7.1	20	J	36	5.5	J	19	6.2	J	7.6	1.2	J	3.5	0.5	J	1.7	0.83		0.8
Total SVOCs		500*	63.8			113.2			238.9			161.1			39.5			14.4			5.1		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

▨ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

░ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			**SB-11**			**SB-11**			**SB-11**			**SB-12**			**SB-12**			**SB-12**			**SB-12**		
Sample Point ID:			SB110411			SB110717			SB110921			SB120107			SB120311			SB120617			SB120821		
Date Sampled:			12/29/2003			12/29/2003			12/30/2003			12/18/2003			12/18/2003			12/18/2003			12/18/2003		
Lab ID:			491784			491787			491789			489748			489750			489753			489755		
Depth (Ft.- BGS):			10			16			20.5			6.5			10			16.5			20.5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																					
2,4-Dimethylphenol	--	--	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
2-Methylnaphthalene	36.4	N/A	-	U	0.7	6.3		3.5	6.5	J	7.1	0.13	J	4.3	-	U	0.36	-	U	3.7	-	U	18
4-Chloro-3-methylphenol	0.24	N/A	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
4-Methylphenol	0.9	4000	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Acenaphthene	90.0	5000	0.8		0.7	0.47	J	3.5	0.88	J	7.1	0.087	J	4.3	-	U	0.36	0.38	J	3.7	2.2	J	18
Acenaphthylene	41.0	N/A	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Acetophenone	--	--	-		0.7	-	J	3.5	-	J	7.1	-	J	4.3	-	U	0.36	-	J	3.7	-	J	18
Anthracene	700.0	20000	0.42	J	0.7	0.9	J	3.5	1.8	J	7.1	0.38	J	4.3	-	U	0.36	1	J	3.7	5.4	J	18
Benzo(a)anthracene	3.0	0.224	0.17	JN	0.07	***1.2***	JN	0.35	***2.1***	JN	0.71	***3.2***	JN	0.43	0.02	JN	0.036	***2.2***	JN	0.37	***15***	JN	1.8
Benzo(a)pyrene	11.0	0.0609	-	U	0.07	-	U	0.35	-	U	0.71	***3.7***		0.43	0.018	J	0.036	-	U	0.37	***3.7***		1.8
Benzo(b)fluoranthene	1.1	N/A	-	U	0.07	-	U	0.35	-	U	0.71	2.4		0.43	0.0095	J	0.036	-	U	0.37	3.7		1.8
Benzo(g,h,i)perylene	800	N/A	0.06	J	0.7	0.3	J	3.5	0.7	J	7.1	12		4.3	0.076	J	0.36	1.1	J	3.7	1.5	J	18
Benzo(k)fluoranthene	1.1	N/A	-	U	0.07	-	U	0.35	-	U	0.71	-	U	0.43	-	U	0.036	-	U	0.37	-	U	1.8
bis(2-Ethylhexyl)phthalate	435.0	50	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Butylbenzylphthalate	122.0	20000	-	U	0.7	-	U	3.5	-	U	7.1	-	UJ	4.3	-	U	0.36	-	UJ	3.7	-	U	18
Carbazole	--	--	0.14	J	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Chrysene	0.4	N/A	0.4	J	0.7	1.7	J	3.5	3.3	J	7.1	4.9		4.3	0.015	JN	0.36	3.3	JN	3.7	19		18
Dibenzo(a,h)anthracene	165000	0.0143	-	U	0.07	-	U	0.35	***0.41***	J	0.71	***3.4***	JN	0.43	-	U	0.036	-	U	0.37	***1.8***		1.8
Dibenzofuran	6.2	N/A	0.53	J	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Di-n-octylphthalate	120.0	2000	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Diphenyl	--	--	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Fluoranthene	1900.0	3000	0.77		0.7	0.82	J	3.5	1.2	J	7.1	1.1	J	4.3	-	U	0.36	0.7	J	3.7	2.4	J	18
Fluorene	350.0	3000	0.68	J	0.7	0.91	J	3.5	1.4	J	7.1	-	U	4.3	-	U	0.36	0.79	J	3.7	3.9	J	18
Indeno(1,2,3-cd)pyrene	3.2	N/A	-	U	0.07	-	U	0.35	-	U	0.71	2.5	JN	0.43	-	U	0.036	0.72		0.37	-	U	1.8
Naphthalene	13.0	300	0.064	J	0.7	-	U	3.5	0.93	J	7.1	0.088	J	4.3	-	U	0.36	-	U	3.7	0.64	JN	18
N-Nitrosodiphenylamine	--	--	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Phenanthrene	220.0	N/A	-	U	0.7	2.8	J	3.5	5	J	7.1	0.75	J	4.3	-	U	0.36	0.32	J	3.7	21		18
Phenol	0.03	50000	-	U	0.7	-	U	3.5	-	U	7.1	-	U	4.3	-	U	0.36	-	U	3.7	-	U	18
Pyrene	665.0	2000	0.64	J	0.7	1.2	J	3.5	2.2	J	7.1	3.9	J	4.3	-	U	0.36	5.1	J	3.7	19		18
Total SVOCs		500*	4.7			16.6			26.4			38.5			0.1			15.6			99.2		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

▨ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

░ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	**SB-14**			**SB-14**			**SB-14**			**SB-14**			**GAGW-04**			**GAGW-04**			**GAGW-04**		
		Sample Point ID:	SB140107			SB140512			SB140717			SB140922			SBGAGW040102			SBGAGW040206			SBGAGW040312		
		Date Sampled:	12/17/2003			12/17/2003			12/17/2003			12/17/2003			11/10/2003			11/10/2003			11/10/2003		
		Lab ID:	488620			488624			488626			488628			479535			479536			479537		
		Depth (Ft.- BGS):	5			11			16.5			21			1			5			11		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																					
2,4-Dimethylphenol	--	--	1.8	JN	19	0.1	J	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
2-Methylnaphthalene	36.4	N/A	27		19	0.16	J	0.7	11		8.7	-	U	8.9	0.084	J	0.37	-	U	0.39	-	U	0.35
4-Chloro-3-methylphenol	0.24	N/A	-	U	19	0.17	J	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
4-Methylphenol	0.9	4000	-	U	19	-	U	0.7	-	U	8.7	-	U	8.9	0.016	J	0.37	-	U	0.39	-	U	0.35
Acenaphthene	90.0	5000	2	J	19	0.086	J	0.7	2	J	8.7	1.2	J	8.9	0.08	J	0.37	-	U	0.39	-	U	0.35
Acenaphthylene	41.0	N/A	-	U	19	-	U	0.7	-	U	8.7	-	U	8.9	0.063	J	0.37	-	U	0.39	-	U	0.35
Acetophenone	--	--	-	J	19	-	J	0.7	-	J	8.7	-	J	8.9	-	J	0.37	-	U	0.39	-	U	0.35
Anthracene	700.0	20000	2.3	J	19	0.23	J	0.7	4.8	J	8.7	3.3	J	8.9	0.14	J	0.37	-	U	0.39	-	U	0.35
Benzo(a)anthracene	3.0	0.224	***10***	JN	1.9	***1***	JN	0.07	***13***	JN	0.87	***9.3***	JN	0.89	***1.9***	JN	0.037	-	U	0.039	-	U	0.035
Benzo(a)pyrene	11.0	0.0609	***13***		1.9	***1.1***		0.07	***4***		0.87	***2.8***		0.89	***1.7***		0.037	-	U	0.039	-	U	0.035
Benzo(b)fluoranthene	1.1	N/A	7.8	J	1.9	0.56	J	0.07	3.3		0.87	2.1	J	0.89	1.4		0.037	-	U	0.039	-	U	0.035
Benzo(g,h,i)perylene	800	N/A	16	J	19	0.84		0.7	2.4	J	8.7	2.2	J	8.9	0.97		0.37	-	U	0.39	-	U	0.35
Benzo(k)fluoranthene	1.1	N/A	-	U	1.9	-	U	0.07	-	U	0.87	0.83	JN	0.89	0.82		0.037	-	U	0.039	-	U	0.035
bis(2-Ethylhexyl)phthalate	435.0	50	6.2	J	19	0.19	J	0.7	-	U	8.7	-	U	8.9	0.089	JN	0.37	0.21	J	0.39	-	U	0.35
Butylbenzylphthalate	122.0	20000	-	U	19	-	U	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
Carbazole	--	--	0.55	J	19	0.058	J	0.7	-	U	8.7	-	U	8.9	0.041	J	0.37	-	U	0.39	-	U	0.35
Chrysene	0.4	N/A	13	J	19	1.1		0.7	15		8.7	12		8.9	3		0.37	-	U	0.39	-	U	0.35
Dibenzo(a,h)anthracene	165000	0.0143	***9.4***		1.9	***0.37***		0.07	***1.9***		0.87	***1***		0.89	***0.59***		0.037	-	U	0.039	-	U	0.035
Dibenzofuran	6.2	N/A	1.6	J	19	0.062	J	0.7	-	U	8.7	-	U	8.9	0.036	J	0.37	-	U	0.39	-	U	0.35
Di-n-octylphthalate	120.0	2000	-	U	19	-	U	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
Diphenyl	--	--	-	U	19	-	U	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
Fluoranthene	1900.0	3000	4.6	J	19	0.54	J	0.7	2.3	J	8.7	1.5	J	8.9	1.1		0.37	-	U	0.39	-	U	0.35
Fluorene	350.0	3000	3.6	J	19	0.17	J	0.7	2.4	J	8.7	1.6	J	8.9	0.046	J	0.37	-	U	0.39	-	U	0.35
Indeno(1,2,3-cd)pyrene	3.2	N/A	7		1.9	0.36		0.07	1.1		0.87	0.73	J	0.89	0.5		0.037	-	U	0.039	-	U	0.035
Naphthalene	13.0	300	6.1	J	19	0.1	J	0.7	4.5	J	8.7	0.6	J	8.9	0.1	J	0.37	-	U	0.39	-	U	0.35
N-Nitrosodiphenylamine	--	--	-	U	19	0.055	J	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
Phenanthrene	220.0	N/A	14	J	19	0.69	J	0.7	14		8.7	9.5		8.9	0.68		0.37	-	U	0.39	-	U	0.35
Phenol	0.03	50000	-	U	19	-	U	0.7	-	U	8.7	-	U	8.9	-	U	0.37	-	U	0.39	-	U	0.35
Pyrene	665.0	2000	13	J	19	1.1		0.7	18		8.7	12		8.9	2.6		0.37	-	U	0.39	-	U	0.35
Total SVOCs		500*	159.0			9.0			99.7			60.7			16.0			0.2			0.0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

▨ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

░ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

Tables checked by J.L.H. on 5/12/2005

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:			GAGW-04			GAL-01			GAL-01			GAL-02			GAL-02			GAL-02 (Duplicate)			GAL-02			GAL-03		
Sample Point ID:			SBGAGW040418			SBGAL010306			SBGAL010512			SBGAL020407			SBGAL022011			DSBGAL022011			SBGAL020817			SBGAL030307		
Date Sampled:			11/10/2003			10/17/2003			10/20/2003			10/28/2003			10/29/2003			10/29/2003			10/28/2003			10/31/2003		
Lab ID:			479538			472676			473290			475734			475747			475748			475738			476806		
Depth (Ft.- BGS):			16			5			11			6.5			10			10			16.5			6.5		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																								
2,4-Dimethylphenol	--	--	-	U	0.36	-	U	8.2	-	U	7.1	-	U	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
2-Methylnaphthalene	36.4	N/A	-	U	0.36	0.32	J	8.2	7.6	J	7.1	0.22	J	4	-	U	3.7	-	U	3.8	1.3	J	9	0.53	J	8.1
4-Chloro-3-methylphenol	0.24	N/A	-	U	0.36	-	U	8.2	-	U	7.1	-	U	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
4-Methylphenol	0.9	4000	-	U	0.36	-	U	8.2	-	U	7.1	0.18	J	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
Acenaphthene	90.0	5000	-	U	0.36	0.74	J	8.2	0.32	J	7.1	0.32	J	4	1.1	J	3.7	1.5	J	3.8	0.59	J	9	2.4	J	8.1
Acenaphthylene	41.0	N/A	-	U	0.36	-	U	8.2	-	U	7.1	0.12	J	4	0.34	J	3.7	0.51	J	3.8	-	U	9	-	U	8.1
Acetophenone	--	--	-	U	0.36	-	J	8.2	-	J	7.1	0.21	J	4	-	J	3.7	-	J	3.8	-	J	9	-	J	8.1
Anthracene	700.0	20000	0.0078	J	0.36	0.63	J	8.2	0.5	J	7.1	0.8	J	4	1.2	J	3.7	1.5	J	3.8	1.7	J	9	1.3	J	8.1
Benzo(a)anthracene	3.0	0.224	0.034	JN	0.036	***3***	JN	0.82	***1.2***	JN	0.71	***17***	JN	0.4	***1.7***	JN	0.37	***1.6***	JN	0.38	***7.7***	JN	0.9	-	U	0.81
Benzo(a)pyrene	11.0	0.0609	-	U	0.036	***5***		0.82	-	U	0.71	***52***	J	0.4	***2.6***	J	0.37	***3.3***	J	0.38	***3***		0.9	***0.68***	J	0.81
Benzo(b)fluoranthene	1.1	N/A	-	U	0.036	2.6		0.82	-	U	0.71	-	UJ	0.4	1.2		0.37	1.3		0.38	1.5		0.9	-	U	0.81
Benzo(g,h,i)perylene	800	N/A	-	U	0.36	5.7	J	8.2	0.51	J	7.1	31	J	4	4		3.7	6.6		3.8	1.7	J	9	0.91	J	8.1
Benzo(k)fluoranthene	1.1	N/A	-	U	0.036	-	U	0.82	-	U	0.71	-	UJ	0.4	0.7	J	0.37	-	U	0.38	0.73	JN	0.9	-	U	0.81
bis(2-Ethylhexyl)phthalate	435.0	50	0.64	JN	0.36	-	U	8.2	12	J	7.1	1.8	J	4	-	U	3.7	1.5	J	3.8	-	U	9	-	U	8.1
Butylbenzylphthalate	122.0	20000	0.12	J	0.36	-	U	8.2	-	U	7.1	-	UJ	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
Carbazole	--	--	-	U	0.36	-	U	8.2	0.24	J	7.1	-	U	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
Chrysene	0.4	N/A	0.052	J	0.36	5.5	J	8.2	1.6	J	7.1	28	J	4	2.3	J	3.7	2.4	J	3.8	10		9	-	U	8.1
Dibenzo(a,h)anthracene	165000	0.0143	-	U	0.036	***1.4***	JN	0.82	-	U	0.71	***14***	J	0.4	***1.1***		0.37	***1.8***		0.38	***0.98***		0.9	***0.44***	J	0.81
Dibenzofuran	6.2	N/A	-	U	0.36	-	U	8.2	0.4	J	7.1	0.099	J	4	0.99	J	3.7	1.2	J	3.8	0.24	J	9	3.3	J	8.1
Di-n-octylphthalate	120.0	2000	-	U	0.36	-	U	8.2	-	U	7.1	-	UJ	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
Diphenyl	--	--	-	U	0.36	-	U	8.2	0.76	J	7.1	-	U	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
Fluoranthene	1900.0	3000	0.02	J	0.36	1.9	J	8.2	0.97	J	7.1	1.8	J	4	2.4	J	3.7	2.4	J	3.8	1.2	J	9	0.42	J	8.1
Fluorene	350.0	3000	-	U	0.36	1.2	J	8.2	1	J	7.1	0.18	J	4	1.9	J	3.7	2.4	J	3.8	0.89	J	9	6	J	8.1
Indeno(1,2,3-cd)pyrene	3.2	N/A	-	U	0.036	1.2	J	0.82	0.2	J	0.71	12	J	0.4	1.4		0.37	2.3		0.38	0.78	J	0.9	0.34	J	0.81
Naphthalene	13.0	300	-	U	0.36	-	U	8.2	4.4	J	7.1	0.26	J	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
N-Nitrosodiphenylamine	--	--	-	U	0.36	-	U	8.2	-	U	7.1	-	U	4	0.29	J	3.7	0.5	J	3.8	1.5	J	9	5.6	J	8.1
Phenanthrene	220.0	N/A	0.028	J	0.36	3.7	J	8.2	2.6	J	7.1	0.46	J	4	-	U	3.7	-	U	3.8	4.8	J	9	-	U	8.1
Phenol	0.03	50000	-	U	0.36	-	U	8.2	-	U	7.1	-	U	4	-	U	3.7	-	U	3.8	-	U	9	-	U	8.1
Pyrene	665.0	2000	0.053	J	0.36	4.5	J	8.2	1.9	J	7.1	24	J	4	2.5	J	3.7	3.2	J	3.8	6	J	9	1.2	J	8.1
Total SVOCs		500*	1.0			37.4			36.2			184.4			25.7			34.0			44.6			23.1		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

■ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

▨ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

TABLE 12B
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		Sample Point:	**GAL-03**			**GAL-03**			**GAL-03**			**GAL-03**			**GAL-04**			**GAL-04**			**SB-16 (GAL-19)**			**SB-17 (GAL-20)**		
		Sample Point ID:	SBGAL030512			SBGAL030716			SBGAL030920			SBGAL031124			SBGAL040207			SBGAL040411			SB16GAL19.0117			SB17GAL20-0217		
		Date Sampled:	10/31/2003			11/3/2003			11/3/2003			11/3/2003			10/22/2003			10/22/2003			2/24/2005			3/1/2005		
		Lab ID:	476808			477462			477464			477466			474678			474680			610388			611404		
		Depth (Ft.- BGS):	11			14.5			19			23.5			6			9			17			17		
Parameter	**TAGM**		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	GW	**USEPA HB**																								
2,4-Dimethylphenol	--	--	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	-	U	3.6	-	U		-	U	
2-Methylnaphthalene	36.4	N/A	4	J	7.4	-	U	1.8	0.31	J	1.7	6.4	J	36	4.7		3.6	12		3.6	1.1	J	1.9	1	J	3.4
4-Chloro-3-methylphenol	0.24	N/A	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	-	U	3.6	-	U		0.12	J	3.4
4-Methylphenol	0.9	4000	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	0.58	JN	3.6	0.27	J	1.9	-	U	
Acenaphthene	90.0	5000	-	U	7.4	0.069	J	1.8	0.18	J	1.7	1.2	J	36	0.26	J	3.6	0.84	J	3.6	0.22	J	1.9	0.43	J	3.4
Acenaphthylene	41.0	N/A	-	U	7.4	0.096	JN	1.8	0.076	J	1.7	-	U	36	-	U	3.6	-	U	3.6	-	U		-	U	
Acetophenone	--	--	-	U	7.4	-	J	1.8	-	J	1.7	-	J	36	-	J	3.6	-	J	3.6	-	U		-	U	
Anthracene	700.0	20000	1.1	J	7.4	0.088	J	1.8	0.42	J	1.7	5.9	J	36	-	U	3.6	0.61	J	3.6	0.19	J	1.9	1.9	J	3.4
Benzo(a)anthracene	3.0	0.224	-	U	0.74	0.14	JN	0.18	***0.84***	JN	0.17	***12***	JN	3.6	***1.8***	JN	0.36	***2.7***	JN	0.36	***0.48***		0.19	***8.3***		0.34
Benzo(a)pyrene	11.0	0.0609	-	U	0.74	-	U	0.18	***0.17***	J	0.17	***1.9***	J	3.6	***2.9***		0.36	***3.5***	J	0.36	***0.48***		0.19	***1.8***		0.34
Benzo(b)fluoranthene	1.1	N/A	-	U	0.74	-	U	0.18	0.11	J	0.17	0.96	J	3.6	1.1	J	0.36	1.3	J	0.36	0.39		0.19	1.6		0.34
Benzo(g,h,i)perylene	800	N/A	0.42	J	7.4	0.29	J	1.8	0.14	J	1.7	1.3	J	36	2.4	J	3.6	2.4	J	3.6	0.48	J	1.9	0.34	J	3.4
Benzo(k)fluoranthene	1.1	N/A	-	U	0.74	-	U	0.18	-	U	0.17	-	U	3.6	-	UJ	0.36	-	UJ	0.36	0.24		0.19	0.52	J	0.34
bis(2-Ethylhexyl)phthalate	435.0	50	-	U	7.4	0.46	J	1.8	-	U	1.7	-	U	36	-	U	3.6	2.7	J	3.6	0.84	J	1.9	-	U	
Butylbenzylphthalate	122.0	20000	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	-	U	3.6	-	U		-	U	
Carbazole	--	--	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	-	U	3.6	0.089	J	1.9	-	U	
Chrysene	0.4	N/A	-	U	7.4	0.55	J	1.8	1.5	J	1.7	21	J	36	2	J	3.6	3.2	J	3.6	0.72	J	1.9	9.9		3.4
Dibenzo(a,h)anthracene	165000	0.0143	-	U	0.74	***0.086***	J	0.18	-	U	0.17	-	U	3.6	***1.1***		0.36	***1.2***		0.36	***0.21***		0.19	***0.29***	J	0.34
Dibenzofuran	6.2	N/A	6.4	J	7.4	0.075	J	1.8	0.1	J	1.7	1.2	J	36	-	U	3.6	-	U	3.6	0.15	J	1.9	-	U	
Di-n-octylphthalate	120.0	2000	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	-	U	3.6	-	U		-	U	
Diphenyl	--	--	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	-	U	3.6	-	U		-	U	
Fluoranthene	1900.0	3000	0.46	J	7.4	0.12	J	1.8	0.3	J	1.7	3	J	36	0.41	J	3.6	1.3	J	3.6	0.6	J	1.9	2.9	J	3.4
Fluorene	350.0	3000	6.5	J	7.4	0.14	J	1.8	0.34	J	1.7	3.9	J	36	0.44	J	3.6	1.5	J	3.6	0.26	J	1.9	0.48	J	3.4
Indeno(1,2,3-cd)pyrene	3.2	N/A	0.16	J	0.74	0.1	J	0.18	-	U	0.17	-	U	3.6	0.87		0.36	0.99		0.36	0.23		0.19	0.25	J	0.34
Naphthalene	13.0	300	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	0.41	J	3.6	6.1		3.6	0.78	J	1.9	1.8	J	3.4
N-Nitrosodiphenylamine	--	--	6	J	7.4	0.16	J	1.8	0.5	J	1.7	-	U	36	0.5	J	3.6	-	U	3.6	-	U		-	U	
Phenanthrene	220.0	N/A	12		7.4	0.042	J	1.8	1.8		1.7	23	J	36	1.3	J	3.6	3.9		3.6	0.84	J	1.9	2.6	J	3.4
Phenol	0.03	50000	-	U	7.4	-	U	1.8	-	U	1.7	-	U	36	-	U	3.6	0.99	J	3.6	-	U		-	U	
Pyrene	665.0	2000	1.3	J	7.4	0.35	J	1.8	0.97	J	1.7	14	J	36	0.97	J	3.6	2.2	J	3.6	0.62	J	1.9	10		3.4
Total SVOCs		500*	38.3			2.8			7.8			95.8			21.2			48.0			9.2			44.2		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - Table 2

GW: TAGM 4046 Soil Cleanup Objectives to Protect Ground Water Quality (ppm).

▨ Indicates that the detected value is greater than the GW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Value (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

* TAGM 4046 establishes a maximum value for both total (500 ppm or mg/kg) and individual (50 ppm or mg/kg) SVOCs.

"N/A" indicates a TAGM Objective is not available.

" -- " indicates the constituent does not have a TAGM Objective value.

░ Indicates SVOC Concentration Exceed the Maximum Individual Value of 50 mg/kg.

Tables checked by J.L.H. on 5/12/2005

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-05**			**SB-05**			**SB-05**			**SB-05**			**SB-06**			**SB-06**			**SB-06**		
	Sample Point ID:	SB050207			SB050411			SB050616			SB050922			SBSB060307			SBSB060412			SBSB060517		
	Date Sampled:	12/29/2003			12/29/2003			12/29/2003			12/29/2003			11/6/2003			11/6/2003			11/6/2003		
	Lab ID:	491750			491752			491754			491757			478847			478848			478849		
	Depth (Ft.- BGS):	6			10			15			21.5			6.5			11			15		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																					
Aroclor-1242		0.28	J	0.075	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	0.22		0.071	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1260		0.22	J	0.075	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072
Total PCB	10	0.5			0			0.22			0.0			0.0			0.0			0.0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-06**			**SB-07**			**SB-07**			**SB-07**			**SB-07**			**SB-09**			**SB-09**		
	Sample Point ID:	SBSB060622			SB070310			SB070412			SB070617			SB070923			SB090207			SB090410		
	Date Sampled:	11/6/2003			12/31/2003			12/31/2003			12/31/2003			12/31/2003			12/23/2003			12/23/2003		
	Lab ID:	478850			491764			491765			491767			491770			490832			490834		
	Depth (Ft.- BGS):	20			8			11			16			22			5.5			9.5		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																					
Aroclor-1242		-	U	0.072	1.7		0.39	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	0.14		0.084	-	U	0.075
Aroclor-1260		0.11		0.076	5.6		0.39	0.35		0.085	-	U	0.072	-	U	0.072	-	U	0.072	-	U	0.072
Total PCB	10	0.11			7.3			0.35			0.0			0.0			0.14			0.0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-09**			**SB-09**			**SB-10**			**SB-10**			**SB-10**			**SB-10**		
	Sample Point ID:	SB090617			SB090821			SB100206			SB100411			SB100716			SB100920		
	Date Sampled:	12/23/2003			12/23/2003			12/19/2003			12/19/2003			12/22/2003			12/22/2003		
	Lab ID:	490836			490838			489716			489718			490758			490760		
	Depth (Ft.- BGS):	16.5			20			5.5			10			15.5			19		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																		
Aroclor-1242		-	U	0.072	-	U	0.072	-	U	0.072	2.5	J	0.38	0.84		0.14	-	U	0.072
Aroclor-1248		-	U	0.075	-	U	0.075	2.3	J	0.37	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	0.29		0.07
Aroclor-1260		-	U	0.072	-	U	0.072	2.7		0.37	2.3		0.38	1.4	J	0.14	0.45		0.07
Total PCB	10	0.0			0.0			5			4.8			2.24			0.74		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-11**			**SB-11**			**SB-11**			**SB-11**			**SB-12**			**SB-12**			**SB-12**		
	Sample Point ID:	SB110207			SB110411			SB110717			SB110921			SB120107			SB120311			SB120617		
	Date Sampled:	12/29/2003			12/29/2003			12/29/2003			12/30/2003			12/18/2003			12/18/2003			12/18/2003		
	Lab ID:	491782			491784			491787			491789			489748			489750			489753		
	Depth (Ft.- BGS):	5			10			16			20.5			6.5			10			16.5		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																					
Aroclor-1242		-	U	0.072	0.37		0.071	1.2		0.071	0.79		0.072	-	U	0.072	-	U	0.072	0.72	J	0.074
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1260		0.87		0.081	0.5	J	0.071	1		0.071	0.24		0.072	-	U	0.072	-	U	0.072	0.66		0.074
Total PCB	10	0.87			0.87			2.2			1.03			0.0			0.0			1.38		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-12**			**SB-14**			**SB-14**			**SB-14**			**SB-14**			**GAGW-04**			**GAGW-04**		
	Sample Point ID:	SB120821			SB140107			SB140512			SB140717			SB140922			SBGAGW040102			SBGAGW040206		
	Date Sampled:	12/18/2003			12/17/2003			12/17/2003			12/17/2003			12/17/2003			11/10/2003			11/10/2003		
	Lab ID:	489755			488620			488624			488626			488628			479535			479536		
	Depth (Ft.- BGS):	20.5			5			11			16.5			21			1			5		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																					
Aroclor-1242		-	U	0.072	5.5		0.38	-	U	0.072	1.6		0.35	-	U	0.072	-	U	0.072	-	U	0.072
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1260		-	U	0.072	4.7		0.38	-	U	0.072	0.98		0.35	-	U	0.072	-	U	0.072	-	U	0.072
Total PCB	10	0.0			***10.2***			0.0			2.58			0.0			0.0			0.0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**GAGW-04**			**GAGW-04**			**GAL-01**			**GAL-01**			**GAL-02**			**GAL-02**		
Sample Point ID:		SBGAGW040312			SBGAGW040418			SBGAL010306			SBGAL010512			SGAL020407			SBGAL022011		
Date Sampled:		11/10/2003			11/10/2003			10/17/2003			10/20/2003			10/28/2003			10/29/2003		
Lab ID:		479537			479538			472676			473290			475734			475747		
Depth (Ft.- BGS):		11			16			5			11			6.5			10		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																		
Aroclor-1242		-	U	0.072	-	U	0.072	2.7		0.16	0.28		0.071	-	U	0.072	-	U	0.072
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1260		-	U	0.072	-	U	0.072	1.1		0.16	0.33		0.071	0.49		0.08	0.42		0.074
Total PCB	10	0.0			0.0			3.8			0.61			0.49			0.42		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**GAL-02 (Duplicate)**			**GAL-02**			**GAL-03**			**GAL-03**			**GAL-03**			**GAL-03**		
Sample Point ID:		DSBGAL022011			SBGAL020817			SBGAL030307			SBGAL030512			SBGAL030716			SBGAL030920		
Date Sampled:		10/29/2003			10/28/2003			10/31/2003			10/31/2003			11/3/2003			11/3/2003		
Lab ID:		475748			475738			476806			476808			477462			477464		
Depth (Ft.- BGS):		10			16.5			6.5			11			14.5			19		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB																		
Aroclor-1242		-	U	0.072	-	U	0.072	1.2		0.16	-	U	0.072	-	U	0.072	-	U	0.072
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.075
Aroclor-1260		0.49		0.076	0.65	J	0.072	1.4		0.16	0.51	J	0.075	-	U	0.072	-	U	0.072
Total PCB	10	0.49			0.65			2.6			0.51			0.0			0.0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12C
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAL-03**			**GAL-04**			**GAL-04**			**SB-16 (GAL-19)**			**SB-17 (GAL-20)**		
	Sample Point ID:	SBGAL031124			SBGAL040207			SBGAL040411			SB16GAL19.0117			SB17GAL20-0217		
	Date Sampled:	11/3/2003			10/22/2003			10/22/2003			2/24/2005			3/1/2005		
	Lab ID:	477466			474678			474680			610388			611404		
	Depth (Ft.- BGS):	23.5			6			9			17			17		
Parameter	**TAGM**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
	USEPA HB															
Aroclor-1242		-	U	0.072	0.55		0.072	1.2		0.073	0.37		0.078	-	U	0.069
Aroclor-1248		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.078	-	U	0.069
Aroclor-1254		-	U	0.075	-	U	0.075	-	U	0.075	-	U	0.078	-	U	0.069
Aroclor-1260		-	U	0.072	0.42	J	0.072	0.7	J	0.073	0.24		0.078	-	U	0.069
Total PCB	10	0.0			0.97			1.9			0.61			0.0		

Notes:

All units are mg/kg.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives for subsurface - Table 3

▨ Indicates that the detected value is greater than the PDW.

USEPA HB: The Lower of the TAGM 4046 USEPA Health Based Carcinogenic or Systemic Toxicant Values (ppm or mg/kg).

Bold/Italics indicates that the detected value is greater than the USEPA HB.

TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-05**			**SB-05**			**SB-05**			**SB-05**			**SB-07**			**SB-07**		
Sample Point ID:		SB050207			SB050411			SB050616			SB050922			SB070310			SB070412		
Date Sampled:		12/29/2003			12/29/2003			12/29/2003			12/29/2003			12/31/2003			12/31/2003		
Lab ID:		491750			491752			491754			491757			491764			491765		
Depth (Ft. - BGS):		6			10			15			21.5			8			11		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	4480		14	2400		13.6	3190		13.2	2820		13	3510		14.6	4550		15.9
Antimony	0.6	2	J	1.3	-	UJ	1.3	-	U	1.2	-	UJ	1.2	1.7	J	1.4	76.6	J	1.5
Arsenic	15.5	8		0.71	3.4		0.69	1.8		0.68	-	U	0.67	6.4		0.75	332		0.82
Barium	600	65.6		0.38	15.3	B	0.37	22.7	B	0.36	19.7	B	0.35	30.9	B	0.4	68.2		0.43
Beryllium	1.75	0.31	B	0.067	0.16	B	0.065	0.22	B	0.063	0.18	B	0.063	0.16	B	0.07	0.27	B	0.076
Cadmium	1	0.7	B	0.089	0.17	B	0.087	0.23	B	0.085	0.17	B	0.083	0.3	B	0.093	1.2	B	0.1
Calcium	35000	2050		9.5	661	B	9.2	1240		9	4620		8.9	26000		9.9	3500		10.8
Chromium	40	9.8		0.36	8.1		0.35	9.3		0.34	5.7		0.33	10.4		0.37	19.1		0.41
Cobalt	60	6.8	B	0.38	1.6	B	0.37	3.4	B	0.36	3.1	B	0.35	3.1	B	0.4	5.9	B	0.43
Copper	50	66.1		0.82	7.6		0.8	16.7		0.78	13.8		0.77	21.8		0.86	1130		0.94
Iron	550000	32100		8.7	6930		8.5	8040		8.3	6470		8.2	8400		9.1	10100		10
Lead	608	217		0.51	4.1		0.5	6.2		0.49	2.9		0.48	48.4		0.54	346		0.59
Magnesium	5000	1780		9.3	946	B	9	1670		8.8	2380		8.7	11800		9.7	1820		10.6
Manganese	5000	537		0.27	60		0.26	121		0.25	222		0.25	138		0.28	94		0.31
Mercury	0.2	-	U	0.019	-	U	0.018	-	U	0.018	-	U	0.017	0.8		0.019	1.4		0.021
Nickel	25	13.2		0.36	4	B	0.35	7.2	B	0.34	6.3	B	0.33	8.5	B	0.37	98.3		0.41
Potassium	43000	591	B	70.3	341	B	68.3	539	B	66.7	401	B	65.7	451	B	73.5	840	B	80.4
Selenium	3.9	-	U	0.94	-	U	0.91	-	U	0.89	-	U	0.87	-	U	0.98	125		1.1
Silver	-	-	U	0.31	-	U	0.3	-	U	0.3	-	U	0.29	-	U	0.33	22.9		0.36
Sodium	8000	179	B	88.2	124	B	85.7	271	B	83.6	215	B	82.4	170	B	92.2	175	B	101
Vanadium	300	19.2		0.4	12.4		0.39	15.1		0.38	9.2	B	0.38	17.1		0.42	19.2		0.46
Zinc	50	75.3		1.3	12.5		1.3	38.2		1.2	15.7		1.2	30		1.4	250		1.5
Total Cyanide	-	-	U	0.56	-	U	0.54	-	U	0.53	-	U	0.52	-	U	0.58	-	U	0.64

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected.

TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

▨ indicates that the detected value is greater than the TAGM Objective.

TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-07**			**SB-07**			**SB-09**			**SB-09**			**SB-09**			**SB-09**			**SB-10**		
	Sample Point ID:	SB070617			SB070923			SB090207			SB090410			SB090617			SB090821			SB100206		
	Date Sampled:	12/31/2003			12/31/2003			12/23/2003			12/23/2003			12/23/2003			12/23/2003			12/19/2003		
	Lab ID:	491767			491770			490832			490834			490836			490838			489716		
	Depth (Ft. - BGS):	16			22			5.5			9.5			16.5			20			5.5		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	3860		13.9	2190		13.7	2850		19.4	1310		17.4	523		16.6	199		16.8	7550		17.3
Antimony	0.6	2.3	J	1.3	2.5	J	1.3	-	UJ	0.98	-	UJ	0.88	-	UJ	0.84	-	UJ	0.85	1.7	J	0.87
Arsenic	15.5	111		0.71	50.5		0.7	27.4		0.85	4.4		0.77	1.7		0.73	-	U	0.74	7.4		0.76
Barium	600	28.9	B	0.38	12.9	B	0.37	93.1		0.33	51.1		0.29	30.3	B	0.28	25.8	B	0.28	149		0.29
Beryllium	1.75	0.2	B	0.067	0.13	B	0.066	6.5		0.025	0.11	B	0.023	0.04	B	0.021	-	U	0.022	0.22	B	0.022
Cadmium	1	0.28	B	0.089	0.16	B	0.087	0.28	B	0.1	-	U	0.09	-	U	0.086	-	U	0.087	16		0.089
Calcium	35000	1880		9.5	3700		9.3	37800		18.6	735	B	16.8	340	B	16	187	B	16.2	2340		16.7
Chromium	40	11.3		0.36	6		0.35	11.9		0.7	5.9		0.63	3.1		0.6	1.4	B	0.61	18.6		0.63
Cobalt	60	4.4	B	0.38	2.6	B	0.37	8.4	B	0.88	0.79	B	0.79	-	U	0.75	-	U	0.76	18		0.78
Copper	50	32.7		0.82	21.3		0.81	127		0.53	4.7	B	0.47	24.9		0.45	2.2	B	0.46	36.8		0.47
Iron	550000	11100		8.7	5090		8.6	10300		9.9	7290		8.9	1200		8.5	156		8.6	11300		8.9
Lead	608	25.3		0.51	13.1		0.5	346		0.55	48.2		0.5	25		0.47	56.2		0.48	456		0.49
Magnesium	5000	2190		9.3	1820		9.1	8960		17.5	498	B	15.8	159	B	15	88.2	B	15.2	1910		15.7
Manganese	5000	230		0.27	141		0.26	183	J	0.73	24.2	J	0.65	11.9	J	0.62	7.5	J	0.63	68.8	J	0.65
Mercury	0.2	0.04		0.019	0.04		0.018	0.18		0.021	-	U	0.019	0.02	B	0.018	-	U	0.018	0.29		0.019
Nickel	25	13.8		0.36	7.9	B	0.35	24.4		0.98	2.3	B	0.88	-	U	0.84	-	U	0.85	44.4		0.87
Potassium	43000	780	B	70.2	399	B	68.9	270	B	26.6	305	B	23.9	188	B	22.8	158	B	23.1	589	B	23.8
Selenium	3.9	1.8		0.93	2.3		0.92	-	U	0.98	-	U	0.88	-	U	0.84	-	U	0.85	-	U	0.87
Silver	-	-	U	0.31	0.44	B	0.31	-	U	0.18	-	U	0.16	-	U	0.15	-	U	0.15	-	U	0.16
Sodium	8000	183	B	88	127	B	86.4	235	B	90.4	-	U	81.3	81.2	B	77.4	-	U	78.4	347	B	80.8
Vanadium	300	22.4		0.4	8.8	B	0.39	11.3	B	0.38	9.3	B	0.34	4.8	B	0.32	0.55	B	0.33	16.2		0.34
Zinc	50	29		1.3	16.5		1.3	673		1.5	12.7		1.3	3.2	B	1.2	2	B	1.3	1310		6.5
Total Cyanide	-	-	U	0.56	-	U	0.55	-	U	0.63	-	U	0.56	-	U	0.54	-	U	0.54	-	U	0.56

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected.

TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

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TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-10**			**SB-10**			**SB-10**			**SB-11**			**SB-11**			**SB-11**			**SB-11**		
Sample Point ID:		SB100411			SB100716			SB100920			SB110207			SB110411			SB110717			SB110921		
Date Sampled:		12/19/2003			12/22/2003			12/22/2003			12/29/2003			12/29/2003			12/29/2003			12/30/2003		
Lab ID:		489718			490758			490760			491782			491784			491787			491789		
Depth (Ft. - BGS):		10			15.5			19			5			10			16			20.5		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	3860		17.8	3600		16.5	3320		16.1	4490		15.1	3810		13.2	2140		13.3	2660		13.4
Antimony	0.6	-	UJ	0.89	-	UJ	0.83	-	UJ	0.81	-	UJ	1.4	-	UJ	1.2	-	UJ	1.2	-	UJ	1.2
Arsenic	15.5	8.1		0.78	1.1		0.72	0.99	B	0.71	28.8		0.77	0.8	B	0.68	-	U	0.68	0.74	B	0.69
Barium	600	90.5		0.3	23.1	B	0.28	21	B	0.27	202		0.41	17.6	B	0.36	15	B	0.36	13	B	0.36
Beryllium	1.75	0.32	B	0.023	0.22	B	0.021	0.24	B	0.021	0.3	B	0.072	0.28	B	0.063	0.14	B	0.064	0.2	B	0.064
Cadmium	1	0.71	B	0.092	-	U	0.085	-	U	0.083	1.1	B	0.096	0.25	B	0.084	0.15	B	0.085	0.18	B	0.086
Calcium	35000	5110		17.1	1200		15.8	1340		15.5	37000		10.2	2400		9	5190		9	1230		9.1
Chromium	40	9.3		0.64	7		0.6	6		0.58	22.4		0.39	8.2		0.34	4.4		0.34	7.2		0.34
Cobalt	60	5.4	B	0.8	3.9	B	0.74	4.2	B	0.73	4.8	B	0.41	3.8	B	0.36	2.3	B	0.36	2.9	B	0.36
Copper	50	72.2		0.48	12.3		0.45	9.4		0.44	52		0.89	25.6		0.78	7		0.79	8.7		0.79
Iron	550000	8470		9.1	7880		8.4	7750		8.3	19200		9.4	8540		8.3	5570		8.3	7530		8.4
Lead	608	160		0.5	6.2		0.47	2.7		0.46	578		0.55	6.8		0.49	2.5		0.49	2.7		0.49
Magnesium	5000	1190		16.1	1620		14.9	1500		14.6	5410		10	2020		8.8	2540		8.9	1310		8.9
Manganese	5000	139	J	0.67	114	J	0.62	261	J	0.6	143		0.29	82.9		0.25	90.7		0.26	115		0.26
Mercury	0.2	0.05		0.019	-	U	0.018	-	U	0.017	0.05		0.02	-	U	0.018	-	U	0.018	-	U	0.018
Nickel	25	12.8		0.89	8.7		0.83	8.1		0.81	16.4		0.39	8.9		0.34	4.8	B	0.34	6.2	B	0.34
Potassium	43000	342	B	24.4	561	B	22.6	519	B	22.1	495	B	76	834	B	66.5	319	B	67.1	464	B	67.5
Selenium	3.9	-	U	0.89	-	U	0.83	-	U	0.81	1.3		1	-	U	0.89	-	U	0.89	-	U	0.9
Silver	-	-	U	0.16	-	U	0.15	-	U	0.15	-	U	0.34	-	U	0.3	-	U	0.3	-	U	0.3
Sodium	8000	180	B	82.8	185	B	76.7	143	B	75.1	283	B	95.3	188	B	83.4	108	B	84.1	134	B	84.7
Vanadium	300	14.7		0.34	9.7	B	0.32	10.6		0.31	27.8		0.43	20.7		0.38	8.1	B	0.38	10.6		0.39
Zinc	50	279		1.3	39		1.2	21.7		1.2	237		1.4	49.4		1.2	9.9		1.2	12.7		1.2
Total Cyanide	-	-	U	0.57	-	U	0.53	-	U	0.52	-	U	0.60	-	U	0.53	0.56	U	0.535	0.56		0.535

Notes:

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See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

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TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

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TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-12**			**SB-12**			**SB-12**			**SB-12**			**SB-14**			**SB-14**			**SB-14**		
	Sample Point ID:	SB120107			SB120311			SB120617			SB120821			SB140107			SB140512			SB140717		
	Date Sampled:	12/18/2003			12/18/2003			12/18/2003			12/18/2003			12/17/2003			12/17/2003			12/17/2003		
	Lab ID:	489748			489750			489753			489755			488620			488624			488626		
	Depth (Ft. - BGS):	6.5			10			16.5			20.5			5			11			16.5		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	16100		20.1	2240		16.8	2460		17.1	2740		16.5	3470		26.1	3400		16.3	2490		16.1
Antimony	0.6	-	UJ	1	-	UJ	0.84	-	UJ	0.86	-	UJ	0.83	-	UJ	1.3	-	UJ	0.82	-	UJ	0.81
Arsenic	15.5	108		0.88	-	U	0.74	0.98	B	0.75	0.79	B	0.72	17.7		1.1	0.74	B	0.71	0.88	B	0.71
Barium	600	422		0.34	7.5	B	0.28	12.4	B	0.29	11.2	B	0.28	125		0.44	29.8	B	0.27	14.3	B	0.27
Beryllium	1.75	5.2		0.026	0.06	B	0.022	0.15	B	0.022	0.17	B	0.021	0.25	B	0.034	0.27	B	0.021	0.17	B	0.021
Cadmium	1	-	U	0.1	-	U	0.087	-	U	0.088	-	U	0.085	0.51	B	0.13	-	U	0.084	-	U	0.083
Calcium	35000	21700		19.4	1110		16.1	1060	B	16.5	3510		15.9	13000		25.1	1630		15.7	1200		15.5
Chromium	40	57.1		0.73	5.2		0.61	7.1		0.62	5.4		0.6	25.8		0.94	9.1		0.59	6.5		0.58
Cobalt	60	51.2		0.91	1.2	B	0.76	3.4	B	0.77	3.4	B	0.74	5.5	B	1.2	3.9	B	0.74	2.8	B	0.73
Copper	50	187		0.55	3.2	B	0.45	5.8		0.46	9		0.45	67.6		0.71	13.1		0.44	9.4		0.44
Iron	550000	37300		10.3	4990		8.6	6680		8.8	5950		8.4	11200		13.4	8200		8.3	6880		8.3
Lead	608	184		0.57	2.1		0.48	2.1		0.49	1.6		0.47	368	J	0.74	11.2	J	0.46	9.5	J	0.46
Magnesium	5000	3600		18.2	1160		15.2	1140		15.5	1480		14.9	2210		23.6	1640		14.7	1320		14.6
Manganese	5000	566	J	0.75	48.8	J	0.63	48.7	J	0.64	65.9	J	0.62	210	J	0.98	161		0.61	190		0.6
Mercury	0.2	0.17		0.022	-	U	0.018	-	U	0.018	-	U	0.018	0.22		0.019	-	U	0.018	-	U	0.017
Nickel	25	77.5		1	3.6	B	0.84	6.9	B	0.86	7.2	B	0.83	15.9		1.3	8.5		0.82	7.2	B	0.81
Potassium	43000	2310		27.6	295	B	23	318	B	23.5	272	B	22.6	689	B	35.8	806	B	22.3	378	B	22.1
Selenium	3.9	-	U	10.1	-	U	0.84	-	U	0.86	-	U	0.83	-	U	4.4	-	U	0.82	-	U	0.81
Silver	-	-	U	0.18	-	U	0.15	-	U	0.15	-	U	0.15	-	U	0.24	-	U	0.15	-	U	0.15
Sodium	8000	239	B	93.9	-	U	0.31	121	B	79.9	100	B	76.8	294	B	122	141	B	75.8	295	B	75.2
Vanadium	300	25.9		0.39	8.3	B	0.32	12.7		0.33	8.4	B	0.32	10.7	B	0.51	10.5		0.32	11.5		0.31
Zinc	50	352		1.5	10.3		1.3	19.4		1.3	14.5		1.2	170		2	22.2		1.2	15.2		1.2
Total Cyanide	-	-	U	0.65	-	U	0.54	-	U	0.55	-	U	0.53	-	U	0.56	-	U	0.53	-	U	0.52

Notes:

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TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**SB-14**			**GAGW-04**			**GAGW-04**			**GAGW-04**			**GAGW-04**			**GAL-01**			**GAL-01**		
	Sample Point ID:	SB140922			SBGAGW040102			SBGAGW040206			SBGAGW040312			SBGAGW040418			SBGAL010306			SBGAL010512		
	Date Sampled:	12/17/2003			11/10/2003			11/10/2003			11/10/2003			11/10/2003			10/17/2003			10/20/2003		
	Lab ID:	488628			479535			479536			479537			479538			472676			473290		
	Depth (Ft. - BGS):	21			1			5			11			16			5			11		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	2740		16.6	5310		13.9	9510		14.7	7170		13.3	4280		13.6	3090		19.1	938		16.4
Antimony	0.6	-	UJ	0.84	-	UJ	1.3	-	UJ	1.4	-	UJ	1.2	-	UJ	1.3	-	UJ	0.96	-	UJ	0.83
Arsenic	15.5	1		0.73	15.5		0.71	3.5		0.75	1.3		0.68	0.94	B	0.69	22.4		0.84	13.8		0.72
Barium	600	17.5	B	0.28	53.3		0.38	19.9	B	0.4	57.3		0.36	36	B	0.37	20.9	B	0.32	63.2		0.28
Beryllium	1.75	0.18	B	0.021	0.3	B	0.067	0.45	B	0.07	0.4	B	0.064	0.27	B	0.065	0.33	B	0.025	-	U	0.021
Cadmium	1	-	U	0.086	-	U	0.089	-	U	0.094	-	U	0.085	-	U	0.087	-	U	0.099	6.3		0.085
Calcium	35000	1020	B	16	2360		9.5	605	B	10	750	B	9	925	B	9.2	977	B	18.3	444	B	15.8
Chromium	40	6.5		0.6	11.5		0.36	12.9		0.38	15.6		0.34	10.2		0.35	10.3		0.69	3.5		0.59
Cobalt	60	2.6	B	0.75	5.9	B	0.38	8.3	B	0.4	7.1	B	0.36	5.2	B	0.37	4.1	B	0.86	2.5	B	0.74
Copper	50	9		0.45	43.9		0.82	13.1		0.87	19.3		0.78	13		0.8	26.6		0.52	15.8		0.45
Iron	550000	6440		8.5	11600		8.7	17800		9.2	17600		8.3	11200		8.5	12700		9.8	2130		8.4
Lead	608	12	J	0.47	608		0.51	6.5		0.54	6.5		0.49	16.2		0.5	24.5		0.54	276		0.47
Magnesium	5000	1380		15	2330		9.3	2830		9.8	2170		8.8	1620		9	100	B	17.2	213	B	14.8
Manganese	5000	119	J	0.62	220		0.27	375		0.28	605		0.25	216		0.26	19.2		0.71	12.2		0.62
Mercury	0.2	-	U	0.018	0.13		0.019	-	U	0.02	0.17		0.018	-	U	0.018	0.07		0.021	0.02	B	0.018
Nickel	25	6	B	0.84	15		0.36	13.8		0.38	13		0.34	9.3		0.35	8	B	0.96	8.3	B	0.83
Potassium	43000	525	B	22.7	424	J	70.2	565	J	74	483	J	66.8	519	J	68.4	103	B	26.2	295	B	22.5
Selenium	3.9	-	U	0.84	-	U	0.94	-	U	0.99	-	U	0.89	-	U	0.91	-	U	0.96	-	U	0.83
Silver	-	-	U	0.15	-	U	0.31	-	U	0.33	-	U	0.3	-	U	0.3	-	U	0.17	-	U	0.15
Sodium	8000	114	B	77.3	1030	B	88.1	142	B	92.8	424	B	83.8	313	B	85.8	120	B	88.9	113	B	76.6
Vanadium	300	8.9	B	0.32	15.4		0.4	18		0.42	26.1		0.38	16.3		0.39	9.7	B	0.37	5.4	B	0.32
Zinc	50	14.5		1.2	-	R	1.3	-	R	1.4	-	R	1.2	-	R	1.3	24.6		1.4	74.3		1.2
Total Cyanide	-	-	U	0.54	-	U	0.56	-	U	0.59	-	U	0.53	-	U	0.54	-	U	0.62	-	U	0.53

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected.

TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

▨ indicates that the detected value is greater than the TAGM Objective.

TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	Sample Point:	**GAL-02**			**GAL-02**			**GAL-02**			**GAL-02 (Duplicate)**			**GAL-03**			**GAL-03**			**GAL-03**		
	Sample Point ID:	SBGAL020407			SBGAL020817			SBGAL022011			DSBGAL022011			SBGAL030307			SBGAL030512			SBGAL030716		
	Date Sampled:	10/28/2003			10/28/2003			10/29/2003			10/29/2003			10/31/2003			10/31/2003			11/3/2003		
	Lab ID:	475734			475738			475747			475748			476806			476808			477462		
	Depth (Ft. - BGS):	6.5			16.5			10			10			6.5			11			14.5		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	4390		27.6	3450		13.5	3760		17.2	2970		17.5	4540		18.8	3370		17.3	2960		13.2
Antimony	0.6	-	UJ	1.4	-	UJ	1.3	-	UJ	0.87	-	UJ	0.88	-	UJ	0.95	-	UJ	0.87	-	UJ	1.2
Arsenic	15.5	17.1		1.2	0.89	B	0.69	2.3		0.76	1.7		0.77	21		0.83	22.9		0.76	2.1		0.68
Barium	600	91.3		0.46	20.5	B	0.37	19.4	B	0.29	16.9	B	0.29	38.8	B	0.32	33	B	0.29	16.3	B	0.36
Beryllium	1.75	0.33	B	0.036	0.12	B	0.065	0.16	B	0.022	0.1	B	0.023	0.21	B	0.024	0.18	B	0.022	0.23	B	0.063
Cadmium	1	1.2	B	0.14	-	U	0.087	-	U	0.089	-	U	0.091	0.22	B	0.097	-	U	0.089	-	U	0.084
Calcium	35000	19000		26.6	9400		9.2	1240		16.6	1020	B	16.9	1120	B	18.1	1820		16.7	843	B	9
Chromium	40	15.5		1	9.7		0.35	8.6		0.62	9.5		0.63	11.4		0.68	8.8		0.63	9.7		0.34
Cobalt	60	16.9	B	1.2	2.3	B	0.37	4.1	B	0.78	2.5	B	0.79	10.4	B	0.85	3.7	B	0.78	3.3	B	0.36
Copper	50	50.8		0.75	11.3		0.8	11.3		0.47	8.3		0.48	21.6		0.51	14.3		0.47	12.1		0.78
Iron	550000	37100		14.2	7530		8.5	8600		8.8	6660		9	11300		9.6	6820		8.9	9930		8.3
Lead	608	382		0.79	12		0.5	8.8		0.49	7.1		0.5	64.3		0.53	25.5		0.49	4.5		0.49
Magnesium	5000	2390		25	5720		9	1540		15.6	1260		15.9	1470		17	1550		15.7	1210		8.8
Manganese	5000	748		1	73.5		0.26	61.2		0.65	50.3		0.66	84.9		0.7	66.4		0.65	107		0.25
Mercury	0.2	0.17		0.02	-	U	0.018	-	U	0.019	-	U	0.019	0.1		0.02	-	U	0.019	-	U	0.018
Nickel	25	29.8		1.4	7	B	0.35	8.1	B	0.87	6	B	0.88	19.6		0.95	6.9	B	0.87	6.8	B	0.34
Potassium	43000	401	B	37.9	435	B	68.3	412	B	23.6	344	B	24.1	424	B	25.8	484	B	23.8	428	B	66.6
Selenium	3.9	2.5		1.4	-	U	0.91	-	U	0.87	-	U	0.88	1.2		0.95	-	U	0.87	-	U	0.89
Silver	-	-	U	0.25	-	U	0.3	-	U	0.16	-	U	0.16	-	U	0.17	-	U	0.16	-	U	0.3
Sodium	8000	160	B	129	87.8	B	85.6	90.5	B	80.3	-	U	0.31	-	U	0.31	86.9	B	80.8	-	U	0.31
Vanadium	300	18.5		0.54	16		0.39	19		0.33	15		0.34	32.8		0.36	15.1		0.34	23.2		0.38
Zinc	50	278		2.1	16.9		1.3	18.8		1.3	15.4		1.3	103		1.4	20.2		1.3	17		1.2
Total Cyanide	-	-	U	0.60	-	U	0.54	-	U	0.56	-	U	0.57	-	U	0.61	-	U	0.56	-	U	0.53

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected.

TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

▨ indicates that the detected value is greater than the TAGM Objective.

TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**GAL-03**			**GAL-03**			**GAL-04**			**GAL-04**			**SB-06**			**SB-06**		
Sample Point ID:		SBGAL030920			SBGAL031124			SBGAL040207			SBGAL040411			SBSB060307			SBSB060412		
Date Sampled:		11/3/2003			11/3/2003			10/22/2003			10/22/2003			11/6/2003			11/6/2003		
Lab ID:		477464			477466			474678			474680			478847			478848		
Depth (Ft. - BGS):		19			23.5			6			9			6.5			11		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	2880		13.1	2630		13.5	3750		16.5	4970		16.9	3380		13.8	8000		14.6
Antimony	0.6	-	UJ	1.2	-	UJ	1.2	-	UJ	0.83	-	UJ	0.85	1.3	J	1.3	-	UJ	1.4
Arsenic	15.5	3.2		0.67	-	U	0.69	2.5		0.73	2.7		0.74	9.8		0.7	3.2		0.75
Barium	600	14.3	B	0.36	15.2	B	0.37	20.6	B	0.28	38.7	B	0.28	73.3		0.37	32.3	B	0.4
Beryllium	1.75	0.17	B	0.063	0.11	B	0.065	0.11	B	0.021	0.21	B	0.022	0.13	B	0.066	0.25	B	0.07
Cadmium	1	-	U	0.084	-	U	0.086	-	U	0.085	0.49	B	0.087	-	U	0.088	-	U	0.093
Calcium	35000	813	B	8.9	903	B	9.1	548	B	15.9	7160		16.2	4610		9.4	1350		9.9
Chromium	40	8.6		0.34	6.4		0.34	8.7		0.6	14.1		0.61	9.8		0.35	19.7		0.37
Cobalt	60	2.9	B	0.36	2.5	B	0.37	2.2	B	0.75	5.2	B	0.76	2.8	B	0.37	3.9	B	0.4
Copper	50	8.2		0.77	8.5		0.8	7.3		0.45	20.3		0.46	25.3		0.81	19.5		0.86
Iron	550000	7660		8.2	5790		8.4	10500		8.5	20900		8.7	14300		8.6	20200		9.1
Lead	608	2.5		0.48	1.9		0.5	2.7		0.47	25.7		0.48	517		0.51	17.9		0.54
Magnesium	5000	1330		8.7	1080		9	1410		15	1950		15.3	2110		9.2	2990		9.7
Manganese	5000	185		0.25	132		0.26	59.8		0.62	317		0.63	214		0.26	196		0.28
Mercury	0.2	-	U	0.017	-	U	0.018	-	U	0.018	0.03	B	0.016	0.18		0.018	-	U	0.019
Nickel	25	6.6	B	0.34	6.2	B	0.34	6.4	B	0.83	9.7		0.85	7.6	B	0.35	12.3		0.37
Potassium	43000	438	B	66.1	344	B	67.9	418	B	22.7	612	B	23.2	458	B	69.4	755	B	73.5
Selenium	3.9	-	U	0.88	-	U	0.9	-	U	0.83	1	B	0.85	-	U	0.92	-	U	0.98
Silver	-	-	U	0.29	-	U	0.3	-	U	0.15	-	U	0.15	-	U	0.31	-	U	0.33
Sodium	8000	-	U	0.31	82	B	85.1	-	U	0.31	221	B	78.7	134	B	87	111	B	92.2
Vanadium	300	15.7		0.38	9.5	B	0.39	10.1	B	0.32	25		0.33	17.7		0.4	20.9		0.42
Zinc	50	13.4		1.2	12.5		1.2	26		1.2	34.8		1.3	66.1		1.3	40.7		1.4
Total Cyanide	-	-	U	0.52	-	U	0.54	-	U	0.53	-	U	0.55	-	U	0.55	-	U	0.58

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected.

TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

▨ indicates that the detected value is greater than the TAGM Objective.

TABLE 12D
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
INORGANICS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-06**			**SB-06**			**SB-16 (GAL-19)**			**SB-17 (GAL-20)**		
Sample Point ID:		SBSB060517			SBSB060622			SB16GAL19.0117			SB17GAL20-0217		
Date Sampled:		11/6/2003			11/6/2003			2/24/2005			3/1/2005		
Lab ID:		478849			478850			610388			611404		
Depth (Ft. - BGS):		15			20			17			17		
Parameter	**TAGM Objective**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aluminum	33000	8950		15.5	5650		14.2	4870		14.6	8170		12.9
Antimony	0.6	-	UJ	1.4	-	UJ	1.3	-		1.4	-		1.2
Arsenic	15.5	-	U	0.79	1.8		0.73	21.4		0.75	10.6		0.66
Barium	600	63.7		0.42	46.6		0.39	115		0.4	70.8		0.35
Beryllium	1.75	0.43	B	0.074	0.3	B	0.068	0.27	U	0.27	0.62		0.062
Cadmium	1	-	U	0.099	-	U	0.091	0.85	J	0.093	-	U	0.082
Calcium	35000	1250		10.5	1310		9.7	23700		9.9	1360		8.7
Chromium	40	18.3		0.4	16.4		0.36	35.2	J	0.37	24.8	J	0.33
Cobalt	60	6.8	B	0.42	5.8	B	0.39	7.3	B	0.4	8	B	0.35
Copper	50	15.5		0.92	15.1		0.84	169		0.86	18.5		0.76
Iron	550000	18100		9.7	14600		8.9	18600		9.1	20100		8
Lead	608	4.3		0.57	6.5		0.52	247		0.61	7.9		0.53
Magnesium	5000	2690		10.3	2090		9.5	3140		9.7	3880		8.5
Manganese	5000	261		0.3	377		0.27	234		0.28	295		0.25
Mercury	0.2	-	U	0.021	-	U	0.019	27	J	0.39	-	U	0.015
Nickel	25	15.6		0.4	13.7		0.36	16.4		0.56	19		0.49
Potassium	43000	1100	B	78.2	1050	B	71.8	762	J	73.6	2460	J	64.8
Selenium	3.9	-	U	1	-	U	0.96	-	U	0.98	-	U	0.86
Silver	-	-	U	0.35	-	U	0.32	1.7	B	0.33	-	U	0.29
Sodium	8000	-	U	0.31	-	U	0.31	453	B	92.3	172	B	81.2
Vanadium	300	26.1		0.45	23.5		0.41	20.2	J	0.47	33.7		0.41
Zinc	50	40.4		1.4	32.1		1.3	204	J	1.4	69.7	J	1.2
Total Cyanide	-	-	U	0.62	-	U	0.57	-	U	0.50	-	U	0.50

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

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TAGM Objective - NYS Technical and Administrative Guidance Memorandum #4046. Recommended Soil Clean Up Objectives - the higher of site background (taken from off-property boring GAGW-04), New York Background or Eastern US Background

▨ indicates that the detected value is greater than the TAGM Objective.

TABLE 12E
SUMMARY OF TOTAL PETROLEUM HYDROCARBON DETECTIONS - METHOD 418.1
SOIL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

GAL-01	GAL-01/GAGW-01 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	4	6	8	10	12	14	18	20	22	23	25	28	30	33	37	42	45	46	48	51	55		
CONCENTRATION, MG/KG	39,600	32,700	15,400	29,900	26,700	22,400	68,300	76,800	48,600	29,400	32,900	21,000	8,710	15,900	16,600	17,300	8,350	321	114	25.6	175		
GAL-01R	GAL-01R TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	6	9	11	14	16	18	20	22	24	26	28												
CONCENTRATION, MG/KG	13,900	10,100	9,780	2,010	26,100	46,400	69,700	92,800	59,800	49,700	25,500												
GAL-02	GAL-02/GAGW-02 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	7	9	11	13	15	17	19	21	23	25	27	29	31	32	34	35	38	40	42	44	47	54
CONCENTRATION, MG/KG	50,700	33,200	381	10,400	16,200	19,100	47,800	97,600	82,500	18,000	21,200	24,600	23,400	17,800	13,900	4,620	2,280	370	433	480	257	324	473
GAL-03	GAL-03 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	9	11	13.5	14.5	17.5	19	21.5	23.5	25	26.5	28.5											
CONCENTRATION, MG/KG (X 1,000)	14,900	60,900	20,600	13,800	12,100	11,500	12,900	45,400	61,400	47,400	34,300	17,000											
GAL-04	GAL-04/GAGW-05 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	4	7	9	11	13	15	17	18	20	22	24	26	28	30	33	34	35	39	43	46	51	56	
CONCENTRATION, MG/KG	70,000	6,870	15,200	12,700	43,000	13,600	11,200	60,600	30,500	20,000	19,000	18,000	18,800	23,200	1,300	963	235	0	431	444	216	79.8	
GAL-05	GAL-05 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	4	7	9	11	13	15	17	19	21	23	25	27	33	35	37								
CONCENTRATION, MG/KG	39,800	23,100	26,000	8,740	9,710	1,310	3,200	9,430	26,700	67,500	47,300	34,100	36,200	18,800	31,600								
GAL-06	GAL-06 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	4	7	8	12	15	17	19	21	23	25	28	30											
CONCENTRATION, MG/KG	17,300	3,870	19,200	0	3,750	38.7	405	8,680	74,800	11,600	39,100	20,200											
GAL-07	GAL-07 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	4	7	9	11	13	15	17	19	21	23	25	27	29	31									
CONCENTRATION, MG/KG	20,000	34,500	30,000	77,700	8,900	11,500	105,000	65,000	61,600	38,600	39,200	34,300	24,900	24,500									
GAL-08	GAL-08 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	9	10	13	15	18	20	22	24	26													
CONCENTRATION, MG/KG	875	104	137	7,540	9,530	100	42.3	25.7	0.0	0.0													
GAL-09	GAL-09 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	10	12	16	20	22	25	27	30	33													
CONCENTRATION, MG/KG	9,140	38	56	39	11,300	37,100	44,300	12,200	26,800	26,800													
GAL-10	GAL-10 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	9	12	15	17	20	21	23	25	27	30	32												
CONCENTRATION, MG/KG	195	96.7	0.0	0.0	18,000	28,700	17,800	4,460	5,290	5,050	6,900												
GAGW-08/GAL-11	GAGW-08/GAL-11 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	8	11	12	15	16	17	21	22	24	26	28	31	34	40	46	51						
CONCENTRATION, MG/KG	3,010	4,240	6,770	6,040	29,700	43,600	57,400	29,300	19,300	18,600	14,200	12,900	8,700	9,260	4,640	122	291						
GAL-12	GAL-12 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	8	13	15	17	19	21	23	26	30	33													
CONCENTRATION, MG/KG	0.0	11,700	20,000	24,200	27,300	18,300	3,780	3,300	641	3,880													

TABLE 12E
SUMMARY OF TOTAL PETROLEUM HYDROCARBON DETECTIONS - METHOD 418.1
SOIL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

GAL-13	GAL-13 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	11	13	16	18	21	22	25	27	31													
CONCENTRATION, MG/KG	45.8	0.0	5,600	34,900	20,400	8,920	9,760	4,680	1,910	16,700													
GAL-14	GAL-14 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	6	11	13	15	17	18	20	25	26	29	31												
CONCENTRATION, MG/KG	36.5	1,720	17,300	35,900	27,200	32,700	28,200	22,400	15,000	19,800	14,000												
GAL-15	GAL-15 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	11	13	14	17	19	21	27	28														
CONCENTRATION, MG/KG	1,740	7,420	4,700	3,000	15,500	41	70.3	31.2	53.7														
GAL-16/GAGW-06I	GAL-16/GAGW-06I TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	9	12	14	19	20	23	27	31	33	34	39											
CONCENTRATION, MG/KG	15,600	11,100	15,500	9,030	25,400	27,500	34,700	22,600	25,300	19,200	8,500	65											
GAL-17	GAL-17 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	6	12	15	18	21	23	26	29	31														
CONCENTRATION, MG/KG	4,780	36,800	25,000	18,400	19,000	21,800	29,600	32,400	10,200														
SB-05	SB-05 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	7	9	11	13	16	18	20	22	27	29	31											
CONCENTRATION, MG/KG	30,900	11,100	13,200	12,100	8,300	7,630	3,180	3,470	6,830	26,400	18,000	28,200											
SB-07	SB-07 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	10	12	14	17	19	21	23	26	28	30	32											
CONCENTRATION, MG/KG	2,130	7,980	13,800	1,970	9,200	9,500	7,670	39,800	26,500	24,200	26,700	28,200											
SB-09	SB-09 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	4	7	8	10	14	17	19	21	22	25	27	29	31	33	35								
CONCENTRATION, MG/KG	73,600	39,900	32,600	23,700	16,900	24,900	27,000	67,600	89,100	77,800	33,600	32,000	34,200	17,900	19,100								
SB-10	SB-10 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	6	8	11	12	15	16	18	20	23	24	27	29	30	32								
CONCENTRATION, MG/KG	80,300	42,900	27,400	28,600	22,600	5,750	19,400	7,800	8,080	57,100	119,000	104,000	20,300	20,200	37,400								
SB-11	SB-11 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	5	7	9	11	13	15	17	19	21	23	25												
CONCENTRATION, MG/KG	49,100	24,800	30,900	21,800	16,100	37,500	41,120	32,300	40,800	38,200	35,000												
SB-12	SB-12 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	9	11	13	15	17	19	21	23	25													
CONCENTRATION, MG/KG	4,980	83.6	74.3	48.4	54,700	51,500	47,300	30,100	19,300	24,300													
SB-14	SB-14 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	8	10	11	12	14	17	20	22	24	26												
CONCENTRATION, MG/KG	38,400	15,400	12,800	12,200	1,510	13,200	99,200	81,000	37,100	23,300	33,400												
SB-15/MW-4R	SB-15/MW-4R TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	9	11	15	16	19	20	23	26	29	33												
CONCENTRATION, MG/KG	16,200	1,130	3,740	202,000	36,300	34,100	27,300	23,500	8,550	2,130	4,890												

TABLE 12E
SUMMARY OF TOTAL PETROLEUM HYDROCARBON DETECTIONS - METHOD 418.1
SOIL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

GAGW-04	GAGW-04 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	2	6	12	18	22	26	30																
CONCENTRATION, MG/KG	112	0.0	0.0	64.5	26,800	22,700	7,320																
GAL-18/GAGW-07	GAL-18/GAGW-07 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	11	15	16	18	21	23	26	31	33													
CONCENTRATION, MG/KG	10,500	10,700	13,900	9,690	32,100	24,700	25,900	25,900	12,700	9,590													
GAL-19	GAL-19 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	17	19	23	25	27	31	33	35															
CONCENTRATION, MG/KG	5,170	10,700	45,600	35,000	32,200	14,400	21,400	17,500															
GAL-20	GAL-20 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	15	17	20	22	25																		
CONCENTRATION, MG/KG	18,400	12,400	4,180	17,200	61,100																		
GAL-21	GAL-21 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	6	9	11	13	15	17	19	21	23	27	33												
CONCENTRATION, MG/KG	3,060	2,760	57	1,390	70,700	98,900	49,900	26,600	5,790	10,200	8,660												
GAL-22	GAL-22 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	8	11	14	17	19	23	25	29	31													
CONCENTRATION, MG/KG	5,520	29,100	8,240	6,510	10,700	52,200	21,000	22,900	22,100	27,300													
GAL-23	GAL-23 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	9	11	13	14	17	19	21	25	26														
CONCENTRATION, MG/KG	1,630	8,720	11,600	23,400	22,900	28,300	21,400	15,100	13,000														
GAL-24	GAL-24 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	9	12	14	16	19	21	26	30														
CONCENTRATION, MG/KG	6,060	10,700	32	467	29,100	10,600	7,810	5,220	14,200														
GAL-25	GAL-25 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	7	9	11	15	17	19	22	25	29	31													
CONCENTRATION, MG/KG	6,550	11,700	8,670	26,000	39,100	49,900	14,200	27,500	20,200	23,300													
GAL-26	GAL-26 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	10	12	14	16	18	22	26	30	32														
CONCENTRATION, MG/KG	14,800	16,300	15,800	68,100	30,100	13,700	25,900	22,700	18,600														
GAL-27	GAL-27 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	10	14	16	18	20	24	26																
CONCENTRATION, MG/KG	13,400	717	63	117	32	76	0																
GAL-28	GAL-28 TPH CONCENTRATION VS. DEPTH																						
DEPTH - FT. - BGS	10	12	14	16	18	20	23	25															
CONCENTRATION, MG/KG	39,300	35,600	3,620	4,350	4,890	469	367	849															

TABLE 12F
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SPECIATED PETROLEUM HYDROCARBONS - MODIFIED METHOD 8015
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-05**			**SB-05**			**SB-07**			**SB-07**			**SB-09**			**SB-09**		
Sample Point ID:		SB050207			SB051025			SB070412			SB071024			SB090719			SB091025		
Date Sampled:		12/29/2003			12/29/2003			12/31/2003			12/31/2003			12/23/2003			12/23/2003		
Lab ID:		4010111-01			4010111-02			4010111-03			4010111-04			3121105-07			3121105-08		
Depth:		6			24.5			11			23			18			24		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
C7		0		850	0		6,700	0		940	0		2,700	0		5,500	0		30,000
C8		0		850	0		6,700	0		940	0		2,700	0		5,500	0		30,000
C9		0		850	10,000		6,700	0		940	8,100		2,700	0		5,500	0		30,000
C10		0		850	8,800		6,700	10,000		940	7,600		2,700	0		5,500	0		30,000
C11		0		850	0		6,700	6,500		940	0		2,700	0		5,500	0		30,000
C12		0		850	0		6,700	1,700		940	0		2,700	0		5,500	0		30,000
C13		0		850	0		6,700	0		940	0		2,700	0		5,500	0		30,000
C14		0		850	11,000		6,700	0		940	4,800		2,700	0		5,500	35,000		30,000
C15		0		850	17,000		6,700	0		940	7,700		2,700	0		5,500	54,000		30,000
C16		0		850	32,000		6,700	0		940	15,000		2,700	79,000		5,500	100,000		30,000
C17		0		850	46,000		6,700	1,400		940	21,000		2,700	12,000		5,500	150,000		30,000
C18		0		850	54,000		6,700	1,900		940	25,000		2,700	14,000		5,500	180,000		30,000
C19		0		850	78,000		6,700	2,800		940	37,000		2,700	21,000		5,500	260,000		30,000
C20		1,000		850	110,000		6,700	4,500		940	54,000		2,700	27,000		5,500	350,000		30,000
C21		1,600		850	83,000		6,700	5,900		940	41,000		2,700	32,000		5,500	320,000		30,000
C22		2,000		850	73,000		6,700	6,300		940	39,000		2,700	32,000		5,500	320,000		30,000
C23		2,400		850	87,000		6,700	9,000		940	45,000		2,700	32,000		5,500	290,000		30,000
C24		3,700		850	88,000		6,700	12,000		940	50,000		2,700	43,000		5,500	410,000		30,000
C25		3,200		850	62,000		6,700	12,000		940	35,000		2,700	32,000		5,500	270,000		30,000
C26		3,500		850	58,000		6,700	12,000		940	31,000		2,700	32,000		5,500	250,000		30,000
C27		4,100		850	55,000		6,700	17,000		940	31,000		2,700	31,000		5,500	240,000		30,000
C28		3,600		850	40,000		6,700	14,000		940	23,000		2,700	28,000		5,500	200,000		30,000
C29		4,100		850	56,000		6,700	19,000		940	19,000		2,700	21,000		5,500	140,000		30,000
C30		2,700		850	11,000		6,700	9,200		940	12,000		2,700	18,000		5,500	110,000		30,000
C31		3,300		850	21,000		6,700	15,000		940	16,000		2,700	16,000		5,500	97,000		30,000
C32		2,600		850	15,000		6,700	9,000		940	9,200		2,700	13,000		5,500	69,000		30,000
C33		2,000		850	12,000		6,700	6,800		940	7,100		2,700	9,500		5,500	53,000		30,000
C34		1,200		850	11,000		6,700	3,700		940	5,500		2,700	0		5,500	32,000		30,000
C35		1,200		850	0		6,700	3,600		940	0		2,700	5,600		5,500	0		30,000
C36		0		850	0		6,700	0		940	0		2,700	0		5,500	0		30,000
Diesel Range Organics		43,870		850	1,038,600		6,700	176,040		940	537,450		2,700	517,300		5,500	3,975,000		30,000
Phytane		0		850	0		6,700	0		940	0		2,700	0		5,500	0		30,000
Pristane		0		850	0		6,700	0		940	0		2,700	0		5,500	0		30,000

Notes:

All units are mg/kg.

Tables checked by WC on 5/7/04

TABLE 12F
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SPECIATED PETROLEUM HYDROCARBONS - MODIFIED METHOD 8015
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-10**			**SB-10**			**SB-11**			**SB-11**			**SB-12**			**SB-12**		
Sample Point ID:		SB100615			SB101023			SB110309			SB110921			SB120107			SB120923		
Date Sampled:		12/22/2003			12/22/2003			12/31/2003			12/30/2003			12/18/2003			12/18/2003		
Lab ID:		3121105-05			3121105-06			4010111-05			4010111-06			3121105-03			3121105-4		
Depth:		14.5			22.5			7			20.5			6.5			22.5		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
C7		0		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
C8		0		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
C9		0		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
C10		960		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
C11		1,400		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
C12		1,300		520	0		16,000	0		2,900	3,100		2,800	0		57	0		5,400
C13		870		520	0		16,000	0		2,900	4,300		2,800	0		57	0		5,400
C14		850		520	0		16,000	0		2,900	6,400		2,800	0		57	0		5,400
C15		640		520	21,000		16,000	0		2,900	8,800		2,800	0		57	0		5,400
C16		700		520	42,000		16,000	0		2,900	15,000		2,800	0		57	11,000		5,400
C17		1,100		520	63,000		16,000	0		2,900	20,000		2,800	0		57	17,000		5,400
C18		1,300		520	74,000		16,000	0		2,900	22,000		2,800	94		57	20,000		5,400
C19		1,700		520	110,000		16,000	0		2,900	35,000		2,800	180		57	31,000		5,400
C20		2,900		520	140,000		16,000	4,000		2,900	49,000		2,800	270		57	44,000		5,400
C21		3,100		520	120,000		16,000	7,500		2,900	40,000		2,800	390		57	37,000		5,400
C22		4,100		520	110,000		16,000	11,000		2,900	37,000		2,800	370		57	36,000		5,400
C23		5,100		520	120,000		16,000	17,000		2,900	44,000		2,800	410		57	42,000		5,400
C24		7,600		520	130,000		16,000	25,000		2,900	49,000		2,800	600		57	48,000		5,400
C25		7,300		520	93,000		16,000	25,000		2,900	34,000		2,800	560		57	35,000		5,400
C26		7,600		520	93,000		16,000	30,000		2,900	32,000		2,800	540		57	36,000		5,400
C27		10,000		520	93,000		16,000	38,000		2,900	43,000		2,800	580		57	35,000		5,400
C28		9,700		520	68,000		16,000	31,000		2,900	14,000		2,800	560		57	31,000		5,400
C29		5,500		520	72,000		16,000	30,000		2,900	18,000		2,800	560		57	26,000		5,400
C30		7,100		520	49,000		16,000	32,000		2,900	17,000		2,800	620		57	27,000		5,400
C31		6,500		520	42,000		16,000	29,000		2,900	18,000		2,800	510		57	20,000		5,400
C32		4,400		520	30,000		16,000	23,000		2,900	9,200		2,800	520		57	16,000		5,400
C33		3,300		520	23,000		16,000	17,000		2,900	6,800		2,800	460		57	11,000		5,400
C34		1,700		520	0		16,000	8,300		2,900	3,700		2,800	180		57	9,100		5,400
C35		1,300		520	0		16,000	9,400		2,900	0		2,800	270		57	7,500		5,400
C36		0		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
Diesel Range Organics		97,066		520	1,548,500		16,000	341,440		2,900	535,080		2,800	7,861		57	551,800		5,400
Phytane		0		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400
Pristane		0		520	0		16,000	0		2,900	0		2,800	0		57	0		5,400

Notes:

All units are mg/kg.

Tables checked by WC on 5/7/04

TABLE 12F
SUMMARY OF CHEMICAL DETECTIONS
SOIL SAMPLE ANALYSES
SPECIATED PETROLEUM HYDROCARBONS - MODIFIED METHOD 8015
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-14**			**SB-14**			**GAGW-02**			**GAGW-02**			**GAGW-05**			**GAGW-05**		
Sample Point ID:		SB140310			SB140922			SBGAGW020234			SBGAGW020438			SBGAGW050234			SBGAGW050539		
Date Sampled:		12/17/2003			12/17/2003			11/20/2003			11/24/2003			11/20/2003			11/20/2003		
Lab ID:		3121105-01			3121105-02			3121105-09			3121105-10			3121105-11			3121105-12		
Depth:		8.5			21			33			37			33			38.5		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
C7		0		1,400	0		5,400	0		170	0		110	0		180	0		6
C8		0		1,400	0		5,400	760		170	0		110	0		180	8		6
C9		0		1,400	0		5,400	2,000		170	0		110	0		180	0		6
C10		0		1,400	0		5,400	2,800		170	0		110	0		180	0		6
C11		0		1,400	0		5,400	3,800		870	0		110	340		180	0		6
C12		0		1,400	0		5,400	4,500		870	230		110	500		180	0		6
C13		0		1,400	0		5,400	4,900		870	280		110	460		180	0		6
C14		1,600		1,400	0		5,400	4,600		870	380		110	570		180	7		6
C15		1,600		1,400	0		5,400	4,400		870	500		110	640		180	10		6
C16		2,300		1,400	8,100		5,400	5,900		870	730		110	920		180	18		6
C17		4,500		1,400	12,000		5,400	6,100		870	800		110	1,000		180	31		6
C18		3,700		1,400	15,000		5,400	5,600		870	920		110	1,100		180	34		6
C19		7,500		1,400	23,000		5,400	7,300		870	1,000		110	1,500		180	55		6
C20		11,000		1,400	35,000		5,400	9,200		870	1,600		110	2,100		180	70		6
C21		12,000		1,400	31,000		5,400	6,500		870	1,500		110	2,100		180	69		6
C22		13,000		1,400	32,000		5,400	4,800		870	1,200		110	1,600		180	55		6
C23		15,000		1,400	39,000		5,400	5,200		870	1,500		110	2,100		180	82		6
C24		25,000		1,400	48,000		5,400	5,100		870	1,500		110	2,400		180	66		6
C25		18,000		1,400	33,000		5,400	3,400		870	900		110	1,700		180	3,015		6
C26		18,000		1,400	33,000		5,400	3,600		870	1,100		110	1,600		180	53		6
C27		18,000		1,400	32,000		5,400	2,400		870	800		110	1,500		180	51		6
C28		17,000		1,400	29,000		5,400	3,400		870	770		110	1,300		180	51		6
C29		15,000		1,400	18,000		5,400	1,200		870	470		110	790		180	37		6
C30		13,000		1,400	18,000		5,400	1,600		870	480		110	890		180	29		6
C31		13,000		1,400	22,000		5,400	3,300		870	380		110	630		180	37		6
C32		9,100		1,400	10,000		5,400	1,600		870	300		110	450		180	26		6
C33		6,800		1,400	6,600		5,400	0		870	210		110	310		180	24		6
C34		3,000		1,400	0		5,400	0		870	140		110	0		180	13		6
C35		3,000		1,400	0		5,400	0		870	150		110	0		180	11		6
C36		0		1,400	0		5,400	0		870	0		110	0		180	0		6
Diesel Range Organics		235,140		1,400	458,320		5,400	100,320		870	17,959		110	26,681		180	845		6
Phytane		0		1,400	0		5,400	0		870	0		110	0		180	0		6
Pristane		0		1,400	0		5,400	0		870	0		110	0		180	0		6

Notes:

All units are mg/kg.

Tables checked by WC on 5/7/04

TABLE 12G
SUMMARY OF TOTAL ORGANIC CARBON
SOIL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

Sample Point:		**SB-05**			**SB-07**			**SB-07**			**SB-09**			**SB-10**		
Sample Point ID:		SB050411			SB070412			SB070719			SB090719			SB100308		
Date Sampled:		12/29/2003			12/31/2003			12/31/2003			12/22/2003			12/19/2003		
Lab ID:		193502			193503			193504			187407			187405		
Depth (Ft. - BGS):		10			11			18.5			18			7		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total Organic Carbon		30,900		713	11,100		348	13,200		365	12,100		339	8,300		331

Sample Point:		**SB-10**			**SB-11**			**SB-12**			**SB-12**		
Sample Point ID:		SB100818			SB110411			SB120209			SB120515		
Date Sampled:		12/22/2003			12/29/2003			12/18/2003			12/18/2003		
Lab ID:		187406			193501			187403			187404		
Depth (Ft. - BGS):		17			10			8.5			14.5		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total Organic Carbon		7,630		330	3,180		322	3,470		130	6,830		130

Sample Point:		**SB-14**			**SB-14**			**GAL-02**			**GAL-03**		
Sample Point ID:		SB140107			SB140310			SBGAL022011			SBGAL030716		
Date Sampled:		12/17/2003			12/17/2003			10/29/2003			11/3/2003		
Lab ID:		187401			187402			154801			154802		
Depth (Ft. - BGS):		5			8.5			10			14.5		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total Organic Carbon		26,400		702	18,000		349	28,200		702	2,130		140

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TAGM - NYS has no recommended Total Organic Carbon Clean up objectives

Tables checked by WC on 5/7/04

TABLE 13A
SUMMARY PHYSICAL CHARACTERISTICS
LNAPL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		QUANTA PROPERTY WELLS																	
Sample Point:		**GAGW-04 ***			**GAL-01**			**GAL-01R**			**GAL-01R (Duplicate)**			**GAL-02**			**GAL-03**		
Date Sampled:		12/17/2003			11/18/2003			7/16/2004			7/16/2004			11/18/2003			11/18/2003		
Lab ID:		488619			481266			547612			547613			481265			481942		
Parameter	**Units**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
% Sediments	wt %	10			0.4			0.34			0.8			0.3			0.05		
% Sulfur	wt %	0.329			0.274			0.323			0.323			0.274			0.416		
BTU/TOT	BTU/TOT	19155			19457			19416			19421			19586			19305		
Flashpoint	deg F	281			201			180			189			280			302		
Interfacial Tension/TOT	dynes/cm	32.55			28.59			12.68			17.85			32.97			31.07		
Specific Gravity	g/cm^3	0.899			0.885			0.891			0.894			0.899			0.899		
Surface Tension/TOT	dynes/cm	38			38.5			33			35.5			38			37.5		
TOX/TOT	mg/kg	5			321			279.43			223.03			155			23		
Viscosity	cSt	41.34			106			82.1			74.15			117.6			51.81		

		QUANTA PROPERTY WELLS																	
Sample Point:		**GAL-04**			**GAL-05**			**GAL-06**			**GAL-07**			**GAL-07B**			**GAL-08**		
Date Sampled:		11/25/2003			11/19/2003			11/17/2003			11/17/2003			11/19/2003			11/25/2003		
Lab ID:		483777			481943			481263			481264			481944			483778		
Parameter	**Units**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
% Sediments	wt %	0.2			0.05			0.05			0.05			0.2			0.05		
% Sulfur	wt %	0.234			0.38			0.331			0.294			0.29			0.223		
BTU/TOT	BTU/TOT	19377			19411			19326			19391			19327			19343		
Flashpoint	deg F	224			277			201			275			260			209		
Interfacial Tension/TOT	dynes/cm	30.5			30.24			32.94			34.38			29.67			30.5		
Specific Gravity	g/cm^3	0.892			0.897			0.897			0.903			0.898			0.915		
Surface Tension/TOT	dynes/cm	30.5			38			39			39			38			30.5		
TOX/TOT	mg/kg	259			38.72			9.56			34.54			23.17			66.69		
Viscosity	cSt	75.9			49.87			30.72			45.02			45.91			47.13		

Notes:

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13A
SUMMARY PHYSICAL CHARACTERISTICS
LNAPL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		QUANTA PROPERTY WELLS																				
Sample Point:		**GAL-09**			**GAL-16**			**GAL-19**			**GAL-20**			**MW-11**			**MW-15 ***			**Sump (Quanta)**		
Date Sampled:		7/10/2004			7/10/2004			4/5/2005			4/6/2005			11/20/2003			7/12/2004			1/14/2004		
Lab ID:		545882			545883			621334			622082			482760			ORGANIC			494865		
Parameter	**Units**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
% Sediments	wt %	-			0.2			49			0.1			0.06			24			1.2		
% Sulfur	wt %	0.38			0.342			0.28			0.353			0.373			0.306			0.385		
BTU/TOT	BTU/TOT	19250			19307			16625			19554			19375			19242			16278		
Flashpoint	deg F	219			303			178			207			219			288			280		
Interfacial Tension/TOT	dynes/cm	20.64			20.77			29.1			29			30.3			10.64			10.68		
Specific Gravity	g/cm^3	0.898			0.905			0.8924			0.8976			0.895			0.898			0.9028		
Surface Tension/TOT	dynes/cm	36			36.5			36.2			37.2			30.3			36			34		
TOX/TOT	mg/kg	7.03			17.89			174.43			10.52			29.47			13.57			456.8		
Viscosity	cSt	34.34			66.15			47.67			37.71			37.33			41.03			254.9		

		NORTH CAPASSO WELLS																				
Sample Point:		**GAL-10**			**GAL-10 (duplicate)**			**GAL-11**			**GAL-12**			**GAL-13**			**GAL-18**			**GAL-21**		
Date Sampled:		7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/16/2004			4/5/2005		
Lab ID:		545873			545874			545870			545876			545871			547611			621338		
Parameter	**Units**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
% Sediments	wt %	1.2			2.4			0.8			0.8			0.2			0.3			0.15		
% Sulfur	wt %	0.202			0.172			0.255			0.241			0.18			0.281			0.231		
BTU/TOT	BTU/TOT	19295			19307			19337			19366			19464			19324			19556		
Flashpoint	deg F	165			163			178			230			141			155			162		
Interfacial Tension/TOT	dynes/cm	16			19.29			15.78			17.26			17.41			15.97			31.5		
Specific Gravity	g/cm^3	0.889			0.888			0.875			0.9009			0.875			0.892			0.8888		
Surface Tension/TOT	dynes/cm	35.8			34.8			36			35.5			35			34.5			36.4		
TOX/TOT	mg/kg	37.29			33.43			177.54			74.27			46.95			67.68			187.1		
Viscosity	cSt	25.43			27.32			50.55			45.93			23.27			27.85			41.59		

Notes:

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13A
SUMMARY PHYSICAL CHARACTERISTICS
LNAPL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		NORTH CAPASSO WELLS																				
Sample Point:		**DGAL-21**			**GAL-22**			**GAL-23**			**GAL-24**			**MW-4R**			**MW-10**			**MH-Sump (North**		
Date Sampled:		4/5/2005			4/5/2005			4/5/2005			4/5/2005			7/9/2004			7/9/2004			8/13/2004		
Lab ID:		621339			621335			621337			621336			545875			545872			554895		
Parameter	**Units**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
% Sediments	wt %	2.5			3			0.15			0.2			0.2			0.4			14		
% Sulfur	wt %	0.222			0.207			0.19			0.171			0.232			0.208			0.35		
BTU/TOT	BTU/TOT	19643			19516			19464			19705			19210			19303			16879		
Flashpoint	deg F	164			158			156			145			229			168			298		
Interfacial Tension/TOT	dynes/cm	30			28.94			31.1			32			16.62			17.09			9.79		
Specific Gravity	g/cm^3	0.8907			0.8878			0.8878			0.8795			0.9			0.891			0.891		
Surface Tension/TOT	dynes/cm	36.8			35.5			36.1			35.2			36			35.5			34		
TOX/TOT	mg/kg	130.71			43.25			73.56			57.98			122.34			76.14			83.55		
Viscosity	cSt	41.63			26.64			31.83			21.81			54.99			36.8			184.2		

		PHOENIX BEVERAGES WELLS											
Sample Point:		**GAL-14**			**GAL-17**			**GAL-26**			**MW-8**		
Date Sampled:		7/10/2004			7/10/2004			4/9/2005			7/10/2004		
Lab ID:		545881			545879			625468			545880		
Parameter	**Units**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
% Sediments	wt %	0.2			0.4			50			-		
% Sulfur	wt %	0.39			0.444			0.402			0.387		
BTU/TOT	BTU/TOT	19245			19283			19091			19246		
Flashpoint	deg F	294			305			278			292		
Interfacial Tension/TOT	dynes/cm	23.19			23.14			33.5			20.76		
Specific Gravity	g/cm^3	0.906			0.9039			0.9084			0.905		
Surface Tension/TOT	dynes/cm	35.5			36			34			36		
TOX/TOT	mg/kg	-			-			< 5.0			9.27		
Viscosity	cSt	49.56			50.12			58.99			51.22		

Notes:

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAGW-04***			**GAGW-04***			**GAL-01**			**GAL-01R**			**GAL-01R (Duplicate)**			**GAL-02**			**GAL-02**		
Date Sampled:	12/17/2003			7/9/2004			11/18/2003			7/16/2004			7/16/2004			11/18/2003			7/12/2004		
Lab ID:	488619			545877			481266			547612			547613			481265			546081		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	-			-			7.6	J	10	6.0		4.5	6.8		4.2	-			-		
Carbon Disulfide	-			-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-			-		
cis-1,2-Dichloroethene	-			-			-			5.6	J	23	6.8	J	21	-			-		
Cyclohexane	9.1	J	21	6.9	J	21	78		50	95		23	100		21	25		25	52		25
1,2-Dichlorobenzene	-			-			120	J	50	71		23	84		21	42	J	25	5.8	J	25
1,3-Dichlorobenzene	-			-			5.5	J	50	-			-			-			-		
1,4-Dichlorobenzene	-			-			14	J	50	12	J	23	13	J	21	4.3	J	25	-		
1,1-Dichloroethane	-			-			-			-			-			-			-		
Ethylbenzene	-			-			180		40	140		18	160		17	4.8	J	20	-		
Freon TF	-			-			-			-			-			-			-		
Isopropylbenzene	-			4.9	J	21	140		50	120		23	140		21	22	J	25	7.9	J	25
Methyl Cyclohexane	25		21	29		21	260		50	250		23	280		21	63		25	100		25
MTBE	-			-			-			-			-			-			-		
Styrene	-			-			-			-			-			-			-		
Tetrachloroethene	-			-			-			-			-			-			-		
Toluene	-			-			85		50	28		23	34		21	3.6	J	25	-		
1,2,4-Trichlorobenzene	-			-			18	J	50	-			-			5.6	J	25	-		
1,1,1-Trichloroethane	-			-			-			-			-			-			-		
Trichloroethene	-			-			-			-			-			-			-		
Trichlorofluoromethane	-			-			-			-			6.1	J	21	-			-		
Xylene (Total)	-			-			740		50	590		23	690		21	110		25	21	J	25
Total VOCs	34			41			1,648			1,318			1,521			280			187		
Total TICs				2,660						9,030			9,710						1,260		
Total VOCs + TICs	34			2,701			1,648			10,348			11,231			280			1,447		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-03**			**GAL-03**			**GAL-04**			**GAL-04**			**GAL-04 (Duplicate)**			**GAL-05**			**GAL-05**		
Date Sampled:	11/18/2003			7/12/2004			11/25/2003			7/12/2004			7/12/2004			11/19/2003			7/12/2004		
Lab ID:	481942			546083			483777			546079			546080			481943			546084		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	2.5	J	5.0	-			3	J	4.5	-			-			5.2	J	5	2.8	J	5.0
Carbon Disulfide	-			-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-			-		
cis-1,2-Dichloroethene	-			-			-			-			-			-			-		
Cyclohexane	29		25	31		25	57		23	100		19	110		21	49		25	28		25
1,2-Dichlorobenzene	8.4	JN	25	6.4	J	25	74	J	23	50		19	52		21	6.8	JN	25	5.8	J	25
1,3-Dichlorobenzene	-			-			3.8	J	23	2.0	J	19	2.3	J	21	-			-		
1,4-Dichlorobenzene	-			-			6.7	J	23	4.9	J	19	5.3	J	21	-			-		
1,1-Dichloroethane	-			-			-			-			-			-			-		
Ethylbenzene	5.2	J	20	3.2	J	20	49		18	22		15	24		17	12	J	20	9.0	J	20
Freon TF	-			-			-			-			-			-			-		
Isopropylbenzene	6.6	J	25	5.2	J	25	42		23	24		19	25		21	11	J	25	8.8	J	25
Methyl Cyclohexane	71		25	56		25	280		23	260		19	280		21	110		25	86		25
MTBE	-			-			-			-			-			-			-		
Styrene	-			-			-			-			-			-			-		
Tetrachloroethene	-			-			-			-			-			-			-		
Toluene	3.7	J	25	3.6	J	25	14	J	23	8.2	J	19	7.8	J	21	8.3	J	25	7.2	J	25
1,2,4-Trichlorobenzene	-			-			13	J	23	-			-			-			-		
1,1,1-Trichloroethane	-			-			-			-			-			-			-		
Trichloroethene	-			-			-			-			-			-			-		
Trichlorofluoromethane	-			-			-			-			-			-			-		
Xylene (Total)	41		25	29		25	270		23	170		19	180		21	98		25	79		25
Total VOCs	167			134			813			641			686			300			227		
Total TICs				856						3,800			4,020						3,240		
Total VOCs + TICs	167			990			813			4,441			4,706			300			3,467		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-06**			**GAL-06**			**GAL-07**			**GAL-07**			**GAL-07B**			**GAL-07B (Dup)**			**GAL-08**		
Date Sampled:	11/17/2003			7/12/2004			11/17/2003			7/12/2004			11/19/2003			11/19/2003			11/25/2003		
Lab ID:	481263			546088			481264			546082			481944			481946			483778		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	3.6	J	5.0	-			-			-			-			2.6	J	5.0	-		
Carbon Disulfide	4.5	J	25	-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-			-		
cis-1,2-Dichloroethene	-			-			-			-			-			-			9.5	J	45
Cyclohexane	46		25	21	J	50	20	J	25	42		23	28		25	38		25	120		45
1,2-Dichlorobenzene	16	J	25	14	J	50	39	J	25	34		23	23	J	25	26	J	25	51	J	45
1,3-Dichlorobenzene	-			-			3.2	J	25	2.5	J	23	-			-			-		
1,4-Dichlorobenzene	2.4	J	25	-			5.2	J	25	4.9	J	23	2.9	J	25	3.2	J	25	9.6	J	45
1,1-Dichloroethane	-			-			-			-			-			-			-		
Ethylbenzene	16	J	20	14	J	40	49		20	31		18	30		20	35		20	9.2	J	36
Freon TF	-			-			-			-			-			-			-		
Isopropylbenzene	100		25	72		50	22	J	25	18	J	23	15	J	25	17	J	25	220		45
Methyl Cyclohexane	150		25	110		50	92		25	100		23	90		25	110		25	210	J	45
MTBE	-			-			-			-			-			-			-		
Styrene	-			-			-			-			-			-			-		
Tetrachloroethene	-			-			-			-			-			-			-		
Toluene	-			-			3.1	J	25	3.5	J	23	2.6	J	25	-			-		
1,2,4-Trichlorobenzene	-			-			-			-			-			-			-		
1,1,1-Trichloroethane	-			-			-			-			-			-			27	J	45
Trichloroethene	-			-			-			-			-			-			7.5	JN	9.1
Trichlorofluoromethane	-			-			-			-			-			-			-		
Xylene (Total)	200		25	50		50	38		25	51		23	25		25	27		25	28	J	45
Total VOCs	539			281			272			287			217			259			692		
Total TICs				11,770						2,770											
Total VOCs + TICs	539			12,051			272			3,057			217			259			692		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-08**			**GAL-09**			**GAL-16**			**GAL-19**			**GAL-20**			**MW-11**			**MW-11**		
Date Sampled:	7/12/2004			7/10/2004			7/10/2004			4/5/2005			4/6/2005			11/20/2003			7/12/2004		
Lab ID:	546086			545882			545883			621334			622082			482760			546087		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	-			-			-			-			-			-			-		
Carbon Disulfide	-			-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-			-		
cis-1,2-Dichloroethene	120		83	-			-			-			-			-			-		
Cyclohexane	140		83	40		25	73		17	-			95		91	18		16	32		23
1,2-Dichlorobenzene	93		83	13	J	25	-			-			-			25	J	16	18	J	23
1,3-Dichlorobenzene	-			-			-			-			-			-			-		
1,4-Dichlorobenzene	24	J	83	-			-			-			-			4.0	J	16	3.4	J	23
1,1-Dichloroethane	16	J	83	-			-			-			-			-			-		
Ethylbenzene	86		67	46		20	-			180	J	170	80		73	12	J	12	12	J	18
Freon TF	390		83	-			-			-			-			-			-		
Isopropylbenzene	290		83	73		25	7.2	J	17	140	J	210	77	J	91	52		16	34		23
Methyl Cyclohexane	280		83	100		25	140		17	250	J	210	170		91	74		16	76		23
MTBE	-			-			7.2	J	17	-			-			-			-		
Styrene	-			-			-			-			-			-			-		
Tetrachloroethene	-			-			-			46	J	42	-			-			-		
Toluene	-			-			-			100	J	210	15	J	91	-			-		
1,2,4-Trichlorobenzene	-			-			-			-			-			-			-		
1,1,1-Trichloroethane	800		83	-			-			-			-			-			-		
Trichloroethene	87		17	-			-			-			-			-			-		
Trichlorofluoromethane	-			-			-			-			-			-			-		
Xylene (Total)	220		83	300		25	10	J	17	1,100	J	210	450	J	91	46		16	50		23
Total VOCs	2,546			572			237			1,816			887			231			225		
Total TICs	13,150			7,240			905			18,330			10,850						1,810		
Total VOCs + TICs	15,696			7,812			1,142			20,146			11,737			231			2,035		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS						**NORTH CAPASSO WELLS**														
Sample Point:	**Sump (Quanta)**			**MW-15 ***			**GAL-10**			**GAL-10 (duplicate)**			**GAL-11**			**GAL-12**			**GAL-13**		
Date Sampled:	7/12/2004			7/12/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004		
Lab ID:	546085			546089			545873			545874			545870			545876			545871		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	29		25	-			-			-			9.4	J	17	1.7	J	3.3	-		
Carbon Disulfide	-			-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-			69	J	83
cis-1,2-Dichloroethene	-			12	J	25	-			-			-			-			-		
Cyclohexane	160		120	9.5	J	25	81	J	110	95	J	110	120		83	22		17	99		83
1,2-Dichlorobenzene	74	J	120	-			-			-			52	J	83	25		17	21	J	83
1,3-Dichlorobenzene	-			-			-			-			-			-			-		
1,4-Dichlorobenzene	-			-			-			-			-			-			18	J	83
1,1-Dichloroethane	-			-			-			-			-			-			-		
Ethylbenzene	240		100	8.3	J	20	240		91	280		91	160		67	16		13	63	J	67
Freon TF	-			-			-			-			-			-			-		
Isopropylbenzene	45	J	120	5.2	J	25	250		110	280		110	140		83	39		17	800		83
Methyl Cyclohexane	80	J	120	38		25	310		110	350		110	300		83	120		17	540		83
MTBE	51	J	120	-			-			-			-			-			-		
Styrene	40	J	120	-			-			-			-			-			-		
Tetrachloroethene	67		25	-			-			-			-			-			-		
Toluene	1,800		120	-			-			-			120		83	-			-		
1,2,4-Trichlorobenzene	-			-			-			-			-			-			-		
1,1,1-Trichloroethane	64	J	120	-			-			-			-			-			-		
Trichloroethene	54		25	13		5.0	-			-			-			-			-		
Trichlorofluoromethane	-			-			-			-			-			-			-		
Xylene (Total)	1,400		120	19	J	25	1,000		110	1,200		110	1,200		83	21		17	56	J	83
Total VOCs	4,104			105			1,881			2,205			2,101			245			1,666		
Total TICs	5,820			1,227			31,200			32,100			21,600			2,590			79,500		
Total VOCs + TICs	9,924			1,332			33,081			34,305			23,701			2,835			81,166		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS																				
Sample Point:	**GAL-18**			**GAL-21**			**DGAL-21**			**GAL-22**			**GAL-23**			**GAL-24**			**MW-4R**		
Date Sampled:	7/16/2004			4/5/2005			4/5/2005			4/5/2005			4/5/2005			4/5/2005			7/9/2004		
Lab ID:	547611			621338			621339			621335			621337			621336			545875		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	4.5	J	5.0	-			-			-			-			-			-		
Carbon Disulfide	-			-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-			11	J	21
cis-1,2-Dichloroethene	-			-			-			-			-			-			-		
Cyclohexane	40		25	-			100	J	500	-			-			-			48		21
1,2-Dichlorobenzene	23	J	25	-			-			-			-			-			25		21
1,3-Dichlorobenzene	-			-			-			-			-			-			2.8	J	21
1,4-Dichlorobenzene	5.1	J	25	-			-			-			-			-			7.2	J	21
1,1-Dichloroethane	-			-			-			-			-			-			-		
Ethylbenzene	130		20	190	J	170	200	J	400	-			290	J	330	610	J	270	17		17
Freon TF	-			-			-			-			-			-			-		
Isopropylbenzene	200		25	200	J	210	200	J	500	350	J	360	320	J	420	570	J	330	33		21
Methyl Cyclohexane	250		25	380	J	210	450	J	500	420	J	360	390	J	420	420	J	330	130		21
MTBE	-			-			-			-			-			-			-		
Styrene	-			-			-			-			-			-			-		
Tetrachloroethene	-			-			-			-			-			-			-		
Toluene	-			77	J	210	83	J	500	-			-			-			8.4	J	21
1,2,4-Trichlorobenzene	-			-			-			-			-			-			-		
1,1,1-Trichloroethane	-			-			-			-			-			-			-		
Trichloroethene	-			-			-			-			-			-			-		
Trichlorofluoromethane	-			-			-			-			-			-			-		
Xylene (Total)	570		25	530	J	210	580	J	500	-			880	J	420	-			83		21
Total VOCs	1,223			1,377			1,613			770			1,880			1,600			365		
Total TICs	11,750			32,000			35,800			49,200			54,500			61,400			2,670		
Total VOCs + TICs	12,973			33,377			37,413			49,970			56,380			63,000			3,035		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13B
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS						**PHOENIX BEVERAGES WELLS**											
Sample Point:	**MW-10**			**MH-Sump (North**			**GAL-14**			**GAL-17**			**GAL-26**			**MW-8**		
Date Sampled:	7/9/2004			8/13/2004			7/10/2004			7/10/2004			4/9/2005			7/10/2004		
Lab ID:	545872			554895			545881			545879			623185			545880		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Benzene	-			-			-			8.6		3.1	-			-		
Carbon Disulfide	-			-			-			-			-			-		
Chlorobenzene	-			-			-			-			-			-		
cis-1,2-Dichloroethene	-			-			-			-			-			-		
Cyclohexane	64	J	210	-			34		17	31		16	-			43		19
1,2-Dichlorobenzene	27	J	210	-			-			-			-			-		
1,3-Dichlorobenzene	-			-			-			-			-			-		
1,4-Dichlorobenzene	-			-			-			-			-			-		
1,1-Dichloroethane	-			-			-			-			-			-		
Ethylbenzene	240		170	4.5	J	17	-			-			-			-		
Freon TF	-			-			-			-			-			-		
Isopropylbenzene	270		210	2.6	J	21	5.4	J	17	4.5	J	16	-			8.1	J	19
Methyl Cyclohexane	350		210	3.3	J	21	80		17	59		16	160		23	90		19
MTBE	-			-			-			2.0	J	16	-			-		
Styrene	-			-			-			-			-			-		
Tetrachloroethene	-			-			-			-			-			-		
Toluene	-			5.6	J	21	-			-			-			-		
1,2,4-Trichlorobenzene	-			-			-			-			-			-		
1,1,1-Trichloroethane	-			-			-			-			-			-		
Trichloroethene	-			-			-			-			-			-		
Trichlorofluoromethane	-			-			-			-			-			-		
Xylene (Total)	1,100		210	27		21	-			-			-			16	J	19
Total VOCs	2,051			43			119			105			160			157		
Total TICs	22,900			1,215			968			982			1,833			1,098		
Total VOCs + TICs	24,951			1,258			1,087			1,087			1,993			1,255		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

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* - Well GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAGW-04***			**GAGW-04***			**GAL-01**			**GAL-01R**			**GAL-01R (Duplicate)**			**GAL-02**			**GAL-02**		
Date Sampled:	12/17/2003			7/9/2004			11/18/2003			7/16/2004			7/16/2004			11/18/2003			7/12/2004		
Lab ID:	488619			545877			481266			547612			547613			481265			546081		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			-			-			-			-			-			-		
Acenaphthylene	-			-			12	J	250	-			-			8	J	500	-		
Acetophenone	-			-			-			290	J	500	-			-			-		
Anthracene	110	J	500	140	J	250	38	J	250	44	J	500	42	J	500	75	J	500	67	J	500
Benzaldehyde	-			-			-						-			-			-		
Benzo(a)anthracene	220		50	260	J	25	52		25	28	J	50	120	J	50	150		50	170		50
Benzo(a)pyrene	34	J	50	52	J	25	-			38	J	50	38	J	50	76		50	75		50
Benzo(b)fluoranthene	-			26	J	25	-			29	J	50	28	J	50	36	J	50	30	J	50
Benzo(g,h,i)perylene	-			-			-			19	J	500	-			61	J	500	42	J	500
Benzo(k)fluoranthene	-			-			-			-			-			-			-		
bis(2-Chloroethoxy)methane	-			-			-			-			-			-			-		
bis(2-Ethylhexyl)phthalate	-			-			66	J	250	-			-			-			-		
Chrysene	290	J	500	380	J	250	71	J	250	170	J	500	180	J	500	190	J	500	240	J	500
Dibenz(a,h)anthracene	-			-			-			-			14	J	50	30	J	50	18	J	50
Dibenzofuran	-			-			25	J	250	-			16	J	500	18	J	500	-		
2,4-Dimethylphenol	-			-			-			-			-			-			-		
Di-n-butylphthalate	-			-			-			-			-			-			-		
Diphenyl	-			-			-			-			-			-			-		
Fluoranthene	50	J	500	-			42	J	250	46	J	500	43	J	500	48	J	500	47	J	500
Fluorene	51	J	500	48	J	250	63	J	250	40	J	500	39	J	500	60	J	500	45	J	500
Hexachlorocyclopentadiene	-			-			-			-			-			-			-		
Indeno(1,2,3-cd)pyrene	-			-			-			17	J	50	-			22	J	50	-		
2-Methylnaphthalene	72	J	500	-			940		250	460	J	500	470	J	500	450	J	500	110	J	500
Naphthalene	-			-			160	J	250	92	J	500	75	J	500	-			-		
N-Nitrosodiphenylamine	-			-			-			-			-			-			-		
Phenanthrene	330	J	500	370	J	250	180	J	250	160	J	500	140	J	500	250	J	500	230	J	500
Pyrene	320	J	500	270	J	250	68	J	250	160	J	500	150	J	500	140	J	500	180	J	500
Total SVOCs	1,477			1,546			1,717			1,593			1,355			1,614			1,254		
Total TICs				25,480						19,130			22,540						22,120		
Total SVOCs + TICs	1,477.0000			27,026.0			1,717.0			20,723.0			23,895.0			1,614.0			23,374.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

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* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-03**			**GAL-03**			**GAL-04**			**GAL-04**			**GAL-04 (Duplicate)**			**GAL-05**			**GAL-05**		
Date Sampled:	11/18/2003			7/12/2004			11/25/2003			7/12/2004			7/12/2004			11/19/2003			7/12/2004		
Lab ID:	481942			546083			483777			546079			546080			481943			546084		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			-			-			-			-			-			-		
Acenaphthylene	-			7.9	J	250	-			-			-			-			-		
Acetophenone	37	J	500	-			130	J	500	-			-			56	J	500	-		
Anthracene	100	J	500	-			88	J	500	86	J	500	94	J	500	110	J	500	80	J	500
Benzaldehyde	-			-			-			-			-			-			-		
Benzo(a)anthracene	89		50	120		25	150		50	220		50	220		50	130		50	140		50
Benzo(a)pyrene	-			25		25	48	J	50	130		50	75		50	-			27	J	50
Benzo(b)fluoranthene	-			-			25	J	50	28	J	50	45	J	50	17	J	50	22	J	50
Benzo(g,h,i)perylene	-			-			41	J	500	51	J	500	47	J	500	-			-		
Benzo(k)fluoranthene	-			-			-			73		50	-			-			-		
bis(2-Chloroethoxy)methane	-			-			-			-			-			-			-		
bis(2-Ethylhexyl)phthalate	-			-			-			-			-			-			-		
Chrysene	160	J	500	220	J	250	200	J	500	240	J	500	240	J	500	180	J	500	210	J	500
Dibenz(a,h)anthracene	-			-			-			25	J	50	36	J	50	-			-		
Dibenzofuran	19	J	500	-			-			-			-			-			-		
2,4-Dimethylphenol	-			-			-			-			-			-			-		
Di-n-butylphthalate	-			-			-			-			-			-			-		
Diphenyl	-			-			-			-			-			-			-		
Fluoranthene	45	J	500	-			59	J	500	64	J	500	52	J	500	56	J	500	39	J	500
Fluorene	75	J	500	72	J	250	57	J	500	65	J	500	52	J	500	49	J	500	46	J	500
Hexachlorocyclopentadiene	-			-			-			-			-			-			-		
Indeno(1,2,3-cd)pyrene	-			-			-			18	J	50	27	J	50	-			-		
2-Methylnaphthalene	120	J	500	31	J	250	220	J	500	230	J	500	240	J	500	240	J	500	190	J	500
Naphthalene	-			-			-			-			-			12	J	500	-		
N-Nitrosodiphenylamine	-			-			-			-			-			94	J	500	-		
Phenanthrene	480	J	500	340		250	210	J	500	220	J	500	220	J	500	370	J	500	230	J	500
Pyrene	140	J	500	210	J	250	130	J	500	220	J	500	220	J	500	150	J	500	180	J	500
Total SVOCs	1,265			1,025.9			1,358			1,670			1,568			1,464			1,164		
Total TICs				29,960						15,680			18,430						28,860		
Total SVOCs + TICs	1,265.0			30,985.9			1,358.0			17,350.0			19,998.0			1,464.0			30,024.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-06**			**GAL-06**			**GAL-07**			**GAL-07**			**GAL-07B**			**GAL-07B (duplicate)**			**GAL-08**		
Date Sampled:	11/17/2003			7/12/2004			11/17/2003			7/12/2004			11/19/2003			11/19/2003			11/25/2003		
Lab ID:	481263			546088			481264			546082			481944			481946			483778		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			-			-			-			-						-		
Acenaphthylene	-			-			-			-			-						-		
Acetophenone	-			-			-			-			56	J	500	48	J	500	-		
Anthracene	130	J	500	96	J	250	150	J	500	94	J	500	140	J	500	140	J	500	140	J	500
Benzaldehyde	-			-			-			-			-						-		
Benzo(a)anthracene	190		50	220		25	240		50	200		50	210		50	200		50	450		50
Benzo(a)pyrene	27	J	50	31		25	68		50	58		50	-			56	J	50	25	J	50
Benzo(b)fluoranthene	22	J	50	20	J	25	-			31	J	50	37	J	50	30	J	50	42	J	50
Benzo(g,h,i)perylene	-			-			39	J	500	37	J	500	-						26	J	500
Benzo(k)fluoranthene	-			-			-			-			-						-		
bis(2-Chloroethoxy)methane	-			-			-			-			-						-		
bis(2-Ethylhexyl)phthalate	-			-			-			-			-						-		
Chrysene	240	J	500	290		250	270	J	500	220	J	500	280	J	500	240	J	500	590		500
Dibenz(a,h)anthracene	-			-			-			12	J	50	-						-		
Dibenzofuran	-			-			18	J	500	-			-						-		
2,4-Dimethylphenol	-			-			-			-			-						-		
Di-n-butylphthalate	-			-			-			-			-						-		
Diphenyl	-			-			-			-			-						-		
Fluoranthene	58	J	500	-			68	J	500	-			65	J	500	72	J	500	110	J	500
Fluorene	47	J	500	41	J	250	64	J	500	50	J	500	53	J	500	54	J	500	33	J	500
Hexachlorocyclopentadiene	-			-			-			-			-						-		
Indeno(1,2,3-cd)pyrene	-			-			-			11	J	50	-						-		
2-Methylnaphthalene	100	J	500	64	J	250	420	J	500	270	J	500	220	J	500	240	J	500	17	J	500
Naphthalene	86	J	500	75	J	250	240	J	500	160	J	500	160	J	500	150	J	500	-		
N-Nitrosodiphenylamine	-			-			-			-			-			84	J	500	-		
Phenanthrene	380	J	500	240	J	250	460	J	500	260	J	500	380	J	500	390	J	500	-		
Pyrene	210	J	500	280		250	240	J	500	230	J	500	190	J	500	200	J	500	250	J	500
Total SVOCs	1,490			1,357			2,277			1,633			1,791			1,904			1,683		
Total TICs				28,660						24,500											
Total SVOCs + TICs	1,490.0			30,017.0			2,277.0			26,133.0			1,791.0			1,904.0			1,683.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-08**			**GAL-09**			**GAL-16**			**GAL-19**			**GAL-20**			**MW-11**			**MW-11**		
Date Sampled:	7/12/2004			7/10/2004			7/10/2004			4/5/2005			4/6/2005			11/20/2003			7/12/2004		
Lab ID:	546086			545882			545883			621334			622082			482760			546087		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			-			-			28	J	250	23	J	250	-			-		
Acenaphthylene	-			-			-			-			-			-			-		
Acetophenone	-			-			-			-			-			-			-		
Anthracene	120	J	500	130	J	1,000	140	J	1,000	64	J	250	94	J	250	100	J	500	88	J	250
Benzaldehyde	-			-			-			-			-			-			-		
Benzo(a)anthracene	610		50	190	J	100	250		100	160		25	180		25	120		50	160		25
Benzo(a)pyrene	52		50	23	J	100	74	J	100	31		25	23	J	25	-			23	J	25
Benzo(b)fluoranthene	60		50	27	J	100	46	J	100	21	J	25	17	J	25	-			-		
Benzo(g,h,i)perylene	-			-			-			-			-			-			-		
Benzo(k)fluoranthene	-			-			-			-			-			-			-		
bis(2-Chloroethoxy)methane	-			-			-			-			-			-			-		
bis(2-Ethylhexyl)phthalate	-			-			-			-			-			-			-		
Chrysene	720		500	320	J	1,000	350	J	1,000	180	J	250	220	J	250	200	J	500	250		250
Dibenz(a,h)anthracene	-			-			-			-			-			-			-		
Dibenzofuran	-			-			-			-			-			-			-		
2,4-Dimethylphenol	-			-			-			-			-			-			-		
Di-n-butylphthalate	-			-			-			-			-			-			-		
Diphenyl	-			-			-			23	J	250	-			-			-		
Fluoranthene	130	J	500	59	J	1,000	58	J	1,000	42	J	250	48	J	250	59	J	500	49	J	250
Fluorene	36	J	500	63	J	1,000	61	J	1,000	44	J	250	48	J	250	57	J	500	57	J	250
Hexachlorocyclopentadiene	-			-			-			-			-			-			-		
Indeno(1,2,3-cd)pyrene	-			-			-			-			-			-			-		
2-Methylnaphthalene	41	J	500	120	J	1,000	-			490		250	98	J	250	59	J	500	63	J	250
Naphthalene	-			-			-			450		250	99	J	250	12	J	500	12	J	250
N-Nitrosodiphenylamine	-			-			-			-			-			-			-		
Phenanthrene	-			380	J	1,000	290	J	1,000	220	J	250	350		250	370	J	500	320		250
Pyrene	380	J	500	240	J	1,000	280	J	1,000	130	J	250	160	J	250	110	J	500	220	J	250
Total SVOCs	2,149			1,552			1,549			1,883			1,360			1,087			1,242		
Total TICs	24,250			35,600			30,640			21,710			23,360						27,800		
Total SVOCs + TICs	26,399.0			37,152.0			32,189.0			23,593.0			24,720.0			1,087.0			29,042.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

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* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS						**NORTH CAPASSO WELLS**														
Sample Point:	**MW-15 ***			**Sump (Quanta)**			**GAL-10**			**GAL-10 (Duplicate)**			**GAL-11**			**GAL-12**			**GAL-13**		
Date Sampled:	7/12/2004			7/12/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004		
Lab ID:	546089			546085			545873			545874			545870			545876			545871		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			-			-			-			-			-			-		
Acenaphthylene	-			-			-			-			-			-			-		
Acetophenone	-			-			-			-			-			-			-		
Anthracene	67	J	250	-			130	J	1,000	120	J	1,000	65	J	1,000	140	J	250	58	J	250
Benzaldehyde	-			-			-			-			-			-			-		
Benzo(a)anthracene	130		25	-			380	J	100	370		100	230	J	100	340	J	25	180	J	25
Benzo(a)pyrene	26		25	-			45	J	100	36	J	100	60	J	100	130	J	25	28	J	25
Benzo(b)fluoranthene	18	J	25	-			59	J	100	34	J	100	35	J	100	100	J	25	21	J	25
Benzo(g,h,i)perylene	-			-			-			-			28	J	1,000	43	J	250	13	J	250
Benzo(k)fluoranthene	-			-			-			-			-			-			-		
bis(2-Chloroethoxy)methane	-			-			-			-			-			-			-		
bis(2-Ethylhexyl)phthalate	-			160	J	500	-			-			-			-			-		
Chrysene	200	J	250	-			510	J	1,000	540	J	1,000	360	J	1,000	440	J	250	250	J	250
Dibenz(a,h)anthracene	-			-			-			-			21	J	100	28	J	25	-		
Dibenzofuran	-			-			-			-			-			-			-		
2,4-Dimethylphenol	-			-			-			-			-			-			-		
Di-n-butylphthalate	-			-			-			-			-			-			-		
Diphenyl	-			58	J	500	-			-			-			-			-		
Fluoranthene	60	J	250	25	J	500	73	J	1,000	69	J	1,000	75	J	1,000	80	J	250	42	J	250
Fluorene	39	J	250	-			-			-			34	J	1,000	73	J	250	20	J	250
Hexachlorocyclopentadiene	-			-			-			-			-			-			-		
Indeno(1,2,3-cd)pyrene	-			-			-			-			-			-			-		
2-Methylnaphthalene	67	J	250	730		500	140	J	1,000	120	J	1,000	450	J	1,000	-			190	J	250
Naphthalene	36	J	250	520		500	330	J	1,000	300	J	1,000	470	J	1,000	-			-		
N-Nitrosodiphenylamine	-			-			-			-			-			130	J	250	-		
Phenanthrene	190	J	250	90	J	500	270	J	1,000	240	J	1,000	170	J	1,000	400	J	250	120	J	250
Pyrene	200	J	250	40	J	500	390	J	1,000	280	J	1,000	210	J	1,000	400	J	250	190	J	250
Total SVOCs	1,033			1,623			2,327			2,109			2,208			2,304			1,112		
Total TICs	26,630			29,900			47,600			52,300			37,300			13,330			66,200		
Total SVOCs + TICs	27,663.0			31,523.0			49,927.0			54,409.0			39,508.0			15,634.0			67,312.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS																				
Sample Point:	**GAL-18**			**GAL-21**			**DGAL-21**			**GAL-22**			**GAL-23**			**GAL-24**			**MW-4R**		
Date Sampled:	7/16/2004			4/5/2005			4/5/2005			4/5/2005			4/5/2005			4/5/2005			7/9/2004		
Lab ID:	547611			621338			621339			621335			621337			621336			545875		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			26	J	250	26	J	250	32	J	250	18	J	250	21	J	500	-		
Acenaphthylene	-			-			-			-			-			-			-		
Acetophenone	-			-			-			-			-			-			-		
Anthracene	130	J	500	70	J	250	79	J	250	110	J	250	78	J	250	85	J	500	130	J	250
Benzaldehyde	-			-			-			-			-			-			-		
Benzo(a)anthracene	270	J	50	240		25	240		25	250		25	260		25	210		50	320	J	25
Benzo(a)pyrene	31	J	50	54		25	56		25	48		25	38		25	27	J	50	120	J	25
Benzo(b)fluoranthene	29	J	50	36	J	25	30	J	25	43	J	25	27	J	25	25	J	50	68	J	25
Benzo(g,h,i)perylene	-			17	J	250	20	J	250	-			-			-			34	J	250
Benzo(k)fluoranthene	15	J	50	22	J	25	16	J	25	-			-			-			-		
bis(2-Chloroethoxy)methane	-			-			-			-			-			-			-		
bis(2-Ethylhexyl)phthalate	-			-						-			-			-			-		
Chrysene	390	J	500	280		250	270		250	270		250	280		250	220	J	500	420	J	250
Dibenz(a,h)anthracene	-			14	J	25	12	J	25	-			-			-			30	J	25
Dibenzofuran	-			-			-			-			-			-			-		
2,4-Dimethylphenol	-			-			-			30	J	250	-			-			-		
Di-n-butylphthalate	-			-			-			-			-			-			-		
Diphenyl	-			32	J	250	25	J	250	-			-			-			-		
Fluoranthene	72	J	500	53	J	250	60	J	250	69	J	250	54	J	250	58	J	500	82	J	250
Fluorene	41	J	500	34	J	250	34	J	250	41	J	250	31	J	250	31	J	500	75	J	250
Hexachlorocyclopentadiene	-			-			-			-			-			-			-		
Indeno(1,2,3-cd)pyrene	-			-			-			-			-			-			-		
2-Methylnaphthalene	81	J	500	220	J	250	210	J	250	200	J	250	240	J	250	240	J	500	110	J	250
Naphthalene	-			430		250	450		250	310		250	440		250	420	J	500	-		
N-Nitrosodiphenylamine	-			-			-			-			-			-			88	J	250
Phenanthrene	330	J	500	190	J	250	200	J	250	300		250	180	J	250	190	J	500	340	J	250
Pyrene	270	J	500	190	J	250	200	J	250	210	J	250	210	J	250	190	J	500	340	J	250
Total SVOCs	1,659			1,908			1,928			1,913			1,856			1,717			2,157		
Total TICs	34,540			23,850			19,750			20,000			20,910			41,400			10,000		
Total SVOCs + TICs	36,199.0			25,758.0			21,678.0			21,913.0			22,766.0			43,117.0			12,157.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

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* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

Tables checked by J.L.H. on 5/12/2005

TABLE 13C
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
SEMI-VOLATILE ORGANIC COMPOUNDS
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS						**PHOENIX BEVERAGES WELLS**											
Sample Point:	**MW-10**			**MH-Sump (N.**			**GAL-14**			**GAL-17**			**GAL-26**			**MW-8**		
Date Sampled:	7/9/2004			8/13/2004			7/10/2004			7/10/2004			4/9/2005			7/10/2004		
Lab ID:	545872			554895			545881			545879			623185			545880		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Acenaphthene	-			48	J	100	-			-			36	J	250	-		
Acenaphthylene	-			-			-			-			-			-		
Acetophenone	-			-			33	J	1,000	-			-			-		
Anthracene	100	J	1,000	18	J	100	140	J	1,000	92	J	1,000	110	J	250	120	J	250
Benzaldehyde	-			-			-			-			-			-		
Benzo(a)anthracene	290	J	100	-			190	J	100	150	J	100	200		25	210	J	25
Benzo(a)pyrene	42	J	100	-			62	J	100	-			74		25	74	J	25
Benzo(b)fluoranthene	35	J	100	-			35	J	100	-			33	J	25	48	J	25
Benzo(g,h,i)perylene	-			-			-			-			30	J	250	20	J	250
Benzo(k)fluoranthene	-			-			-			-			18	J	25	-		
bis(2-Chloroethoxy)methane	-			-			-			-			-			-		
bis(2-Ethylhexyl)phthalate	-			150	J	100	-			-			-			-		
Chrysene	380	J	1,000	-			320	J	1,000	270	J	1,000	260		250	280	J	250
Dibenz(a,h)anthracene	-			-			-			-			27	J	25	-		
Dibenzofuran	-			30	J	100	-			-			-			-		
2,4-Dimethylphenol	-			-			-			-			-			-		
Di-n-butylphthalate	-			32	J	100	-			-			-			-		
Diphenyl	-			-			-			-			-			-		
Fluoranthene	54	J	1,000	17	J	100	96	J	1,000	-			57	J	250	-		
Fluorene	31	J	1,000	87	J	100	85	J	1,000	93	J	1,000	76	J	250	61	J	250
Hexachlorocyclopentadiene	-			-			-			-			-			-		
Indeno(1,2,3-cd)pyrene	-			-			-			-			-			16	J	25
2-Methylnaphthalene	130	J	1,000	600		100	-			-			-			-		
Naphthalene	310	J	1,000	120		100	-			-			-			-		
N-Nitrosodiphenylamine	-			-			-			-			-			-		
Phenanthrene	210	J	1,000	120		100	240	J	1,000	440	J	1,000	440		250	370	J	250
Pyrene	230	J	1,000	91	J	100	290	J	1,000	150	J	1,000	190	J	250	310	J	250
Total SVOCs	1,812			1,313			1,491			1,195			1,551			1,509		
Total TICs	41,500			29,570			33,440			44,300			29,020			24,730		
Total SVOCs + TICs	43,312.0			30,883.0			34,931.0			45,495.0			30,571.0			26,239.0		

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* Wells GAGW-04 and MW-15 are located north of the Quanta property across Review Avenue.

TABLE 13D
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAGW-04 ***			**GAL-01**			**GAL-01R**			**GAL-01R (duplicate)**			**GAL-02**			**GAL-03**			**GAL-04**		
Date Sampled:	12/17/2003			11/18/2003			7/16/2004			7/16/2004			11/18/2003			11/18/2003			11/25/2003		
Lab ID:	488619			481266			547612			547613			481265			481942			483777		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1242	-			60		5	55		5	54		5	33		2	-			55		5
Aroclor-1260	-			28	J	5	25		5	23		5	22		2	-			22		5
Total PCBs	0			88			80			77			55			0			77		

	QUANTA PROPERTY WELLS																				
Sample Point:	**GAL-05**			**GAL-06**			**GAL07**			**GAL-07B**			**GAL-07B (Duplicate)**			**GAL-08**			**GAL-09**		
Date Sampled:	11/19/2003			11/17/2003			11/17/2003			11/19/2003			11/19/2003			11/25/2003			7/10/2004		
Lab ID:	481943			481263			481264			481944			481946			483778			545882		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1242	-			-			16		1	11		1	9.8		1	-			-		
Aroclor-1260	7.1		1	-			5.3		1	3.5		1	2.7		1	-			-		
Total PCBs	7.1			0			21.3			14.5			12.5			0			0		

	QUANTA PROPERTY WELLS																	
Sample Point:	**GAL-16**			**GAL-19**			**GAL-20**			**MW-11**			**MW-15 ***			**Sump (Quanta)**		
Date Sampled:	7/10/2004			4/5/2005			4/6/2005			11/20/2003			7/12/2004			1/14/2004		
Lab ID:	545883			621334			622082			482760			546089			494865		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1242	-			-			-			-			-			49		5
Aroclor-1260	-			-			-			-			-			20		5
Total PCBs	0			0			0			0			0			69		

	NORTH CAPASSO WELLS																				
Sample Point:	**GAL-10**			**GAL-10 (duplicate)**			**GAL-11**			**GAL-12**			**GAL-13**			**GAL-18**			**GAL-21**		
Date Sampled:	7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/16/2004			4/5/2005		
Lab ID:	545873			545874			545870			545876			545871			547611			621338		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1242	-			-			8.3		2	-			-			-			-		
Aroclor-1260	5		1	3.1	P*	1	11		2	12		2	5		1	5.6		1	-		
Total PCBs	5			3.1			19.3			12			5			5.6			0		

TABLE 13D
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
PCBs
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS																				
Sample Point:	**DGAL-21**			**GAL-22**			**GAL-23**			**GAL-24**			**MW-4R**			**MW-10**			**MH-Sump**		
Date Sampled:	4/5/2005			4/5/2005			4/5/2005			4/5/2005			7/9/2004			7/9/2004			8/13/2004		
Lab ID:	621339			621335			621337			621336			545875			545872			554895		
Parameter	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1242	-			-			-			-			19		2	-			-		
Aroclor-1260	-			-			-			-			15		2	6.1	P*	1	-		
Total PCBs	0			0			0			0			34			6.1			0		

Sample Point:	**PHOENIX BEVERAGES WELLS**											
Date Sampled:	**GAL-14**			**GAL-17**			**MW-8**			**GAL-26**		
Lab ID:	7/10/2004			7/10/2004			7/10/2004			4/9/2005		
Parameter	545881			545879			545880			623185		
Aroclor-1242	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Aroclor-1260	-			-			-			-		
Total PCBs	-			-			-			-		
	0			0			0			0		

Notes:

All units are mg/kg.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13E
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE 37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																	
Sample Point:	**GAGW-04 ***			**GAL-01R**			**GAL-01R (Duplicate)**			**GAL-02**			**GAL-03**			**GAL-04**		
Date Sampled:	12/17/2003			7/16/2004			7/16/2004			11/18/2003			11/18/2003			11/25/2003		
Lab ID:	488619			547612			547613			481265			481942			483777		
Parameter	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**
Aluminum	-			30.9		6.3	38.7		6.3	15.1	B	6.3	-			39.5		6.3
Arsenic	1		0.32	4.4		0.32	4.7		0.32	1.3		0.32	-			2.5		0.32
Barium	-			28.5		0.17	33.9		0.17	10	B	0.17	2	B	0.17	16.1	B	0.17
Cadmium	-			-			-			-			-			-		
Calcium	13.2	B	4.3	58	B	4.3	71	B	4.3	42.7	B	4.3	16.8	B	4.3	59	B	4.3
Chromium	0.34	B	0.16	5.1		0.16	6.2		0.16	2.6		0.16	0.73	B	0.16	2.9		0.16
Copper	0.71	B	0.37	0.65	B	0.37	0.77	B	0.37	1.1	B	0.37	-			1.2	B	0.37
Iron	-			83.3		3.9	103		3.9	27.8		3.9	4.2	B	3.9	87.5		3.9
Lead	-			15.9		0.23	18.2		0.23	10.9		0.23	1.3		0.23	22.6		0.23
Magnesium	-			-			-			-			-			-		
Manganese	-			2		0.12	2.4		0.12	1.1	B	0.12	0.38	B	0.12	2.1		0.12
Mercury	-			-			-			-			-			-		
Nickel	-			0.17	B	0.16	-			-			-			-		
Potassium	-			-			-											
Silver	-			-			-			-			-			-		
Selenium	-			-			-			-			0.43	B	0.42	-		
Sodium	-			-			-			-			-			-		
Vanadium	0.18	B	0.18	6.7		0.18	6.8		0.18	4.1	B	0.18	0.72	B	0.18	5.8		0.18
Zinc	1.3		0.58	2.8	B	0.58	2.3	B	0.58	2.2	B	0.58	1.5	B	0.58	2.6	B	0.58

Notes:

All units are in mg/kg

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TABLE 13E
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE 37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS																	
Sample Point:	**GAL-05**			**GAL-06**			**GAL-07**			**GAL-08**			**GAL-09**			**GAL-16**		
Date Sampled:	11/19/2003			11/17/2003			11/17/2003			11/25/2003			7/10/2004			7/10/2004		
Lab ID:	481943			481263			481264			483778			545882			54583		
Parameter	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**
Aluminum	-			-			-			-			-			6.9	B	6.3
Arsenic	2.2		0.32	0.75		0.32	0.89		0.32	1.5		0.32	0.79		0.32	1.9		0.32
Barium	4.5	B	0.17	0.23	B	0.17	1.7	B	0.17	0.2	B	0.17	-			1.7	B	0.17
Cadmium	-			-			-			-			-			-		
Calcium	17.2	B	4.3	13.8	B	4.3	15.9	B	4.3	14.5	B	4.3	18	B	4.3	26.9	B	4.3
Chromium	0.69	B	0.16	0.51	B	0.16	0.68	B	0.16	1.3		0.16	0.28	B	0.16	0.61	B	0.16
Copper	-			0.61	B	0.37	-			-			-			-		
Iron	10.1	B	3.9	5.1	B	3.9	4.3	B	3.9	9.5	B	3.9	5.4	B	3.9	22		3.9
Lead	2.2		0.23	-			1.7		0.23	-			-			0.49	B	0.23
Magnesium	-			-			-			-			-			-		
Manganese	0.45	B	0.12	-			0.46	B	0.12	-			-			0.2	B	0.12
Mercury	-			-			-			-			-			-		
Nickel	-			-			-			-			-			-		
Potassium													-			-		
Silver	-			-			-			-			-			-		
Selenium	0.44	B	0.42	-			-			0.75		0.42	-			-		
Sodium	-			-			-			-			-			-		
Vanadium	0.44	B	0.18	-			0.72	B	0.18	2.4	B	0.18	0.36	B	0.18	1.2	B	0.18
Zinc	0.6	B	0.58	0.65	B	0.58	-			-			-			0.87	B	0.58

Notes:

All units are in mg/kg

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"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13E
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE 37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS														
Sample Point:	**GAL-19**			**GAL-20**			**MW-11**			**MW-15**			**Sump (Quanta)**		
Date Sampled:	4/5/2005			4/6/2005			11/20/2003			7/12/2004			1/14/2004		
Lab ID:	621334			622082			482760			546089			494865		
Parameter	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**
Aluminum	6.9	B	6.3	-			-			7.3	B	6.3	9.7	B	5.9
Arsenic	1		0.32	12.6		0.32	-			1.4		0.32	1.2		0.36
Barium	2.3	B	0.17	-			-			-			42		0.15
Cadmium	-			-			-			-			0.05	B	0.04
Calcium	122	B	4.3	14.8	B	4.3	13.2	B	4.3	21.2	B	4.3	102	B	3.8
Chromium	0.55	B	0.16	0.29	B	0.16	0.6	B	0.16	0.49	B	0.16	0.99	B	0.11
Copper	-			-			1.5	B	0.37	0.66	B	0.37	6.2		0.27
Iron	15		3.9	6.1	B	3.9	-			16.4		3.9	99.3		3.7
Lead	0.93		0.26	-			0.3	B	0.23	-			399		0.21
Magnesium	21.4	B	4.2	-			-			-			23.1	B	3.2
Manganese	0.49	B	0.12	-			-			0.4	B	0.12	1	B	0.1
Mercury	-			-			-			-			-		
Nickel	-			-			-			-			0.78	B	0.14
Potassium	41.4	B	31.5	-						-			-		
Silver	-			-			-			0.23	B	0.14	-		
Selenium	-			-			-			-			-		
Sodium	50.1	B	39.5	-			-			-			76.7	B	35.2
Vanadium	0.49	B	0.2	-			0.36	B	0.18	0.84	B	0.18	0.48	B	0.13
Zinc	-			-			1	B	0.58	-			60.7		0.52

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13E
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE 37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS																	
Sample Point:	**GAL-10**			**GAL-10 (duplicate)**			**GAL-11**			**GAL-12**			**GAL-13**			**GAL-18**		
Date Sampled:	7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/16/2004		
Lab ID:	545873			545874			545870			545876			545871			547611		
Parameter	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**
Aluminum	11.2	B	6.3	10.5	B	6.3	53.1		6.3	21.5		6.3	13.8	B	6.3	10.9	B	6.3
Arsenic	2.4		0.32	2.3		0.32	6.9		0.32	1.5		0.32	2.3		0.32	6.4		0.32
Barium	0.38	B	0.17	0.38	B	0.17	10.4	B	0.17	1.6	B	0.17	0.32	B	0.17	2.1	B	0.17
Cadmium	-			-			-			-			-			-		
Calcium	29.6	B	4.3	28	B	4.3	127	B	4.3	29.5	B	4.3	33.3	B	4.3	20.4	B	4.3
Chromium	0.67	B	0.16	0.89	B	0.16	4.1		0.16	3		0.16	0.43	B	0.16	1.1		0.16
Copper	1.5	B	0.37	0.78	B	0.37	0.86	B	0.37	0.53	B	0.37	-			1.4	B	0.37
Iron	11	B	3.9	10	B	3.9	46.8		3.9	20.5		3.9	12.4	B	3.9	14.7	B	3.9
Lead	-			-			2.2		0.23	0.34	B	0.23	-			1		0.23
Magnesium	-			-			5.4	B	4.2	-			-			-		
Manganese	-			0.15	B	0.12	1.7		0.12	0.33	B	0.12	0.28	B	0.12	0.32	B	0.12
Mercury	-			0.02	B	0.017	-			-			-			-		
Nickel	-			-			0.33	B	0.16	-			-			-		
Potassium	-			-			-			-			-			-		
Silver	0.15	B	0.14	-			-			-			-			-		
Selenium	-			-			-			-			-			-		
Sodium	-			-			-			-			-			-		
Vanadium	0.74	B	0.18	0.7	B	0.18	6.3		0.18	7.5		0.18	1.4	B	0.18	1.5	B	0.18
Zinc	0.85	B	0.58	0.73	B	0.58	0.87	B	0.58	0.69	B	0.58	-			-		

Notes:

All units are in mg/kg

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"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13E
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE 37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS																	
Sample Point:	**GAL-21**			**DGAL-21**			**GAL-22**			**GAL-23**			**GAL-24**			**MW-4R**		
Date Sampled:	4/5/2005			4/5/2005			4/5/2005			4/5/2005			4/5/2005			7/9/2004		
Lab ID:	621338			621339			621335			621337			621336			545875		
Parameter	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**
Aluminum	23.3		6.3	21		6.3	-			6.4	B	6.3	26.7		6.3	18.3	B	6.3
Arsenic	7.5		0.32	7.1		0.32	4		0.64	8		0.32	7.8		0.32	2.4		0.32
Barium	1.2	B	0.17	1.1	B	0.17	0.51	B	0.34	1.4	B	0.17	1.4	B	0.17	8	B	0.17
Cadmium	-			-			-			-			-			-		
Calcium	30.1	B	4.3	27.9	B	4.3	14.8	B	8.5	28.2	B	4.3	32.5	B	4.3	46.6	B	4.3
Chromium	2.8		0.16	2.4		0.16	0.73	B	0.32	1.7		0.16	3.2		0.16	2.5		0.16
Copper	-			-			-			-			0.4	B	0.37	0.42	B	0.37
Iron	4.9	B	3.9	6.5	B	3.9	8.5	B	7.8	10	B	3.9	6.9	B	3.9	23.1		3.9
Lead	-			-			-			-			-			5.3		0.23
Magnesium	-			-			-			-			-			-		
Manganese	-			-			-			0.43	B	0.12	-			1.8		0.12
Mercury	-			-			-			-			-			-		
Nickel	-			-			-			-			-			-		
Potassium	-			-			-			-			-			-		
Silver	-			-			-			-			-			-		
Selenium	-			-			-			-			-			-		
Sodium	-			-			-			-			-			-		
Vanadium	5	B	0.2	4.8	B	0.2	0.51	B	0.4	2	B	0.2	4.9	B	0.2	4.6	B	0.18
Zinc	-			-			1.3	B	1.2	0.63	B	0.58	-			1.1	B	0.58

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13E
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
METALS
QUANTA RESOURCES SITE 37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS						**PHOENIX BEVERAGES WELLS**											
Sample Point:	**MW-10**			**MH-Sump (N.**			**GAL-14**			**GAL-17**			**GAL-26**			**MW-8**		
Date Sampled:	7/9/2004			8/13/2004			7/10/2004			7/10/2004			4/9/2005			7/10/2004		
Lab ID:	545872			554895			545881			545879			623185			545880		
Parameter	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**	**Result**	**Qual**	**IDL**
Aluminum	16.7	B	6.3	77.4		6.3	103		6.3	7.9	B	6.3	-			8.7	B	6.3
Arsenic	7.1		0.32	-			1.6		0.32	0.82		0.32	2		0.64	1.5		0.32
Barium	1.4	B	0.17	7.6	B	0.17	0.33	B	0.17	-			-			0.9	B	0.17
Cadmium	-			0.62		0.04	-			-			-			-		
Calcium	37.8	B	4.3	465	B	4.3	19.9	B	4.3	25.8	B	4.3	22	B	8.5	28.4	B	4.3
Chromium	1.6		0.16	1.5		0.16	0.67	B	0.16	0.36	B	0.16	0.44	B	0.32	0.62	B	0.16
Copper	0.37	B	0.37	18.2		0.37	0.42	B	0.37	-			-			0.8	B	0.37
Iron	11.1	B	3.9	361		3.9	9.9	B	3.9	5.5	B	3.9	18	B	7.8	20.4		3.9
Lead	0.53		0.23	19.9		0.26	-			-			-			0.78		0.23
Magnesium	-			29.9	B	4.2	-			-						-		
Manganese	0.4	B	0.12	4.3		0.12	0.16	B	0.12	0.13	B	0.12	0.3	B	0.24	0.31	B	0.12
Mercury	-			-			-			-			-			-		
Nickel	-			1.6	B	0.24	-			-			-			-		
Potassium	-			-			-			-			-			-		
Silver	-			-			-			-			-			-		
Selenium	-			-			-			-			-			-		
Sodium	-			52.8	B	39.5	-			-			-			-		
Vanadium	2.8	B	0.18	2.9	B	0.2	1.3	B	0.18	0.41	B	0.18	0.57	B	0.4	0.85	B	0.18
Zinc	0.68	B	0.58	244		0.58	-			0.59	B	0.58	-			0.98	B	0.58

Notes:

All units are in mg/kg

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

"-" indicates that the constituent was not detected as qualified by "U " or "UJ".

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

TABLE 13F
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
GRO/DRO/MRO
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		QUANTA PROPERTY WELLS																	
Sample Point:		**GAGW-04 ***			**GAL-01R**			**GAL-01R (Duplicate)**			**GAL-02**			**GAL-03**			**GAL-04**		
Date Sampled:		7/9/2004			7/16/2004			7/16/2004			7/12/2004			7/12/2004			7/12/2004		
Lab ID:		545877			547612			547613			546081			546083			546079		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total GRO		3,400	J	420	40,000	J	4,500	34,000	J	4,500	2,600	J	230	2,700	J	250	7,600	J	450
Total DRO		959,000	J	180,000	564,000	J	180,000	520,000	J	180,000	704,000	J	180,000	952,000	J	180,000	748,000	J	180,000
Total MRO		266,000	J	60,000	451,000	J	60,000	420,000	J	60,000	321,000	J	60,000	341,000	J	60,000	409,000	J	60,000

		QUANTA PROPERTY WELLS																	
Sample Point:		**GAL-05**			**GAL-06**			**GAL-07**			**GAL-08**			**GAL-09**			**GAL-16**		
Date Sampled:		7/12/2004			7/12/2004			7/12/2004			7/12/2004			7/10/2004			7/10/2004		
Lab ID:		546084			546088			546082			546086			545882			545883		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total GRO		4,000	J	250	29,000	J	2,500	4,100	J	380	63,000	J	5,000	22,000	J	2,500	5,800	J	830
Total DRO		1,020,000	J	180,000	988,000	J	180,000	823,000	J	180,000	844,000	J	180,000	956,000	J	180,000	704,000	J	180,000
Total MRO		407,000	J	60,000	322,000	J	60,000	318,000	J	60,000	388,000	J	60,000	248,000	J	60,000	300,000	J	60,000

		QUANTA PROPERTY WELLS														
Sample Point:		**GAL-19**			**GAL-20**			**MW-11**			**MW-15 ***			**Sump (Quanta)**		
Date Sampled:		4/5/2005			4/6/2005			7/12/2004			7/12/2004			7/12/2004		
Lab ID:		621334			622082			546087			546089			546085		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total GRO		44,000	J	12,000	18,000	J	4,500	11,000	J	1,100	3,600	J	250	9,700	J	2,100
Total DRO		909,000	J	180,000	952,000	J	180,000	1,030,000	J	180,000	1,040,000	J	180,000	556,000	J	180,000
Total MRO		201,000	J	60,000	99,000	J	60,000	342,000	J	60,000	317,000	J	60,000	509,000	J	60,000

		NORTH CAPASSO WELLS																	
Sample Point:		**GAL-10**			**GAL-10 (duplicate)**			**GAL-11**			**GAL-12**			**GAL-13**			**GAL-18**		
Date Sampled:		7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/9/2004			7/16/2004		
Lab ID:		545873			545874			545870			545876			545871			547611		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total GRO		66,000	J	5,000	64,000	J	3,800	36,000	J	3,600	12,000	J	710	90,000	J	12,000	60,000	J	5,000
Total DRO		694,000	J	180,000	711,000	J	180,000	678,000	J	180,000	780,000	J	180,000	604,000	J	180,000	746,000	J	180,000
Total MRO		302,000	J	60,000	319,000	J	60,000	441,000	J	60,000	316,000	J	60,000	422,000	J	60,000	306,000	J	60,000

TABLE 13F
SUMMARY OF CHEMICAL DETECTIONS
LNAPL SAMPLE ANALYSES
GRO/DRO/MRO
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

		NORTH CAPASSO WELLS																	
Sample Point:		**GAL-21**			**DGAL-21**			**GAL-22**			**GAL-23**			**GAL-24**			**MW-4R**		
Date Sampled:		4/5/2005			4/5/2005			4/5/2005			4/5/2005			4/5/2005			7/9/2004		
Lab ID:		621338			621339			621335			621337			621336			545875		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total GRO		64,000	J	17,000	48,000	J	9,600	84,000	J	25,000	79,000	J	21,000	130,000	J	19,000	11,000	J	2,300
Total DRO		705,000	J	180,000	767,000	J	180,000	915,000	J	180,000	818,000	J	180,000	762,000	J	180,000	730,000	J	180,000
Total MRO		178,000	J	60,000	177,000	J	60,000	153,000	J	60,000	172,000	J	60,000	190,000	J	60,000	326,000	J	60,000

		NORTH CAPASSO WELLS						PHOENIX BEVERAGES WELLS											
Sample Point:		**MW-10**			**MH-Sump (N. Capasso)**			**GAL-14**			**GAL-17**			**GAL-26**			**MW-8**		
Date Sampled:		7/9/2004			8/13/2004			7/10/2004			7/10/2004			4/9/2005			7/10/2004		
Lab ID:		545872			554895			545881			545879			623185			545880		
Parameter		**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Total GRO		55,000	J	3,800	1,800	J	450	3,100	J	420	2,600	J	420	4,600	J	910	4,400	J	500
Total DRO		671,000	J	180,000	474,000	J	180,000	835,000	J	180,000	846,000	J	180,000	852,000	J	25,000	832,000	J	180,000
Total MRO		339,000	J	60,000	397,000	J	60,000	262,000	J	60,000	258,000	J	60,000	94,100	J	60,000	268,000	J	60,000

Notes:

All units are mg/kg.

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

See "Notes and Qualifiers for Analytical Results" for qualifier definitions in Appendix H.

TABLE 13G
SUMMARY OF GC/FID FINGERPRINT
LNAPL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	QUANTA PROPERTY WELLS					
Sample Point:	**GAGW-04 ***	**GAL-01R**	**GAL-01R (Duplicate)**	**GAL-02**	**GAL-03**	**GAL-04**
Date Sampled:	7/9/2004	7/16/2004	7/16/2004	7/12/2004	7/12/2004	7/12/2004
Lab ID:	545877	547612	547613	546081	546083	546079
	Product I.D.	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**
	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.

	QUANTA PROPERTY WELLS					
Sample Point:	**GAL-04 (Duplicate)**	**GAL-05**	**GAL-06**	**GAL-07**	**GAL-08**	**GAL-09**
Date Sampled:	7/12/2004	7/12/2004	7/12/2004	7/12/2004	7/12/2004	7/10/2004
Lab ID:	546080	546084	546088	546082	546086	545882
	Product I.D.	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**
	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil and Mineral Spirits.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil and Mineral Spirits.

	QUANTA PROPERTY WELLS					
Sample Point:	**GAL-16**	**LGAL-19**	**LNGAL-20**	**MW-11**	**MW-15 ***	**Sump (Quanta)**
Date Sampled:	7/10/2004	4/5/2005	4/6/2005	7/12/2004	7/12/2004	7/12/2004
Lab ID:	545883	621334	622082	546087	546089	546085
	Product I.D.	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**
	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of mixture of light petroleum products in the boiling range of Gasoline to Diesel/#2 Fuel Oil.

Notes:

LNAPL Description of GC Fingerprints provided by STL Edison, New Jersey

🟧	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in boiling range of degraded diesel/#2 fuel oil.
🟥	Most closely resembles a mixture of a lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.
🟦	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil and Mineral Spirits.
🟩	Most closely resembles a lube oil/mineral oil with lesser amounts of mixture of light petroleum products in the boiling range of Gasoline to Diesel/#2 Fuel Oil.
🟨	Most closely resembles a mixture of a Diesel/ #2 Fuel Oil and Lube Oil/Mineral Oil.

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

Tables checked by WC on 5/7/04

TABLE 13G
SUMMARY OF GC/FID FINGERPRINT
LNAPL SAMPLE ANALYSES
QUANTA RESOURCES SITE
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

	NORTH CAPASSO WELLS					
Sample Point:	**GAL-10**	**GAL-10 (Duplicate)**	**GAL-11**	**GAL-12**	**GAL-13**	**GAL-18**
Date Sampled:	7/9/2004	7/9/2004	7/9/2004	7/9/2004	7/9/2004	7/16/2004
Lab ID:	545873	545874	545870	545876	545871	547611
	Product I.D.	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**
	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.

	NORTH CAPASSO WELLS					
Sample Point:	**LNGAL-21**	**LNGAL-22**	**LNGAL-23**	**LNGAL-24**	**MW-4R**	**MW-10**
Date Sampled:	4/5/2005	4/5/2005	4/5/2005	4/5/2005	7/9/2004	7/9/2004
Lab ID:	621338	621335	621337	621336	545875	545872
	Product I.D.	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**
	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a mixture of lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.

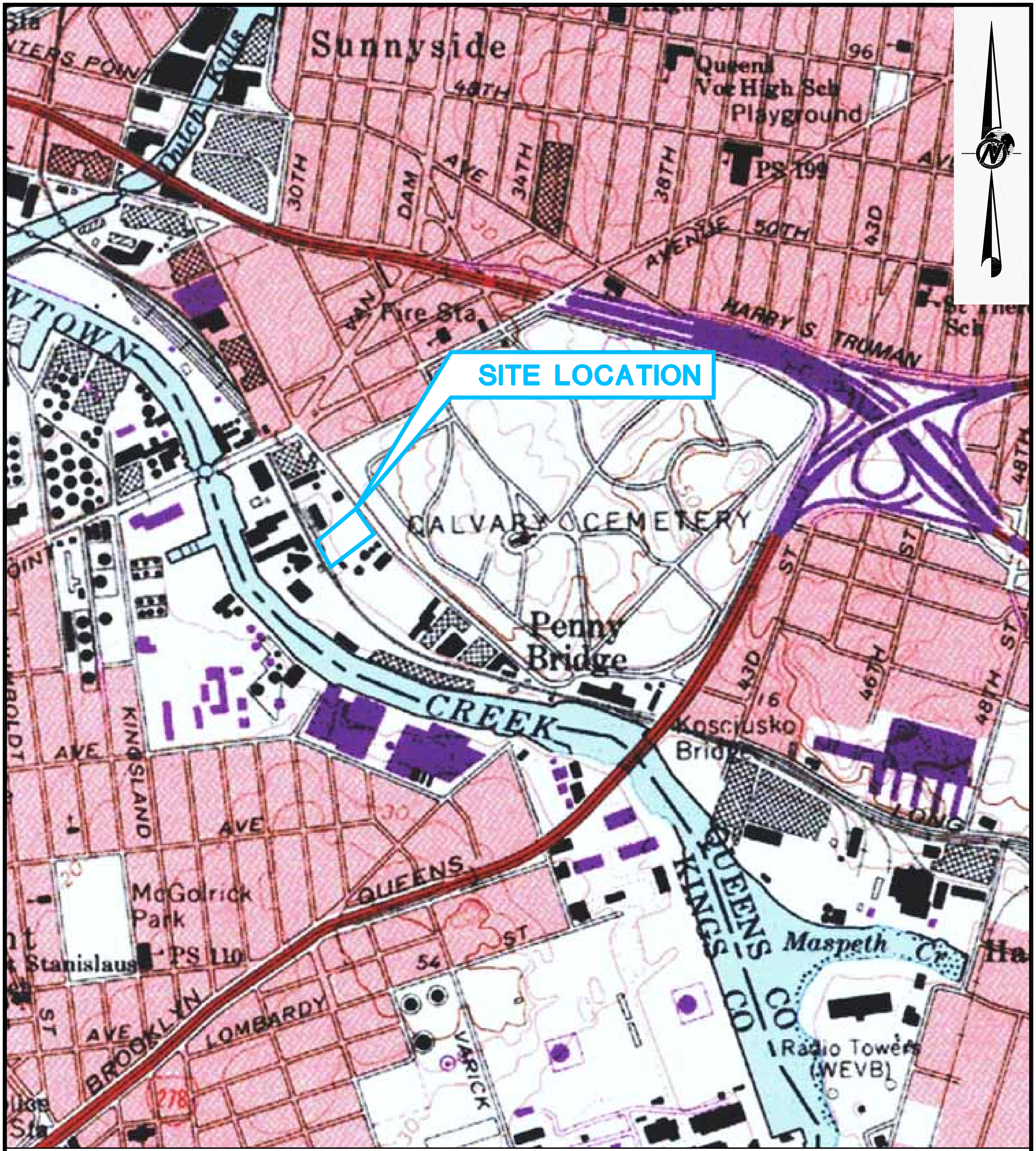
	NORTH CAPASSO WELLS	PHOENIX BEVERAGES WELLS			
Sample Point:	**MH-Sump (North Capasso)**	**GAL-14**	**GAL-17**	**GAL-26**	**MW-8**
Date Sampled:	8/13/2004	7/10/2004	7/10/2004	4/9/2005	7/10/2004
Lab ID:	554895	545881	545879	623185	545880
	Product I.D.	**Product I.D.**	**Product I.D.**	**Product I.D.**	**Product I.D.**
	Most closely resembles a mixture of a Diesel/ #2 Fuel Oil and Lube Oil/Mineral Oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.

LNAPL Description of GC Fingerprints provided by STL Edison, New Jersey

🟧	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in boiling range of degraded diesel/#2 fuel oil.
🟥	Most closely resembles a mixture of a lube oil/mineral oil and a light petroleum product in the boiling range of Mineral Spirits with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil.
🟦	Most closely resembles a lube oil/mineral oil with lesser amounts of a light petroleum product in the boiling range of degraded diesel/#2 fuel oil and Mineral Spirits.
🟩	Most closely resembles a lube oil/mineral oil with lesser amounts of mixture of light petroleum products in the boiling range of Gasoline to Diesel/#2 Fuel Oil.
🟨	Most closely resembles a mixture of a Diesel/ #2 Fuel Oil and Lube Oil/Mineral Oil.

* - Wells GAGW-04 and MW-15 are located north of the Quanta property across from Review Avenue.

Tables checked by WC on 5/7/04



REFERENCES

1.) MAP TAKEN FROM U.S.G.S. 7.5 MINUTE QUADRANGLE OF BROOKLYN, NEW YORK, DATED 1979.

1000 0 1000
SCALE FEET

Golder Associates
Philadelphia USA

SCALE	AS SHOWN	TITLE	
DATE	06/20/05		
DESIGN	AM	SITE LOCATION MAP	
CADD	AM		
FILE No. 0236151M001	CHECK SDM		
PROJECT No. 023-6151 REV. 0	REVIEW RSW	QUANTA RESOURCES SITE	FIGURE 1

Drawing file: 0236151M001.dwg Feb 02, 2006 - 11:00am

Drawing file: 0236151M002.dwg Feb 02, 2006 – 10:59am

REFERENCE

1.) AERIAL PHOTOGRAPH TAKEN FROM DIGITAL IMAGE FILE "1200 DPI AERIAL.JPG", DATED 2004, PROVIDED BY GEOD CORPORATION.

FIGURE 2

PROJECT No. 023-6151
FILE No. 0236151M002
REV. 0 SCALE AS SHOWN
DESIGN RSW 04/18/05
CADD AM 06/20/05
CHECK SDM 06/20/05
REVIEW RSW 06/20/05

TITLE

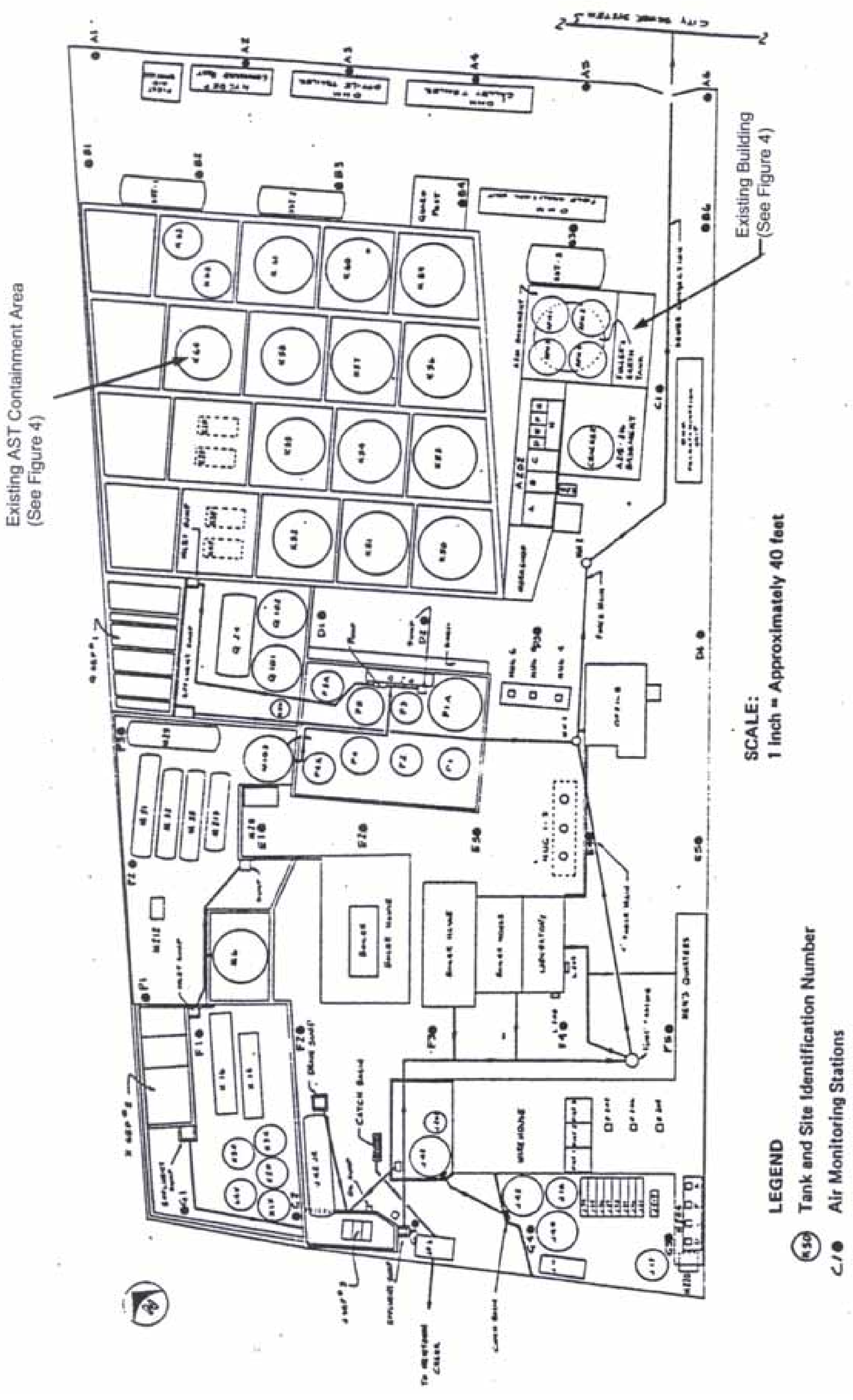
QUANTA RESOURCES SITE
(2004)

PROJECT

QUANTA RESOURCES SITE
DATA SUMMARY REPORT
QUEENS, NEW YORK

Golder Associates
Philadelphia USA

Drawing file: 0236151M003.dwg Feb 02, 2006 - 10:58am



SCALE:
1 inch = Approximately 40 feet

LEGEND

(B30) Tank and Site Identification Number

C1 ● Air Monitoring Stations

SOURCE: O.H. Materials

Figure II-2
Quanta Facility Prior to Cleaning Operations

REFERENCES

1.) MAP TAKEN FROM FIGURE TITLED "QUANTA FACILITY PRIOR TO CLEANING OPERATIONS", PROVIDED BY OHM.

Golder Associates
Philadelphia USA

SCALE	AS SHOWN	TITLE	
DATE	06/20/05		
DESIGN	RSW		
CADD	AM		
FILE No. 0236151M003	CHECK	SDM	
PROJECT No. 023–6151	REV. 0	REVIEW	RSW

LAYOUT OF QUANTA RESOURCES SITE PRIOR TO REMOVAL ACTION

QUANTA RESOURCES SITE

FIGURE 3

LEGEND

●	SURFICIAL SOIL SAMPLE LOCATIONS
●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON-PROPERTY AND OFF-PROPERTY MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF-PROPERTY MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▣	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.-MSL)
——	1 FOOT CONTOUR LINE (FT.-MSL)

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8-23-04.xls AND 2148A 4-11-05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW-9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW-7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

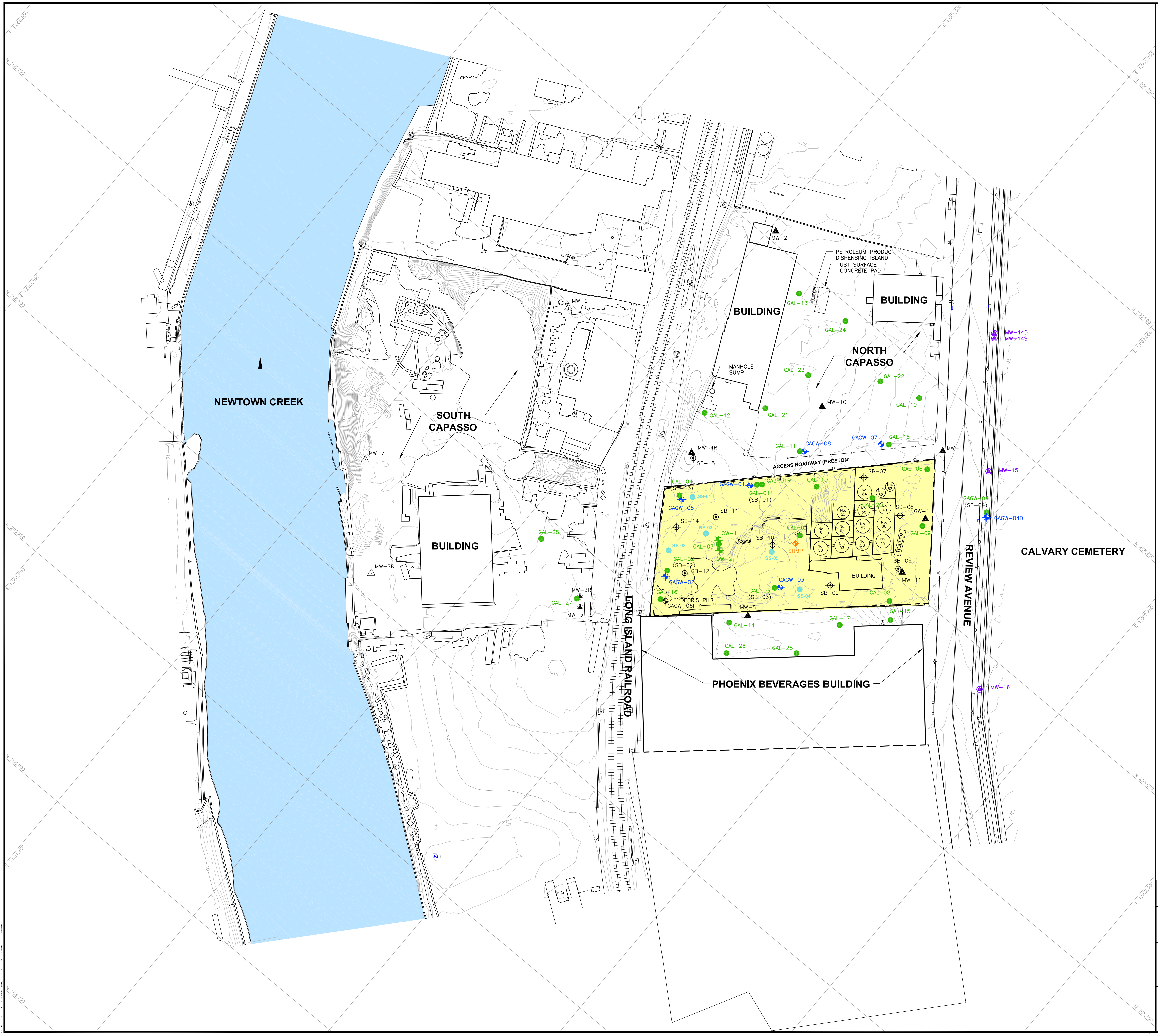
TITLE

REMEDIAL INVESTIGATION
MONITORING POINTS

Golder Associates
Philadelphia USA

PROJECT No.		023-6151	FILE No.	0236151M004
DESIGN	SDM	06/02/05	SCALE AS SHOWN	REV. 0
CADD	RG	06/20/05		
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

FIGURE 4



LEGEND

●	SURFICIAL SOIL SAMPLE LOCATIONS
●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▣	LNAPL PILOT TEST STUDY OBSERVATION WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.-MSL)
——	1 FOOT CONTOUR LINE (FT.-MSL)

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8-23-04.xls AND 2148A 4-11-05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

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6.) LOCATION OF MW-7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

50 0 50 100
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

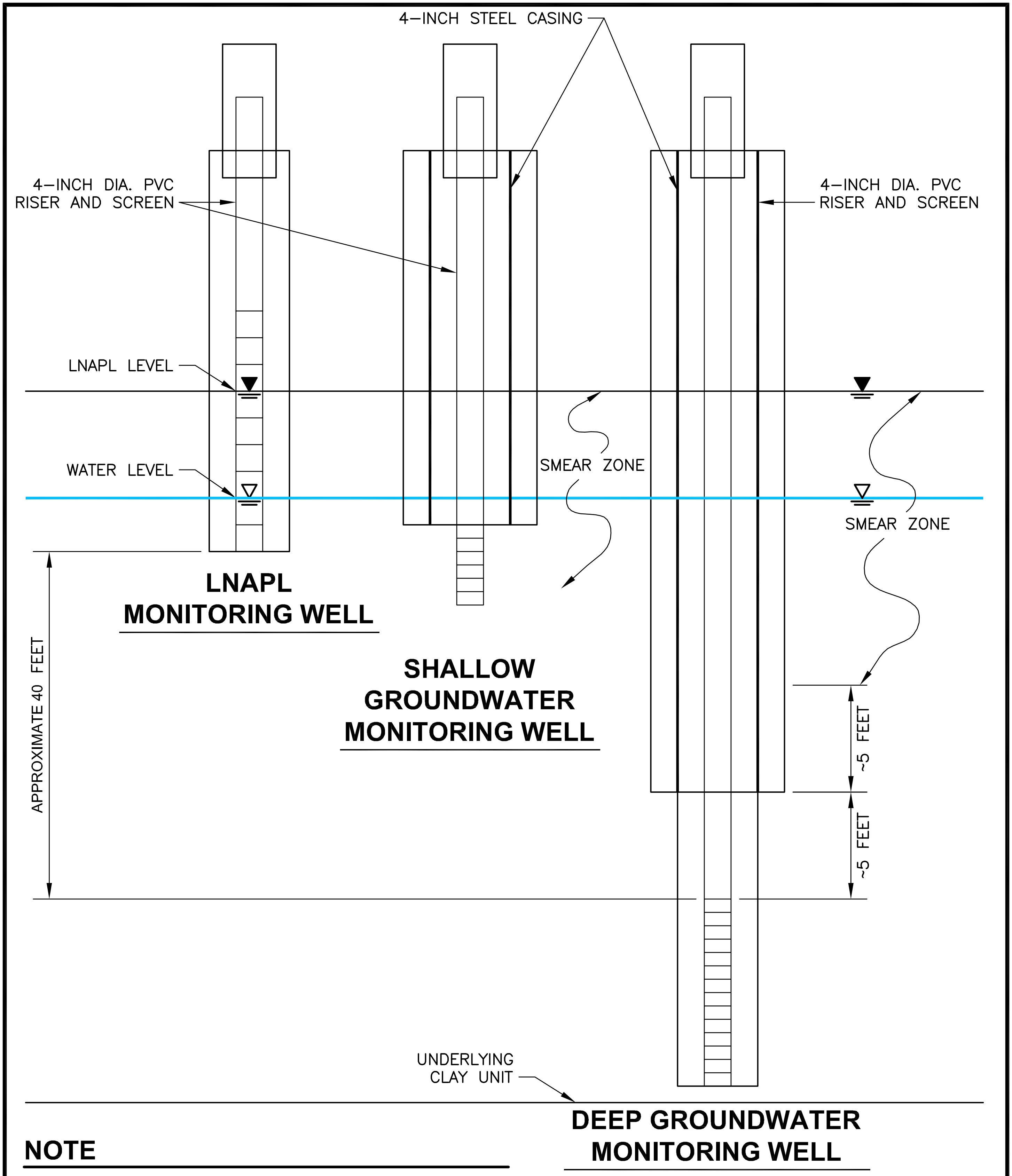
REMEDIAL INVESTIGATION MONITORING POINTS AND VICINITY PLAN

Golder Associates
Philadelphia USA

PROJECT No.		023-6151
DESIGN	SDM	06/02/05
CADD	AM	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

FILE No. 0236151M005
SCALE AS SHOWN
REV. 0

FIGURE 5



NOTE

1.) SEE DATA SUMMARY REPORT TABLE 1 FOR WELL CONSTRUCTION DETAILS.

Golder Associates
Philadelphia USA

SCALE	AS SHOWN	TITLE	
DATE	06/20/05		
DESIGN	RSW		
CADD	AM		
CHECK	SDM		
REVIEW	RSW		

MONITORING WELL CONSTRUCTION SCHEMATIC DIAGRAM

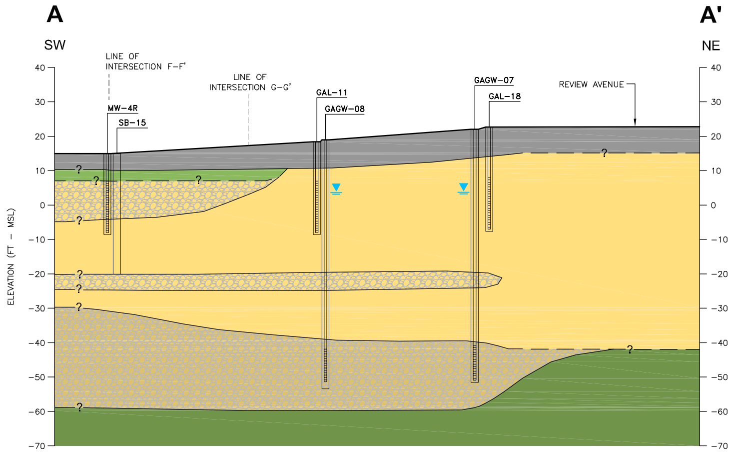
QUANTA RESOURCES SITE

FIGURE 6

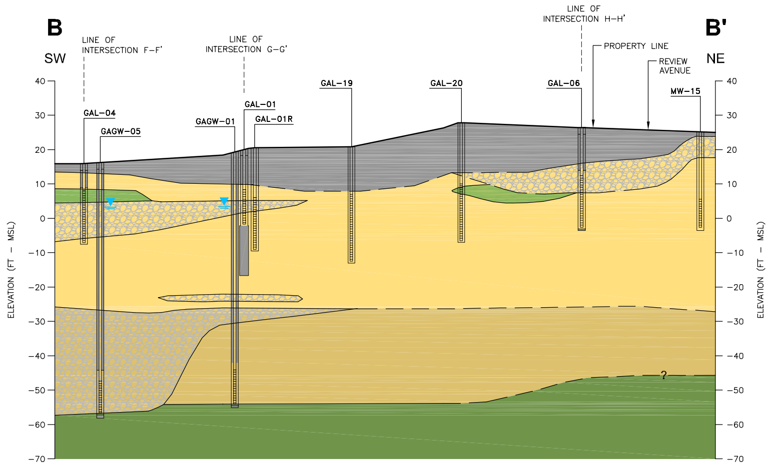
FILE No. 0236151M024

PROJECT No. 023-6151 REV. 0

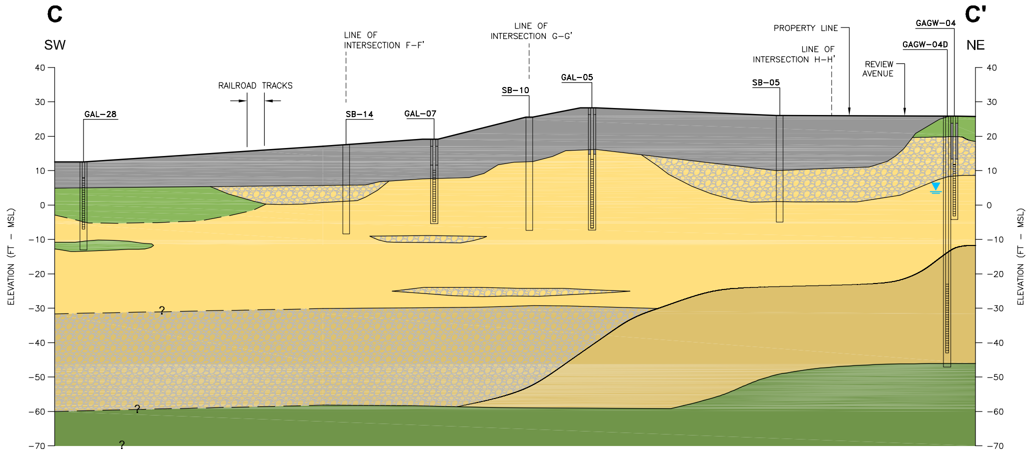
Drawing file: 0236151M024.dwg Feb 02, 2006 - 11:03am



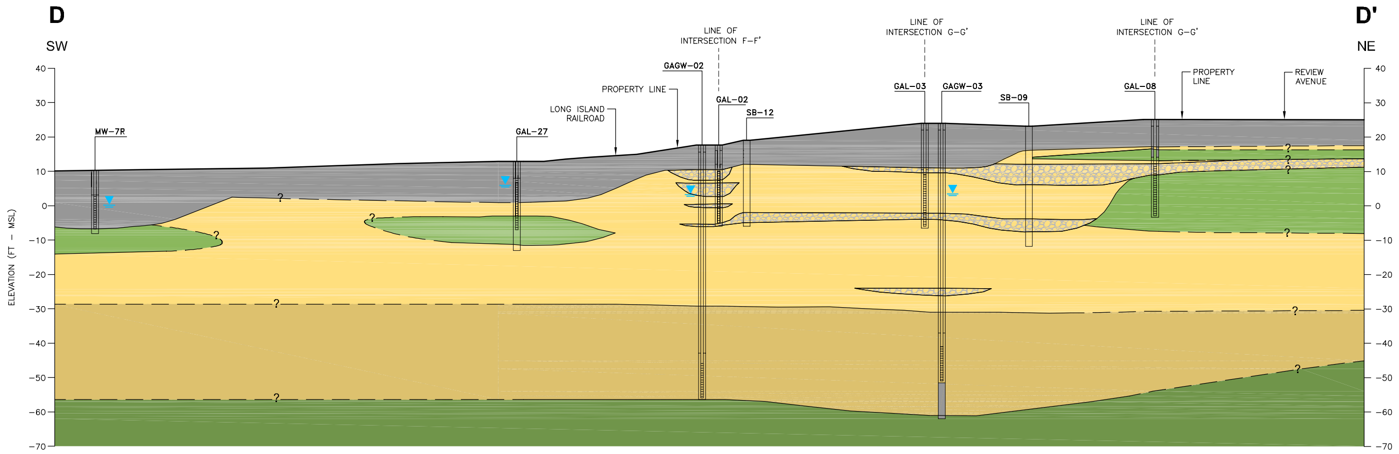
A
7
CROSS SECTION A-A'



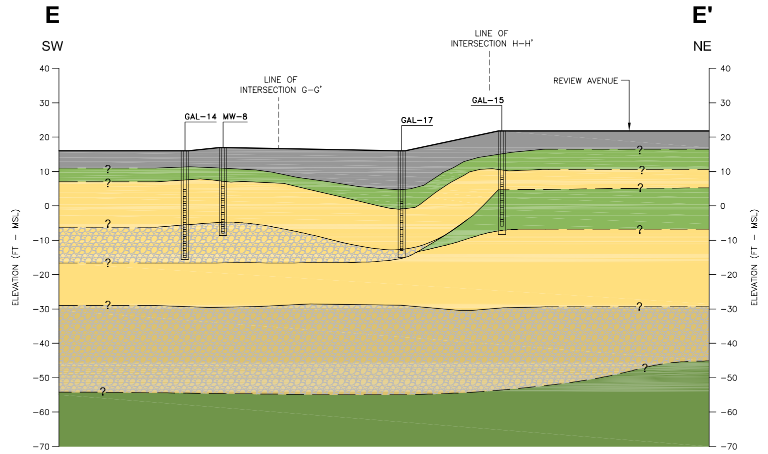
B
7
CROSS SECTION B-B'



C
7
CROSS SECTION C-C'



D
7
CROSS SECTION D-D'



E
7
CROSS SECTION E-E'

LEGEND

GAL-08 — WELL/BORING IDENTIFICATION

- TOP OF WELL/BORING
- TOP OF SCREENED INTERVAL
- BOTTOM OF SCREENED INTERVAL
- BOTTOM OF WELL/BORING

▼ GROUNDWATER ELEVATION (FT.-MSL) AS MEASURED ON APRIL 19, 2005

- URBAN FILL
- UPPER SAND AND GRAVEL UNIT
- (SILTY, SILTY-CLAY UNIT PRESENT IN EASTERN PART OF SITE)
- LOWER SAND AND GRAVEL UNIT (GRAVEL HORIZONS MOSTLY IN THE WESTERN PORTION OF SITE)
- LOWER CLAY (RARITAN FORMATION) (UNDERLINES MOST OF SITE)

NOTES

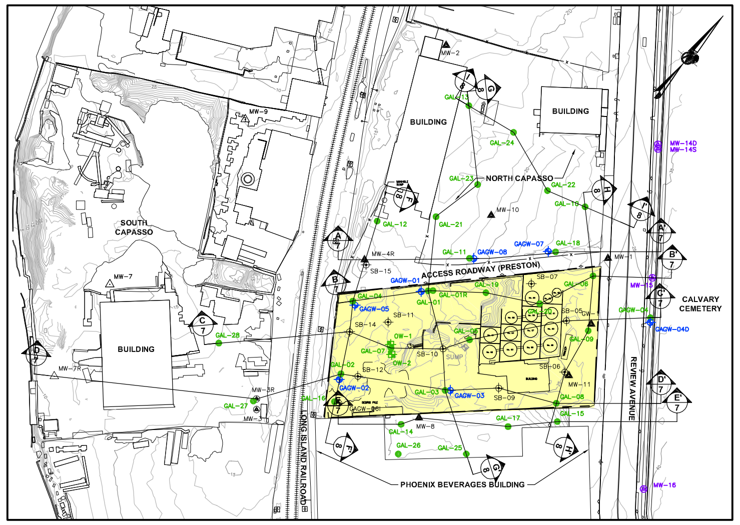
1.) SUBSURFACE INFORMATION OBTAINED DURING THE REMEDIAL INVESTIGATION SUPPLEMENTED WITH BOREHOLE INFORMATION OBTAINED FROM PREVIOUS INVESTIGATION BY HALEY AND ALDRICH (MONITORING WELLS MW-3R, MW-4R, MW-7R, MW-8 AND MW-11).

2.) INTERPRETED BOUNDARIES AND VERTICAL EXTENT ARE APPROXIMATE.

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.DWG, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8-23-04.xls AND 2148A 4-11-05.xls, PROVIDED BY GEOD CORP.



CROSS SECTION LOCATION MAP

100 0 100
SCALE FEET

50 0 50 100
HORIZONTAL SCALE FEET

20 0 20 40
VERTICAL SCALE FEET

VERTICAL EXAGGERATION X2.5

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

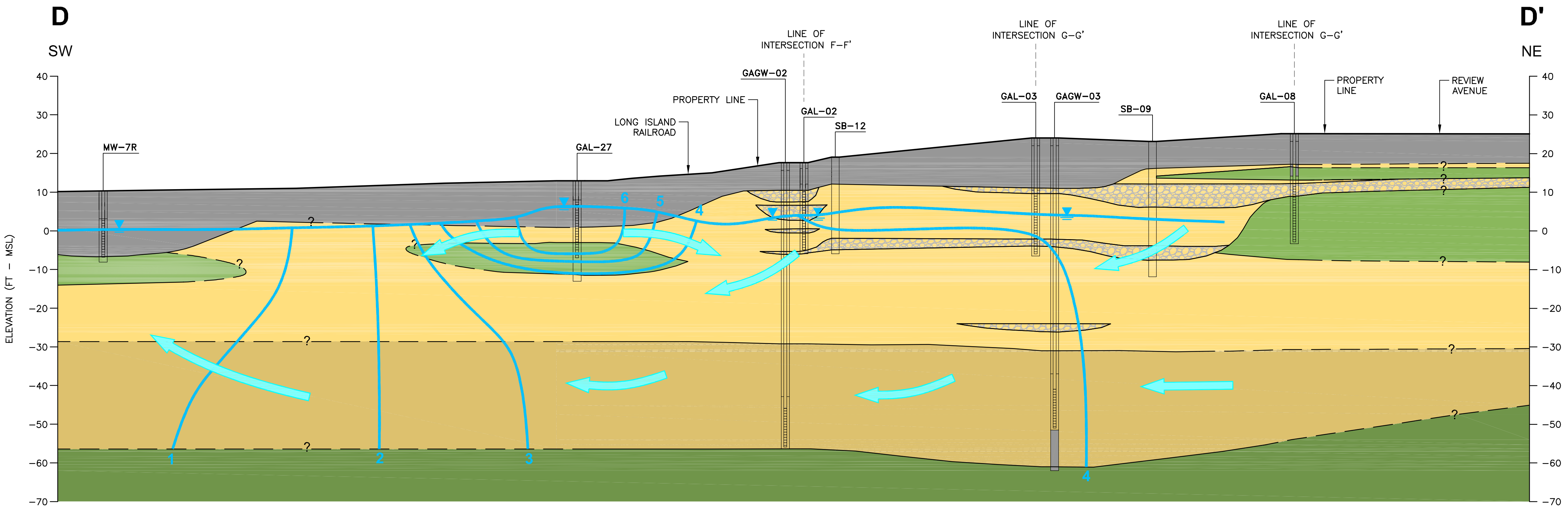
PROJECT
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE
GENERALIZED GEOLOGIC CROSS SECTIONS A-A', THROUGH E-E'

Golder Associates
Philadelphia USA

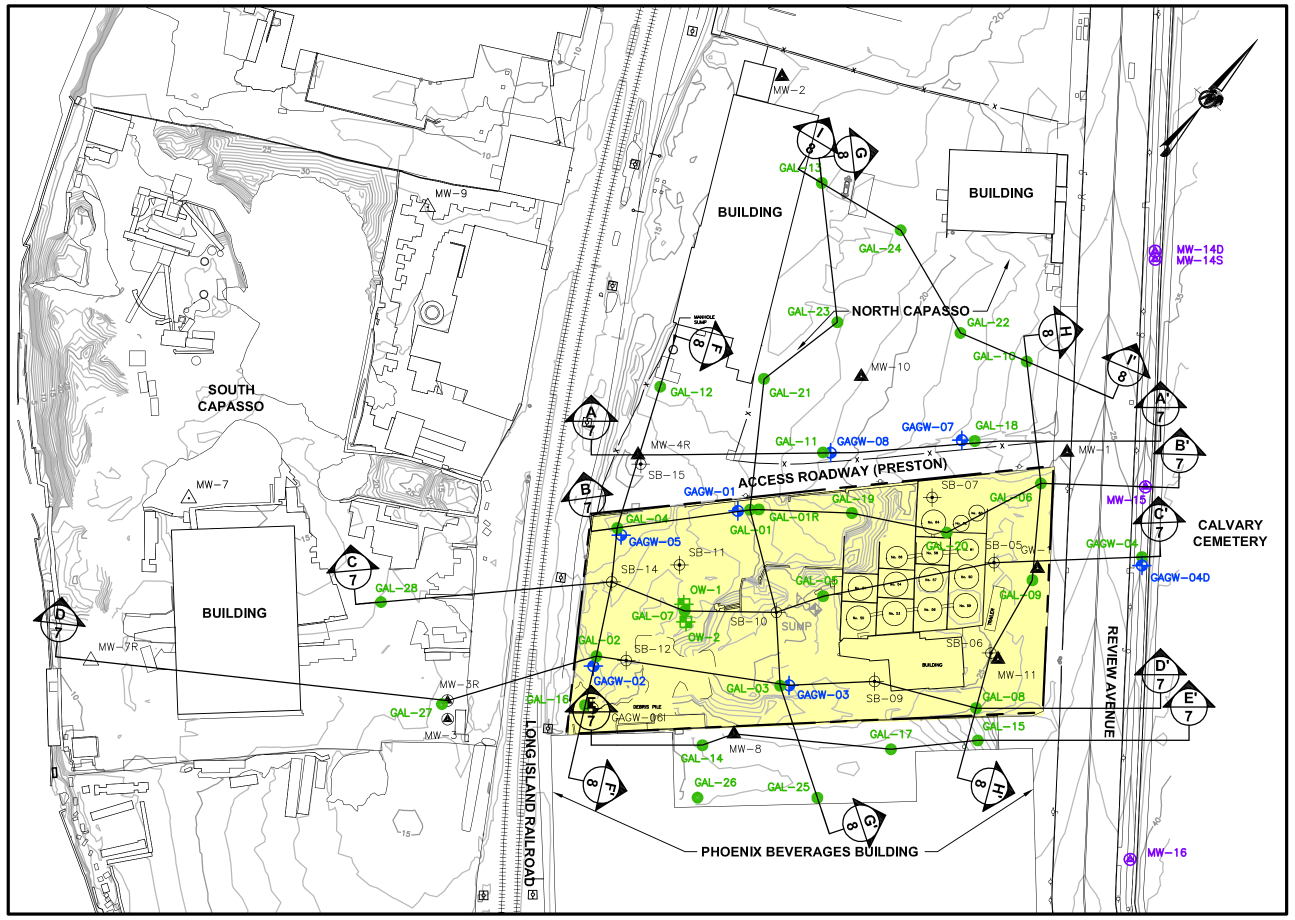
PROJECT No.		023-6151	FILE No.	0236151M009
DESIGN	FG	06/01/05	SCALE AS SHOWN	REV. 0
CADD	RG	06/20/05	FIGURE 7	
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

Drawing file: 0236151M009.dwg Feb 02, 2006 - 11:03am



CROSS SECTION D-D'

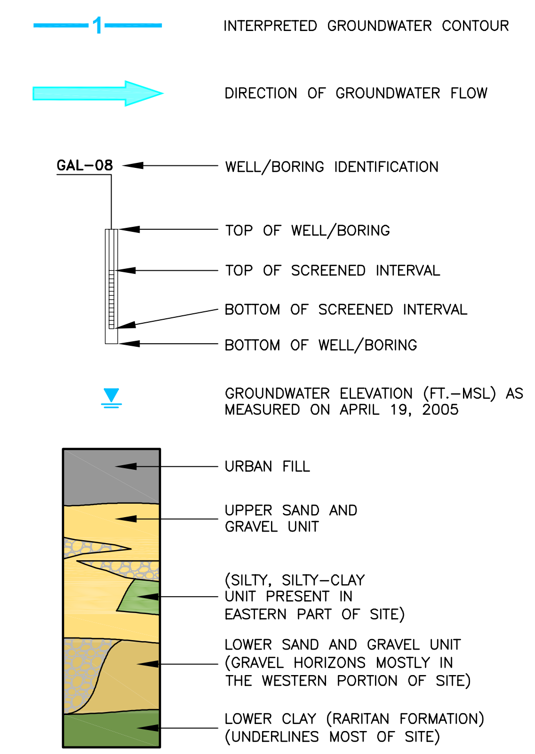
D
7



CROSS SECTION LOCATION MAP

100 0 100
SCALE FEET

LEGEND



—1—	INTERPRETED GROUNDWATER CONTOUR
⇨	DIRECTION OF GROUNDWATER FLOW
GAL–08	WELL/BORING IDENTIFICATION
	TOP OF WELL/BORING
	TOP OF SCREENED INTERVAL
	BOTTOM OF SCREENED INTERVAL
	BOTTOM OF WELL/BORING
▽	GROUNDWATER ELEVATION (FT.–MSL) AS MEASURED ON APRIL 19, 2005
	URBAN FILL
	UPPER SAND AND GRAVEL UNIT
	(SILTY, SILTY–CLAY UNIT PRESENT IN EASTERN PART OF SITE)
	LOWER SAND AND GRAVEL UNIT (GRAVEL HORIZONS MOSTLY IN THE WESTERN PORTION OF SITE)
	LOWER CLAY (RARITAN FORMATION) (UNDERLINES MOST OF SITE)

NOTES

1.) SUBSURFACE INFORMATION OBTAINED DURING THE REMEDIAL INVESTIGATION SUPPLEMENTED WITH BOREHOLE INFORMATION OBTAINED FROM PREVIOUS INVESTIGATION BY HALEY AND ALDRICH (MONITORING WELLS MW–3R, MW–4R, MW–7R, MW–8 AND MW–11).

2.) INTERPRETED BOUNDARIES AND VERTICAL EXTENT ARE APPROXIMATE.

REFERENCES

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2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls, PROVIDED BY GEOD CORP.

50 0 50
HORIZONTAL SCALE FEET

20 0 20
VERTICAL SCALE FEET

VERTICAL EXAGGERATION X2.5

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

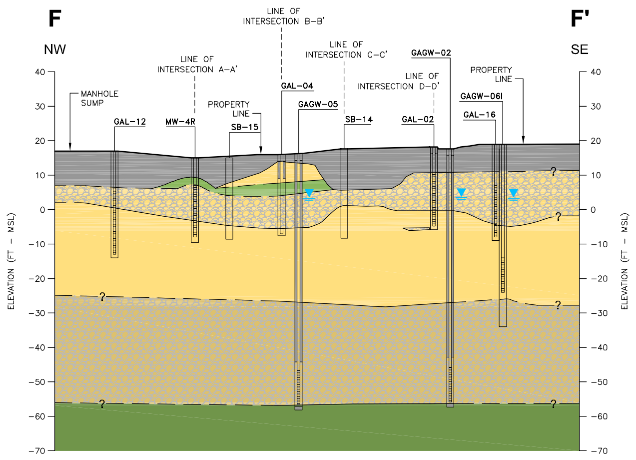
PROJECT
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE
GENERALIZED HYDROGEOLOGIC CROSS SECTION D-D'

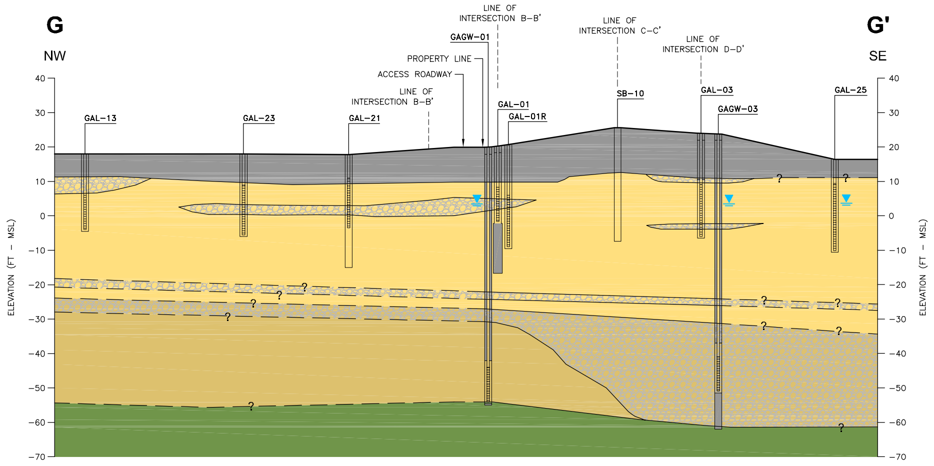
Golder Associates
Philadelphia USA
NJ Authorization #24GA28029100

PROJECT No.		023–6151	FILE No.	0236151M021
DESIGN	SDM	06/02/05	SCALE AS SHOWN	REV. 0
CADD	RG	06/20/05	FIGURE 7A	
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

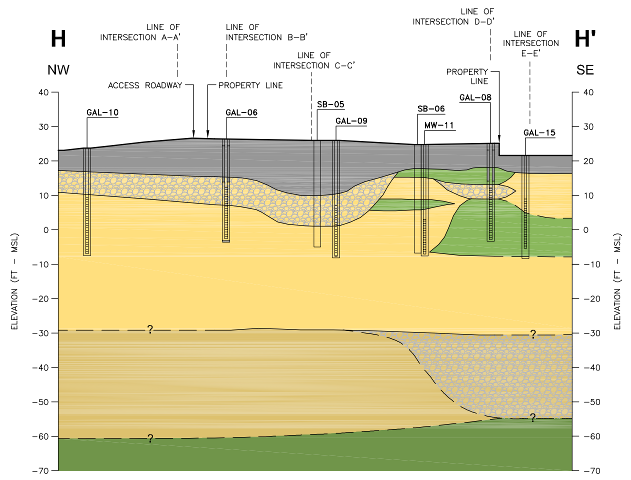
Drawing file: 0236151M021.dwg Feb 02, 2006 – 11:02am



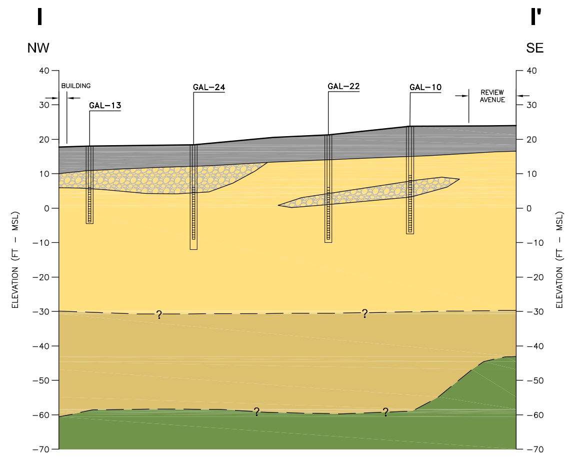
F 8 CROSS SECTION F-F'



G 8 CROSS SECTION G-G'



H 8 CROSS SECTION H-H'



I 8 CROSS SECTION I-I'

LEGEND

GAL–08 — WELL/BORING IDENTIFICATION

TOP OF WELL/BORING

TOP OF SCREENED INTERVAL

BOTTOM OF SCREENED INTERVAL

BOTTOM OF WELL/BORING

▼ GROUNDWATER ELEVATION (FT.–MSL) AS MEASURED ON APRIL 19, 2005

URBAN FILL

UPPER SAND AND GRAVEL UNIT

(SILTY, SILTY–CLAY UNIT PRESENT IN EASTERN PART OF SITE)

LOWER SAND AND GRAVEL UNIT (GRAVEL HORIZONS MOSTLY IN THE WESTERN PORTION OF SITE)

LOWER CLAY (RARITAN FORMATION) (UNDERLINES MOST OF SITE)

NOTES

1.) SUBSURFACE INFORMATION OBTAINED DURING THE REMEDIAL INVESTIGATION SUPPLEMENTED WITH BOREHOLE INFORMATION OBTAINED FROM PREVIOUS INVESTIGATION BY HALEY AND ALDRICH (MONITORING WELLS MW–3R, MW–4R, MW–7R, MW–8 AND MW–11).

2.) INTERPRETED BOUNDARIES AND VERTICAL EXTENT ARE APPROXIMATE.

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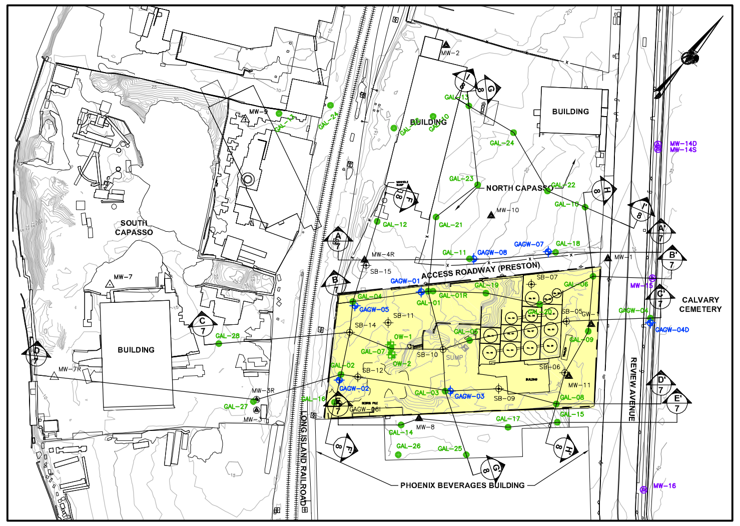
2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls, PROVIDED BY GEOD CORP.



CROSS SECTION LOCATION MAP

100 0 100
SCALE FEET

50 0 50 100
HORIZONTAL SCALE FEET

20 0 20 40
VERTICAL SCALE FEET

VERTICAL EXAGGERATION X2.5

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

GENERALIZED GEOLOGIC CROSS SECTIONS F-F' THROUGH I-I'

Golder Associates
Philadelphia USA

PROJECT No.		023–6151	FILE No.	0236151M010
DESIGN	FG	06/01/05	SCALE AS SHOWN	REV. 0
CADD	RG	06/20/05		
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

FIGURE 8

Drawing file: 0236151M010.dwg Feb 02, 2006 – 11:02am

Figure 9
Groundwater Elevation vs. Precipitation
Quanta Resources Site
Long Island City, New York

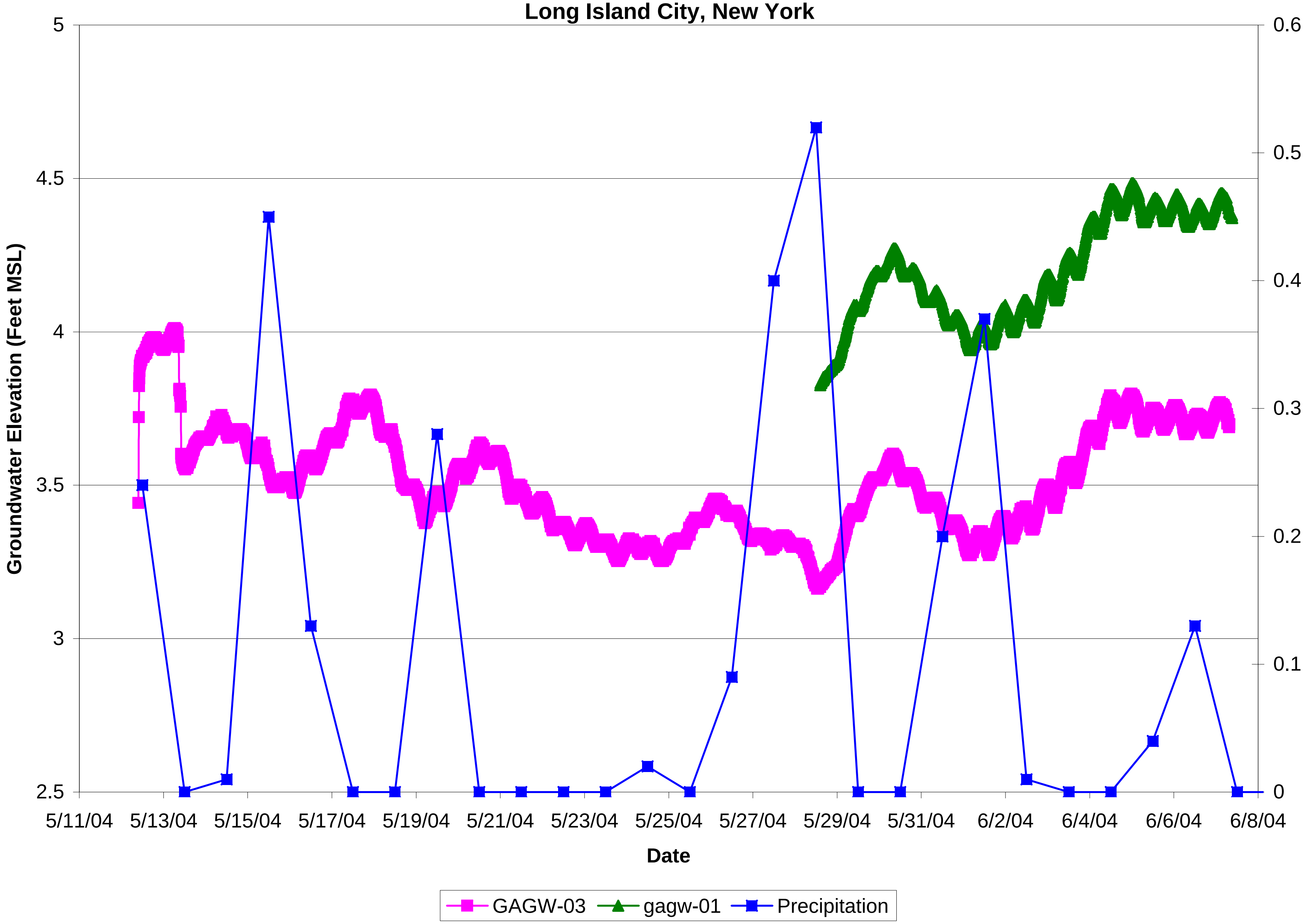
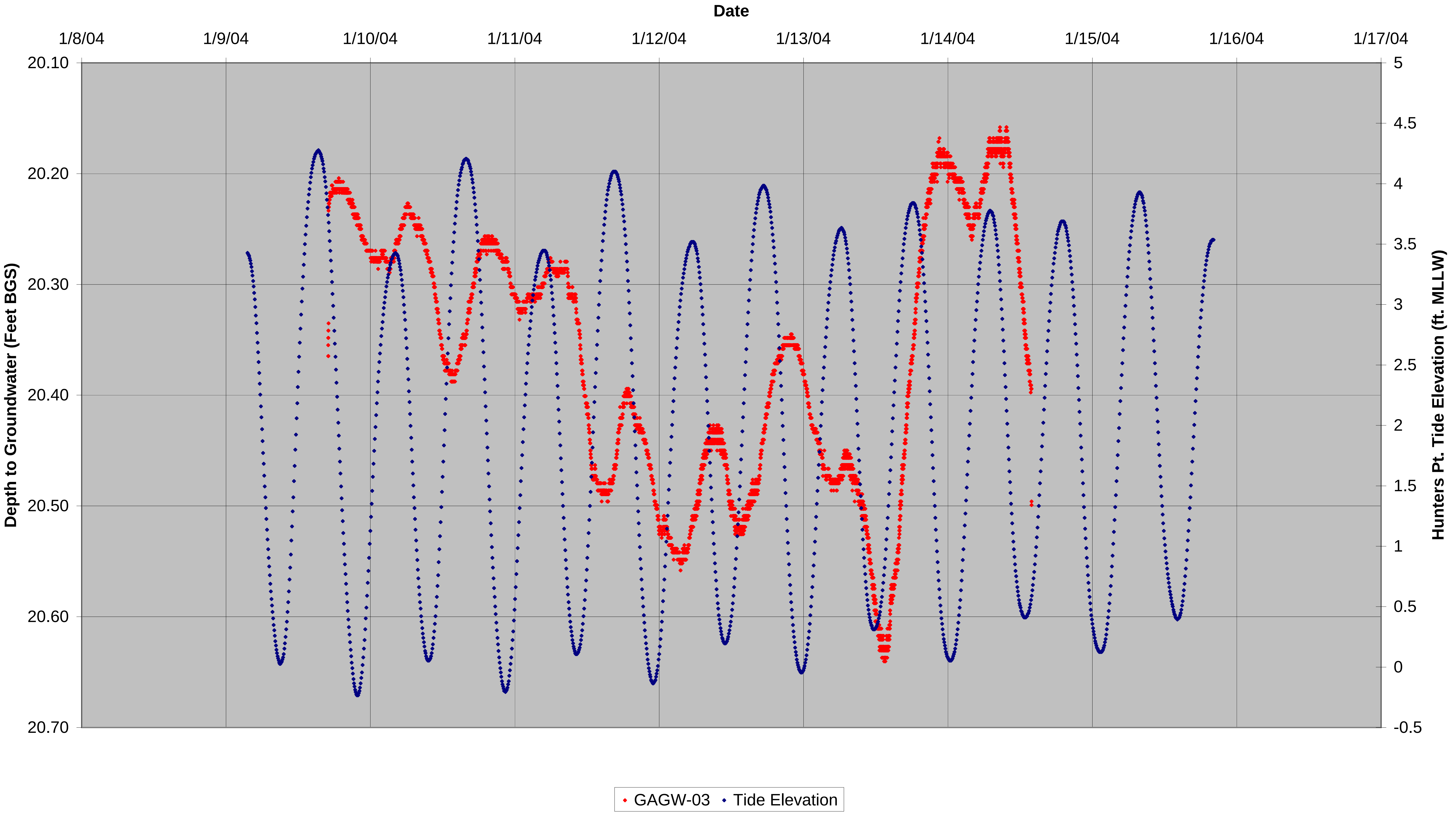
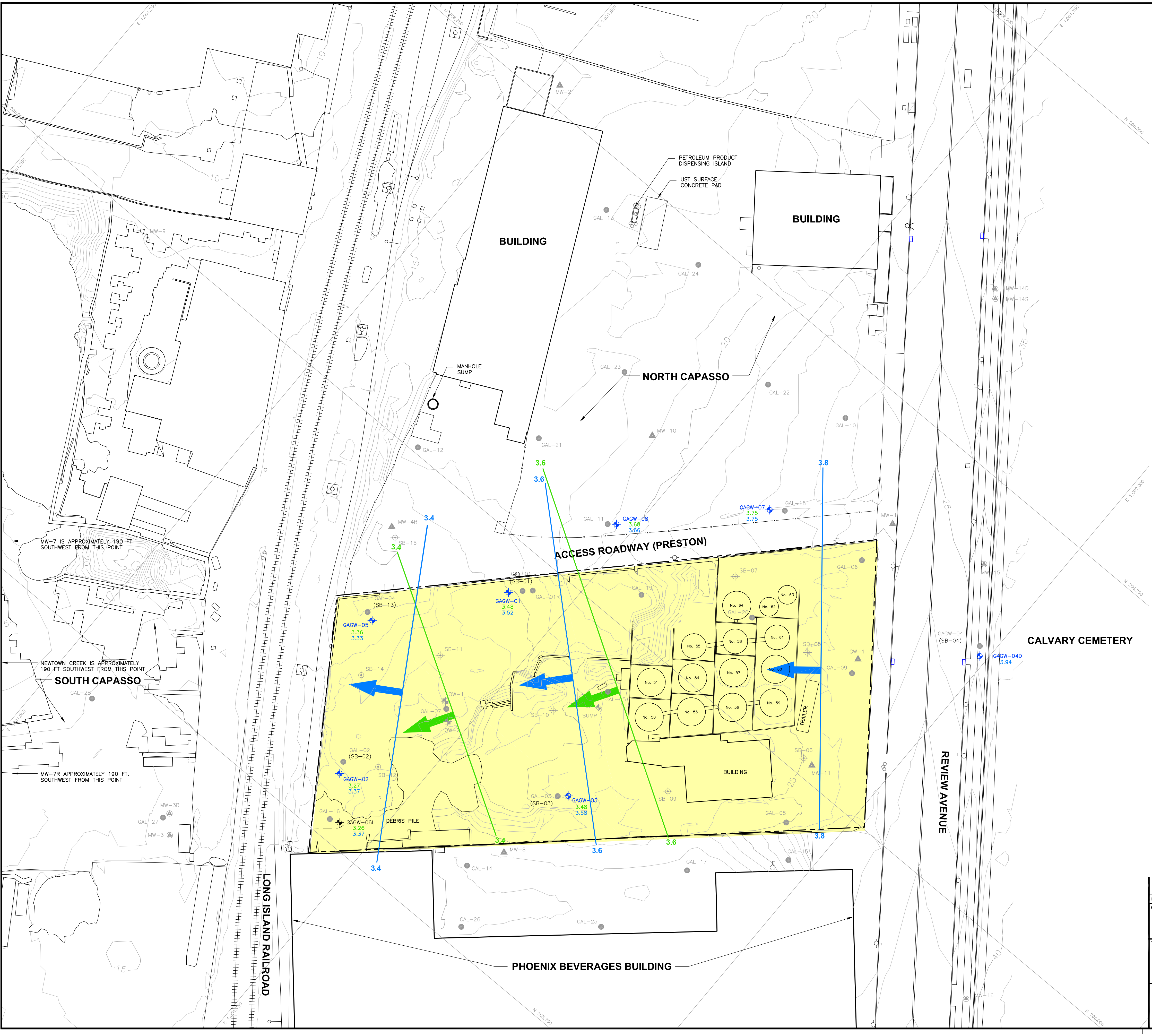
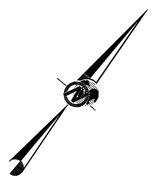


Figure 10
Water Levels vs. Tidal Flux
Quanta Resources Site
Long Island City, New York





Drawing file: 0236151M008.dwg Feb 02, 2006 – 11:01am



LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
▲	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON–PROPERTY AND OFF–PROPERTY MONITORING WELL LOCATION (SEE REFERENCE 2)
▲	EXISTING OFF–PROPERTY MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF–PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
—3.4—	INTERPRETED GROUNDWATER CONTOUR (JULY 24, 2004)
←	INTERPRETED GROUNDWATER FLOW DIRECTION
3.75	GROUNDWATER ELEVATION (FT.–MSL)
—3.8—	INTERPRETED GROUNDWATER CONTOUR (AUGUST 31, 2004)
←	INTERPRETED GROUNDWATER FLOW DIRECTION
3.75	GROUNDWATER ELEVATION (FT.–MSL)
— – – —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.–MSL)
——	1 FOOT CONTOUR LINE (FT.–MSL)

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

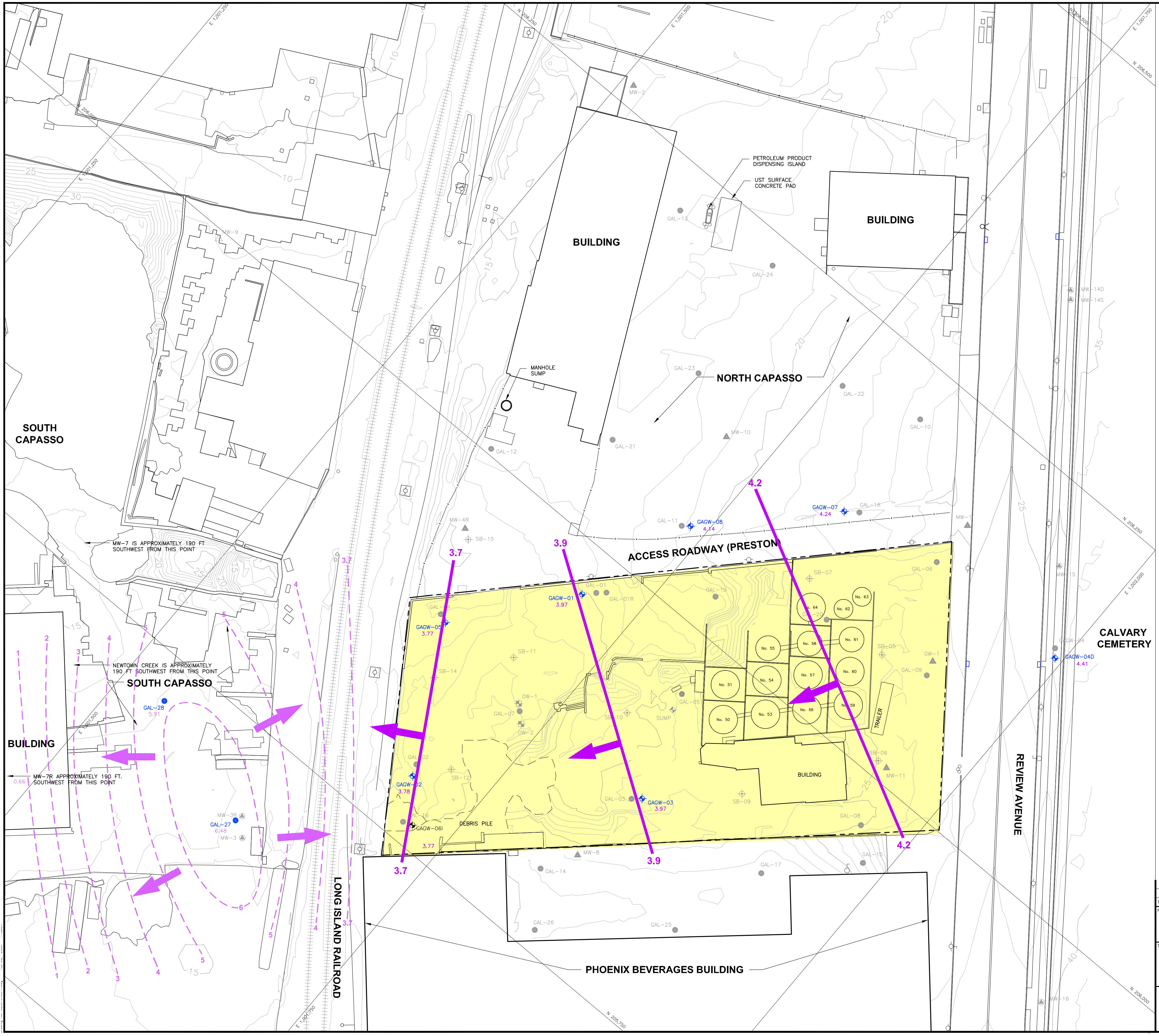
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

INTERPRETED GROUNDWATER CONTOUR MAP (JULY AND AUGUST 2004)

Golder Associates
Philadelphia USA

PROJECT No.		023–6151	FILE No.	0236151M008
DESIGN	SDM	06/01/05	SCALE AS SHOWN	REV. 0
CADD	AM	06/20/05	FIGURE 11	
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		



LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
▲	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
▲	EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
—3.4—	INTERPRETED GROUNDWATER CONTOUR (APRIL 19, 2005) (DASHED WHERE INFERRED)
←	INTERPRETED GROUNDWATER FLOW DIRECTION
3.75	GROUNDWATER ELEVATION (FT.-MSL)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.-MSL)
——	1 FOOT CONTOUR LINE (FT.-MSL)

NOTES

1.) FT-MSL – FEET MEAN SEA LEVEL

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8-23-04.xls AND 2148A 4-11-05.xls PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW-9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW-7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

INTERPRETED GROUNDWATER CONTOUR MAP
(APRIL 2005)

Golder Associates
Philadelphia USA

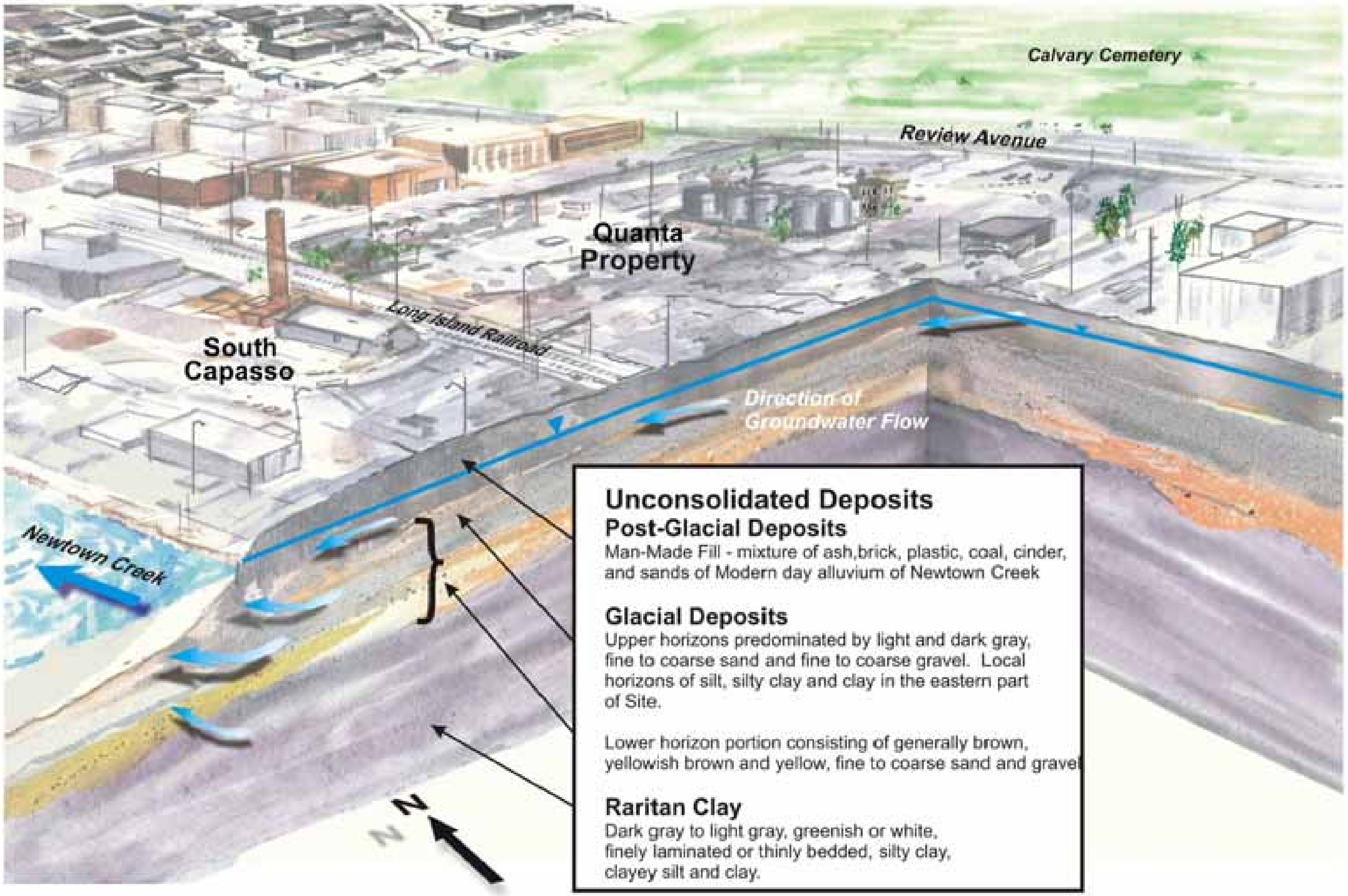
PROJECT No.		023-6151
DESIGN	SDM	06/02/05
CADD	RG	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

FILE No. 0236151M017
SCALE AS SHOWN REV. 0

FIGURE 12

Drawing file: 0236151M018.dwg Feb 03, 2006 - 4:10pm

CONCEPTUAL SITE HYDROGEOLOGIC MODEL



Unconsolidated Deposits

Post-Glacial Deposits

Man-Made Fill - mixture of ash,brick, plastic, coal, cinder, and sands of Modern day alluvium of Newtown Creek

Glacial Deposits

Upper horizons predominated by light and dark gray, fine to coarse sand and fine to coarse gravel. Local horizons of silt, silty clay and clay in the eastern part of Site.

Lower horizon portion consisting of generally brown, yellowish brown and yellow, fine to coarse sand and gravel

Raritan Clay

Dark gray to light gray, greenish or white, finely laminated or thinly bedded, silty clay, clayey silt and clay.

FIGURE 13

REVIEW RSW 06/20/05
CHECK SDM 06/20/05
CADD AM 06/20/05
DESIGN RV 06/01/05
REV. 0 SCALE AS SHOWN
FILE No. 0236151M018
PROJECT No. 023-6151

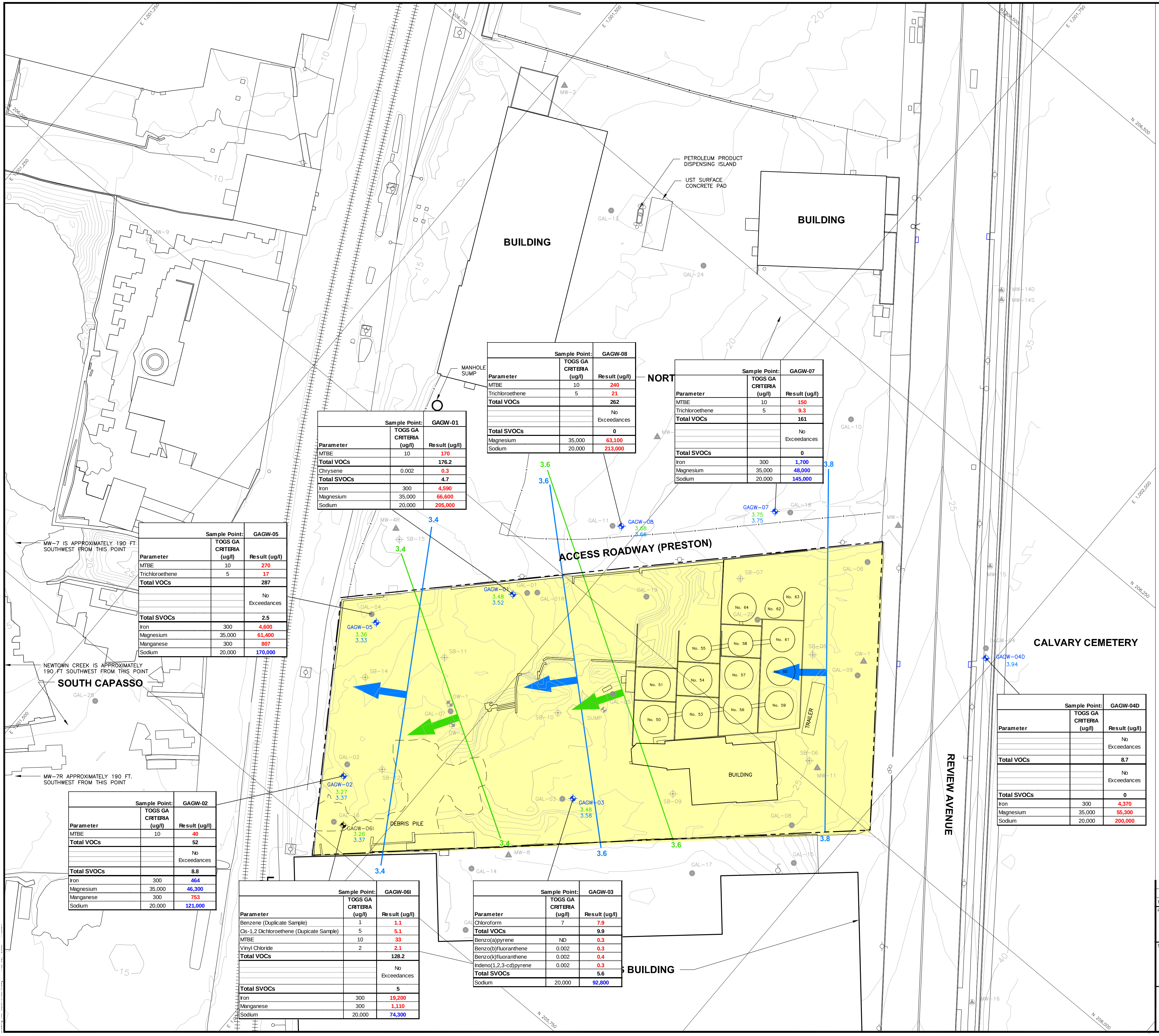
TITLE

CONCEPTUAL SITE HYDROGEOLOGIC MODEL

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

Golder Associates
Philadelphia USA



	Sample Point:	GAGW-08
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
MTBE	10	240
Trichloroethene	5	21
Total VOCs		262
		No Exceedances
Total SVOCs		0
Magnesium	35,000	63,100
Sodium	20,000	213,000

	Sample Point:	GAGW-07
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
MTBE	10	150
Trichloroethene	5	9.3
Total VOCs		161
		No Exceedances
Total SVOCs		0
Iron	300	1,700
Magnesium	35,000	48,000
Sodium	20,000	145,000

	Sample Point:	GAGW-01
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
MTBE	10	170
Total VOCs		176.2
Chrysene	0.002	0.3
Total SVOCs		4.7
Iron	300	4,590
Magnesium	35,000	66,600
Sodium	20,000	205,000

	Sample Point:	GAGW-05
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
MTBE	10	270
Trichloroethene	5	17
Total VOCs		287
		No Exceedances
Total SVOCs		2.5
Iron	300	4,600
Magnesium	35,000	61,400
Manganese	300	807
Sodium	20,000	170,000

	Sample Point:	GAGW-04D
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
		No Exceedances
Total VOCs		8.7
		No Exceedances
Total SVOCs		0
Iron	300	4,370
Magnesium	35,000	55,300
Sodium	20,000	200,000

	Sample Point:	GAGW-02
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
MTBE	10	40
Total VOCs		52
		No Exceedances
Total SVOCs		8.8
Iron	300	464
Magnesium	35,000	46,300
Manganese	300	753
Sodium	20,000	121,000

	Sample Point:	GAGW-06I
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
Benzene (Duplicate Sample)	1	1.1
Cis-1,2 Dichloroethene (Dupicate Sample)	5	5.1
MTBE	10	33
Vinyl Chloride	2	2.1
Total VOCs		128.2
		No Exceedances
Total SVOCs		5
Iron	300	19,200
Manganese	300	1,110
Sodium	20,000	74,300

	Sample Point:	GAGW-03
Parameter	TOGS GA CRITERIA (ug/l)	Result (ug/l)
Chloroform	7	7.9
Total VOCs		9.9
Benzo(a)pyrene	ND	0.3
Benzo(b)fluoranthene	0.002	0.3
Benzo(k)fluoranthene	0.002	0.4
Indeno(1,2,3-cd)pyrene	0.002	0.3
Total SVOCs		5.6
Sodium	20,000	92,800

LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
▲	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
▲	EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
—3.4—	INTERPRETED GROUNDWATER CONTOUR (JULY 24, 2004)
⬅	INTERPRETED GROUNDWATER FLOW DIRECTION
3.75	GROUNDWATER ELEVATION (FT.–MSL)
—3.8—	INTERPRETED GROUNDWATER CONTOUR (AUGUST 31, 2004)
⬅	INTERPRETED GROUNDWATER FLOW DIRECTION
3.75	GROUNDWATER ELEVATION (FT.–MSL)
— – – —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.–MSL)
——	1 FOOT CONTOUR LINE (FT.–MSL)

NOTES

1.) FIGURE SHOWS GROUNDWATER QUALITY EXCEEDANCES (RED) BASED ON COMPARISON OF REPORTED ANALYTICAL RESULTS FROM SAMPLING EVENTS CONDUCTED IN JANUARY 2004 (GAGW–01, GAGW–02, GAGW–03, AND GAGW–05) AND AUGUST 2004 (GAGW–04D, GAGW–06I, GAGW–07 AND GAGW–08) TO THE NEW YORK STATE TOGS 1.1.1 CLASS GA GROUNDWATER CRITERIA (OCTOBER 1993, REVISED JUNE 1998 AND APRIL 2000 ADDENDUM). METAL CONCENTRATIONS THAT EXCEED THE TOGS GA CRITERIA AND ARE LESS THAN BACKGROUND GROUNDWATER CONCENTRATIONS (GAGW–04D) ARE IN BLUE.

2.) ALL RESULTS ARE SHOWN IN UG/L (PPB).

3.) THERE WERE NO DETECTIONS OF PCB'S.

4.) FT–MSL – FEET MEAN SEA LEVEL

5.) ND – NOT DETECTED

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

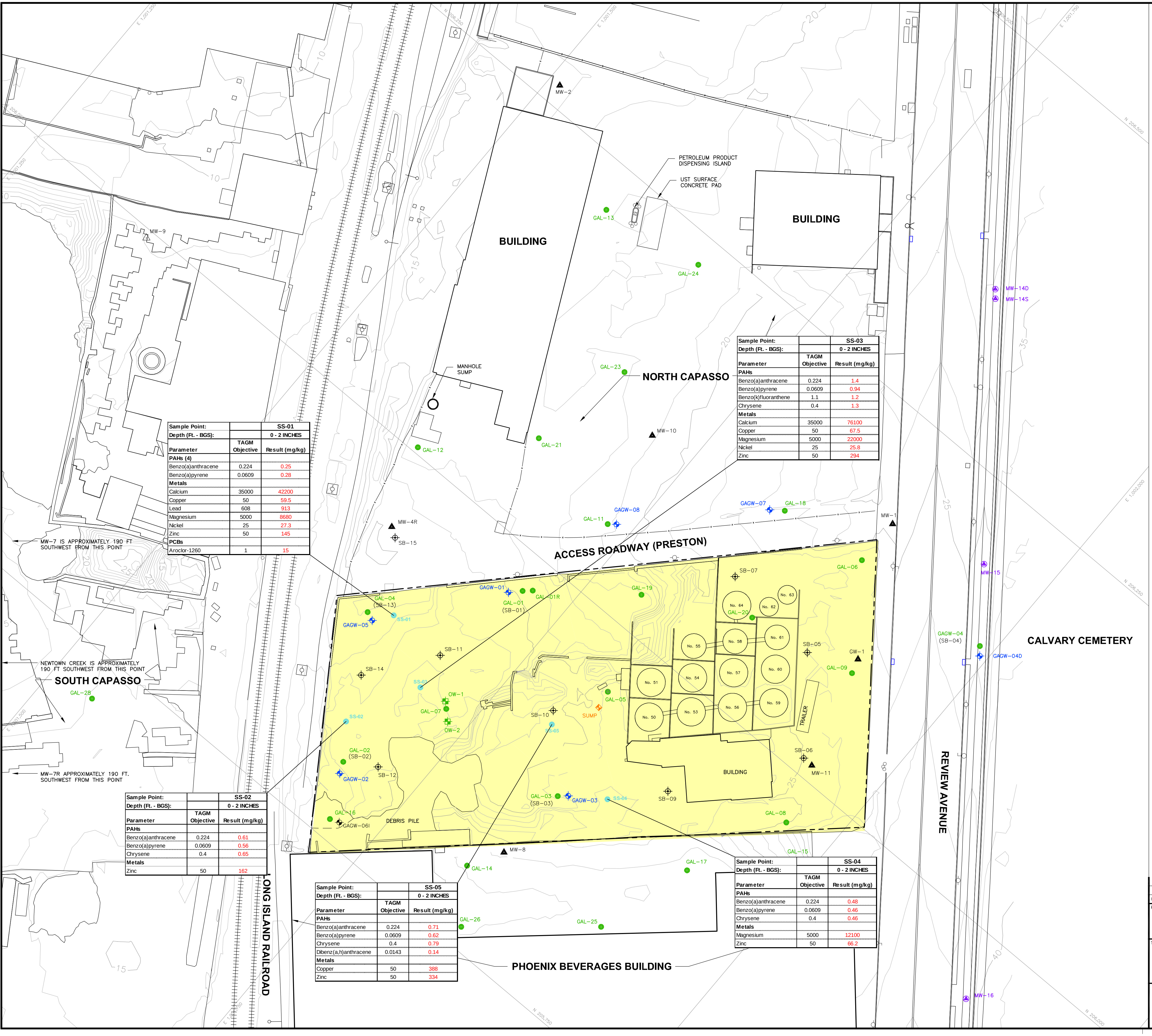
PROJECT
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE
SUMMARY OF GROUNDWATER EXCEEDANCES OF THE NEW YORK STATE TOGS 1.1.1 CLASS GA GROUNDWATER CRITERIA

Golder Associates
Philadelphia USA

PROJECT No.		023–6151	FILE No.	0236151M016
DESIGN	SDM	06/01/05	SCALE AS SHOWN	REV. 0
CADD	RG	06/20/05		
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

FIGURE 14



Sample Point:		SS-01
Depth (Ft. - BGS):		0 - 2 INCHES
Parameter	TAGM Objective	Result (mg/kg)
PAHs (4)		
Benzo(a)anthracene	0.224	0.25
Benzo(a)pyrene	0.0609	0.28
Metals		
Calcium	35000	42200
Copper	50	59.5
Lead	608	913
Magnesium	5000	8680
Nickel	25	27.3
Zinc	50	145
PCBs		
Aroclor-1260	1	15

Sample Point:		SS-03
Depth (Ft. - BGS):		0 - 2 INCHES
Parameter	TAGM Objective	Result (mg/kg)
PAHs		
Benzo(a)anthracene	0.224	1.4
Benzo(a)pyrene	0.0609	0.94
Benzo(k)fluoranthene	1.1	1.2
Chrysene	0.4	1.3
Metals		
Calcium	35000	76100
Copper	50	67.5
Magnesium	5000	22000
Nickel	25	25.8
Zinc	50	294

Sample Point:		SS-02
Depth (Ft. - BGS):		0 - 2 INCHES
Parameter	TAGM Objective	Result (mg/kg)
PAHs		
Benzo(a)anthracene	0.224	0.61
Benzo(a)pyrene	0.0609	0.56
Chrysene	0.4	0.65
Metals		
Zinc	50	162

Sample Point:		SS-05
Depth (Ft. - BGS):		0 - 2 INCHES
Parameter	TAGM Objective	Result (mg/kg)
PAHs		
Benzo(a)anthracene	0.224	0.71
Benzo(a)pyrene	0.0609	0.62
Chrysene	0.4	0.79
Dibenz(a,h)anthracene	0.0143	0.14
Metals		
Copper	50	388
Zinc	50	334

Sample Point:		SS-04
Depth (Ft. - BGS):		0 - 2 INCHES
Parameter	TAGM Objective	Result (mg/kg)
PAHs		
Benzo(a)anthracene	0.224	0.48
Benzo(a)pyrene	0.0609	0.46
Chrysene	0.4	0.46
Metals		
Magnesium	5000	12100
Zinc	50	66.2

LEGEND

●	SURFICIAL SOIL SAMPLE LOCATIONS
●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⌖	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⌖	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⌖	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON–PROPERTY AND OFF–PROPERTY MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF–PROPERTY MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▣	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF–PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— – – —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.–MSL)
——	1 FOOT CONTOUR LINE (FT.–MSL)

NOTES

1.) FIGURE SHOWS SURFICIAL URBAN FILL / SOIL EXCEEDANCES (RED) BASED ON COMPARISON OF REPORTED ANALYTICAL RESULTS TO NEW YORK STATE TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM #4046, RECOMMENDED SOIL CLEANUP OBJECTIVES (**TAGM**) AS DISCUSSED IN SECTION 5.2 OF THE RI REPORT.

2.) **TAGM** VALUES ARE THE LOWER OF THE USEPA HEALTH BASED CRITERIA (RESIDENTIAL EXPOSURE SCENARIO) AND THE GROUNDWATER PROTECTION VALUE (DRINKING WATER SCENARIO). THUS, THE **TAGM** VALUES DO NOT DIRECTLY APPLY TO POTENTIAL EXPOSURE SCENARIOS ON THE QUANTA PROPERTY AND ARE USED FOR SCREENING PURPOSES ONLY.

3.) ALL RESULTS ARE SHOWN IN mg/kg (ppm).

4.) CHROMIUM WAS DETECTED IN THE DUPLICATE SAMPLE DSS–01 AT A CONCENTRATION AT 43.3 PPM WHICH EXCEEDS THE TAGM OBJECTIVE.

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE
SURFICIAL URBAN FILL / SOIL EXCEEDANCES OF
NEW YORK STATE TAGM 4046
RECOMMENDED SOIL CLEANUP OBJECTIVES

Golder Associates
Philadelphia USA

PROJECT No.		023–6151	FILE No.	0236151M019
DESIGN	SDM	06/02/05	SCALE AS SHOWN	REV. 0
CADD	RG	06/20/05	**FIGURE 15**	
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

Drawing file: 0236151M019.dwg Feb 02, 2006 – 11:05am

Sample Point:		GAL-01			
Depth (Ft.- BGS):		5	11		
Parameter	TAGM	Result (mg/kg)			
Benzene	0.06	0.41	-		
Xylene (Total)	1.2	1.2	5.5		
Total VOCs	10	10.2	18.5		

Sample Point:		SB-10			
Depth (Ft.- BGS):		5.5	10	15.5	19
Parameter	TAGM	Result (mg/kg)			
Benzene	0.06	0.16	0.63	-	-
1,2-Dichlorobenzene	7.9	11	5.2	0.86	0.52
Ethylbenzene	5.5	11	6.1	0.49	0.25
Toluene	1.5	3.3	5.1	-	-
Trichloroethene	0.7	1	0.13	-	-
Vinyl Chloride	0.2	-	1.7	-	-
Xylene (Total)	1.2	31	25	1.6	0.71
Total VOCs	10	63.8	48.4	4.1	2.0

Sample Point:		SB-11			
Depth (Ft.- BGS):		5	10	16	20.5
Parameter	TAGM	Result (mg/kg)			
Acetone	0.2	8.4	-	-	-
Xylene (Total)	1.2	0.19	0.19	0.64	1.9
Total VOCs	10	18.1	0.9	2.1	6.6

Sample Point:		GAL-04	
Depth (Ft.- BGS):		6	9
Parameter	TAGM	Result (mg/kg)	
Acetone	0.2	-	3.3
Xylene (Total)	1.2	0.35	1.5
Total VOCs	10	2.2	7.4

Sample Point:		SB-14			
Depth (Ft.- BGS):		5	11	16.5	21
Parameter	TAGM	Result (mg/kg)			
Benzene	0.06	-	0.38	0.22	-
1,1-Dichloroethane	0.2	-	13	-	-
Methylene Chloride	0.1	-	1.1	-	-
Tetrachloroethene	1.4	-	5.5	0.16	-
Toluene	1.5	-	6.9	1.8	0.094
Trichloroethene	0.7	-	3.5	-	-
Xylene (Total)	1.2	-	14	7.8	0.31
Total VOCs	10	0.0	69.7	31.7	4.3

Sample Point:		SB-12			
Depth (Ft.- BGS):		6.5	10	16.5	20.5
Parameter	TAGM	Result (mg/kg)			
Acetone	0.2	1.9	0.73	-	-
Benzene	0.06	0.11	-	-	-
1,1-Dichloroethane	0.2	0.32	-	-	-
Total VOCs	10	2.5	1.2	6.0	8.1

Sample Point:		GAL-02		
Depth (Ft.- BGS):		6.5	10	16.5
Parameter	TAGM	Result (mg/kg)		
Acetone	0.2	2.4	-	2
Benzene	0.06	0.07	-	-
1,1-Dichloroethane	0.2	0.36	-	-
Total VOCs	10	4.7	0.4	4.1

Sample Point:		SB-16 (GAL-19)
Depth (Ft. - BGS):		17
Parameter	TAGM	Result (mg/kg)
Methylene Chloride	0.1	0.65
Xylene (Total)	1.2	3.4
Total VOCs	10	8.8

Sample Point:		GAL-03				
Depth (Ft.- BGS):		6.5	11	14.5	19	23.5
Parameter	TAGM	Result (mg/kg)				
Acetone	0.2	1.4	2.5	-	-	-
Benzene	0.06	-	-	-	-	0.086
Xylene (Total)	1.2	-	0.11	0.15	0.29	1.6
Total VOCs	10	1.4	3.9	0.9	1.8	7.4

Sample Point:		SB-07			
Depth (Ft.- BGS):		6	11	16.5	22
Parameter	TAGM	Result (mg/kg)			
Acetone	0.2	0.73	-	-	-
Ethylbenzene	5.5	-	0.085	1.7	6.7
Xylene (Total)	1.2	-	0.29	10	33
Total VOCs	10	0.7	3.0	15.4	53.7

Sample Point:		SB-17 (GAL-20)
Depth (Ft. - BGS):		17
Parameter	TAGM	Result (mg/kg)
Xylene (Total)	1.2	4.8
Total VOCs	10	14.2

Sample Point:		SB-05			
Depth (Ft.- BGS):		6	10	15	21.5
Parameter	TAGM	Result (mg/kg)			
Acetone	0.2	-	-	4.3	-
Xylene (Total)	1.2	0.23	1	0.46	1.8
Total VOCs	10	1.1	3.1	5.4	2.9

Sample Point:		GAGW-04			
Depth (Ft.- BGS):		1	5	11	16
Parameter	TAGM	Result (mg/kg)			
		No Exceedances			
Total VOCs	10	0.0	0.0	0.0	0.0

Sample Point:		SB-06			
Depth (Ft.- BGS):		6.5	11	15	20
Parameter	TAGM	Result (mg/kg)			
Trichloroethene	0.7	1.2	-	-	-
Vinyl Chloride	0.2	0.3	-	-	-
Total VOCs	10	4.1	15.5	0.8	0.7

Sample Point:		SB-09			
Depth (Ft.- BGS):		5.5	9.5	16.5	20
Parameter	TAGM	Result (mg/kg)			
Acetone	0.2	-	5.2	1.3	-
Benzene	0.06	-	-	-	0.093
Xylene (Total)	1.2	0.12	0.52	4.7	11
Total VOCs	10	1.6	7.4	10.9	29.9

LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON−SITE AND OFF−SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF−SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF−PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
++++++++	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.−MSL)
——	1 FOOT CONTOUR LINE (FT.−MSL)

NOTES

1.) FIGURE SHOWS SUBSURFACE SOIL EXCEEDANCES (RED) BASED ON COMPARISON OF REPORTED ANALYTICAL RESULTS TO NEW YORK STATE TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM #4046, RECOMMENDED SOIL CLEANUP OBJECTIVES (**TAGM**) AS DISCUSSED IN SECTION 4.2 OF THE DSR.

2.) **TAGM** VALUES ARE THE LOWER OF THE USEPA HEALTH BASED CRITERIA (RESIDENTIAL EXPOSURE SCENARIO) AND THE GROUNDWATER PROTECTION VALUE (DRINKING WATER SCENARIO). THUS, THE **TAGM** VALUES DO NOT DIRECTLY APPLY TO POTENTIAL EXPOSURE SCENARIOS ON THE QUANTA PROPERTY AND ARE USED FOR SCREENING PURPOSES ONLY.

3.) WHEN A SAMPLE WAS COLLECTED WITHIN URBAN FILL THE DEPTH IS SHADED ORANGE.

4.) (−) INDICATES NOT DETECTED RESULT

5.) ALL RESULTS ARE SHOWN IN mg/kg (ppm).

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8−23−04.xls AND 2148A 4−11−05.xls PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATIONS OF MW−7R AND MW−9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW−7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

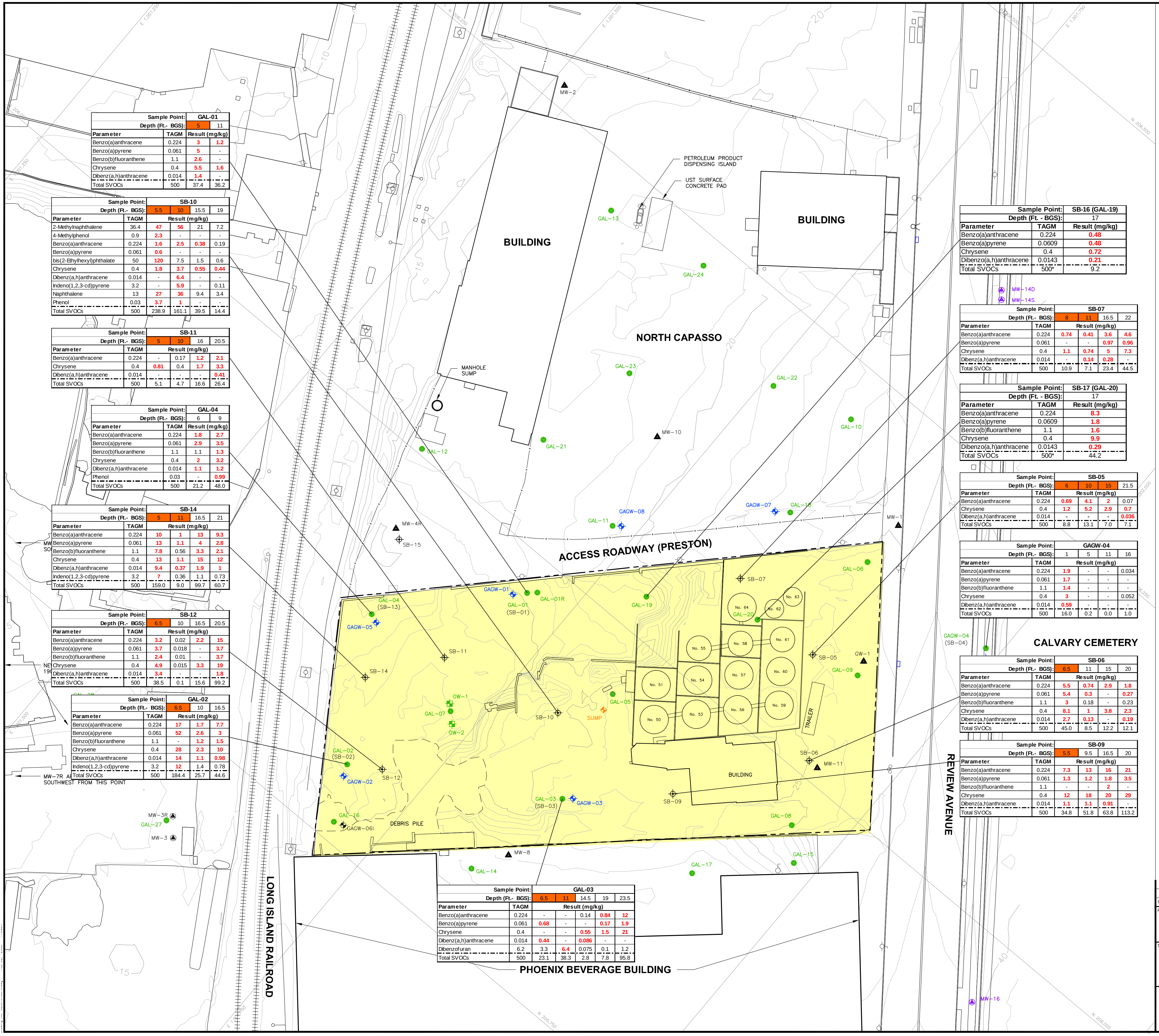
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

SUBSURFACE SOIL VOC EXCEEDANCES OF NEW YORK STATE TAGM 4046 RECOMMENDED SOIL CLEANUP OBJECTIVES

Golder Associates
Philadelphia USA

PROJECT No.		023−6151	FILE No.	0236151M013
DESIGN	SDM	06/02/05	SCALE AS SHOWN	REV. 0
CADD	AM	06/20/05	FIGURE 16	
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		



Sample Point:		GAL-01	
Depth (Ft.- BGS):		5	11
Parameter	TAGM	Result (mg/kg)	
Benzo(a)anthracene	0.224	**3**	**1.2**
Benzo(a)pyrene	0.061	**5**	-
Benzo(b)fluoranthene	1.1	**2.6**	-
Chrysene	0.4	**5.5**	**1.6**
Dibenz(a,h)anthracene	0.014	**1.4**	-
Total SVOCs	500	37.4	36.2

Sample Point:		SB-10			
Depth (Ft.- BGS):		5.5	10	15.5	19
Parameter	TAGM	Result (mg/kg)			
2-Methylnaphthalene	36.4	**47**	**56**	21	7.2
4-Methylphenol	0.9	**2.3**	-	-	-
Benzo(a)anthracene	0.224	**1.6**	**2.5**	**0.38**	0.19
Benzo(a)pyrene	0.061	**0.6**	-	-	-
bis(2-Ethylhexyl)phthalate	50	**120**	7.5	1.5	0.6
Chrysene	0.4	**1.8**	**3.7**	**0.55**	**0.44**
Dibenz(a,h)anthracene	0.014	-	**6.4**	-	-
Indeno(1,2,3-cd)pyrene	3.2	-	**5.9**	-	0.11
Naphthalene	13	**27**	**36**	9.4	3.4
Phenol	0.03	**3.7**	**1**	-	-
Total SVOCs	500	238.9	161.1	39.5	14.4

Sample Point:		SB-11			
Depth (Ft.- BGS):		5	10	16	20.5
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	-	0.17	**1.2**	**2.1**
Chrysene	0.4	**0.81**	0.4	**1.7**	**3.3**
Dibenz(a,h)anthracene	0.014	-	-	-	**0.41**
Total SVOCs	500	5.1	4.7	16.6	26.4

Sample Point:		GAL-04	
Depth (Ft.- BGS):		6	9
Parameter	TAGM	Result (mg/kg)	
Benzo(a)anthracene	0.224	**1.8**	**2.7**
Benzo(a)pyrene	0.061	**2.9**	**3.5**
Benzo(b)fluoranthene	1.1	1.1	**1.3**
Chrysene	0.4	**2**	**3.2**
Dibenz(a,h)anthracene	0.014	**1.1**	**1.2**
Phenol	0.03	-	**0.99**
Total SVOCs	500	21.2	48.0

Sample Point:		SB-14			
Depth (Ft.- BGS):		5	11	16.5	21
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**10**	**1**	**13**	**9.3**
Benzo(a)pyrene	0.061	**13**	**1.1**	**4**	**2.8**
Benzo(b)fluoranthene	1.1	**7.8**	0.56	**3.3**	**2.1**
Chrysene	0.4	**13**	**1.1**	**15**	**12**
Dibenz(a,h)anthracene	0.014	**9.4**	**0.37**	**1.9**	**1**
Indeno(1,2,3-cd)pyrene	3.2	**7**	0.36	1.1	0.73
Total SVOCs	500	159.0	9.0	99.7	60.7

Sample Point:		SB-12			
Depth (Ft.- BGS):		6.5	10	16.5	20.5
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**3.2**	0.02	**2.2**	**15**
Benzo(a)pyrene	0.061	**3.7**	0.018	-	**3.7**
Benzo(b)fluoranthene	1.1	**2.4**	0.01	-	**3.7**
Chrysene	0.4	**4.9**	0.015	**3.3**	**19**
Dibenz(a,h)anthracene	0.014	**3.4**	-	-	**1.8**
Total SVOCs	500	38.5	0.1	15.6	99.2

Sample Point:		GAL-02		
Depth (Ft.- BGS):		6.5	10	16.5
Parameter	TAGM	Result (mg/kg)		
Benzo(a)anthracene	0.224	**17**	**1.7**	**7.7**
Benzo(a)pyrene	0.061	**52**	**2.6**	**3**
Benzo(b)fluoranthene	1.1	-	**1.2**	**1.5**
Chrysene	0.4	**28**	**2.3**	**10**
Dibenz(a,h)anthracene	0.014	**14**	**1.1**	**0.98**
Indeno(1,2,3-cd)pyrene	3.2	**12**	1.4	0.78
Total SVOCs	500	184.4	25.7	44.6

Sample Point:		GAL-03				
Depth (Ft.- BGS):		6.5	11	14.5	19	23.5
Parameter	TAGM	Result (mg/kg)				
Benzo(a)anthracene	0.224	-	-	0.14	**0.84**	**12**
Benzo(a)pyrene	0.061	**0.68**	-	-	**0.17**	**1.9**
Chrysene	0.4	-	-	**0.55**	**1.5**	**21**
Dibenz(a,h)anthracene	0.014	**0.44**	-	**0.086**	-	-
Dibenzofuran	6.2	3.3	**6.4**	0.075	0.1	1.2
Total SVOCs	500	23.1	38.3	2.8	7.8	95.8

Sample Point:		SB-16 (GAL-19)
Depth (Ft. - BGS):		17
Parameter	TAGM	Result (mg/kg)
Benzo(a)anthracene	0.224	**0.48**
Benzo(a)pyrene	0.0609	**0.48**
Chrysene	0.4	**0.72**
Dibenzo(a,h)anthracene	0.0143	**0.21**
Total SVOCs	500*	9.2

Sample Point:		SB-07			
Depth (Ft.- BGS):		8	11	16.5	22
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**0.74**	**0.41**	**3.6**	**4.6**
Benzo(a)pyrene	0.061	-	-	**0.97**	**0.96**
Chrysene	0.4	**1.1**	**0.74**	**5**	**7.3**
Dibenz(a,h)anthracene	0.014	-	**0.14**	**0.28**	-
Total SVOCs	500	10.9	7.1	23.4	44.5

Sample Point:		SB-17 (GAL-20)
Depth (Ft. - BGS):		17
Parameter	TAGM	Result (mg/kg)
Benzo(a)anthracene	0.224	**8.3**
Benzo(a)pyrene	0.0609	**1.8**
Benzo(b)fluoranthene	1.1	**1.6**
Chrysene	0.4	**9.9**
Dibenzo(a,h)anthracene	0.0143	**0.29**
Total SVOCs	500*	44.2

Sample Point:		SB-05			
Depth (Ft.- BGS):		6	10	15	21.5
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**0.69**	**4.1**	**2**	0.07
Chrysene	0.4	**1.2**	**5.2**	**2.9**	**0.7**
Dibenz(a,h)anthracene	0.014	-	-	-	**0.036**
Total SVOCs	500	8.8	13.1	7.0	7.1

Sample Point:		GAGW-04			
Depth (Ft.- BGS):		1	5	11	16
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**1.9**	-	-	0.034
Benzo(a)pyrene	0.061	**1.7**	-	-	-
Benzo(b)fluoranthene	1.1	**1.4**	-	-	-
Chrysene	0.4	**3**	-	-	0.052
Dibenz(a,h)anthracene	0.014	**0.59**	-	-	-
Total SVOCs	500	16.0	0.2	0.0	1.0

Sample Point:		SB-06			
Depth (Ft.- BGS):		6.5	11	15	20
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**5.5**	**0.74**	**2.9**	**1.8**
Benzo(a)pyrene	0.061	**5.4**	**0.3**	-	**0.27**
Benzo(b)fluoranthene	1.1	**3**	0.18	-	0.23
Chrysene	0.4	**8.1**	**1**	**3.8**	**2.3**
Dibenz(a,h)anthracene	0.014	**2.7**	**0.13**	-	**0.19**
Total SVOCs	500	45.0	8.5	12.2	12.1

Sample Point:		SB-09			
Depth (Ft.- BGS):		5.5	9.5	16.5	20
Parameter	TAGM	Result (mg/kg)			
Benzo(a)anthracene	0.224	**7.3**	**13**	**16**	**21**
Benzo(a)pyrene	0.061	**1.3**	**1.2**	**1.8**	**3.5**
Benzo(b)fluoranthene	1.1	-	-	**2**	-
Chrysene	0.4	**12**	**18**	**20**	**29**
Dibenz(a,h)anthracene	0.014	**1.1**	**1.1**	**0.91**	-
Total SVOCs	500	34.8	51.8	63.8	113.2

LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
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◆	SUMP (SEE REFERENCE 2)
▣	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
++++++	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.-MSL)
——	1 FOOT CONTOUR LINE (FT.-MSL)

NOTES

1.) FIGURE SHOWS SUBSURFACE SOIL EXCEEDANCES (RED) BASED ON COMPARISON OF REPORTED ANALYTICAL RESULTS TO NEW YORK STATE TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM #4046, RECOMMENDED SOIL CLEANUP OBJECTIVES (**TAGM**) AS DISCUSSED IN SECTION 4.2 OF THE DSR.

2.) **TAGM** VALUES ARE THE LOWER OF THE USEPA HEALTH BASED CRITERIA (RESIDENTIAL EXPOSURE SCENARIO) AND THE GROUNDWATER PROTECTION VALUE (DRINKING WATER SCENARIO). THUS, THE **TAGM** VALUES DO NOT DIRECTLY APPLY TO POTENTIAL EXPOSURE SCENARIOS ON THE QUANTA PROPERTY AND ARE USED FOR SCREENING PURPOSES ONLY.

3.) WHEN A SAMPLE WAS COLLECTED WITHIN URBAN FILL THE DEPTH IS SHADED ORANGE.

4.) (–) INDICATES NOT DETECTED RESULT

5.) ALL RESULTS ARE SHOWN IN mg/kg (ppm).

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

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REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

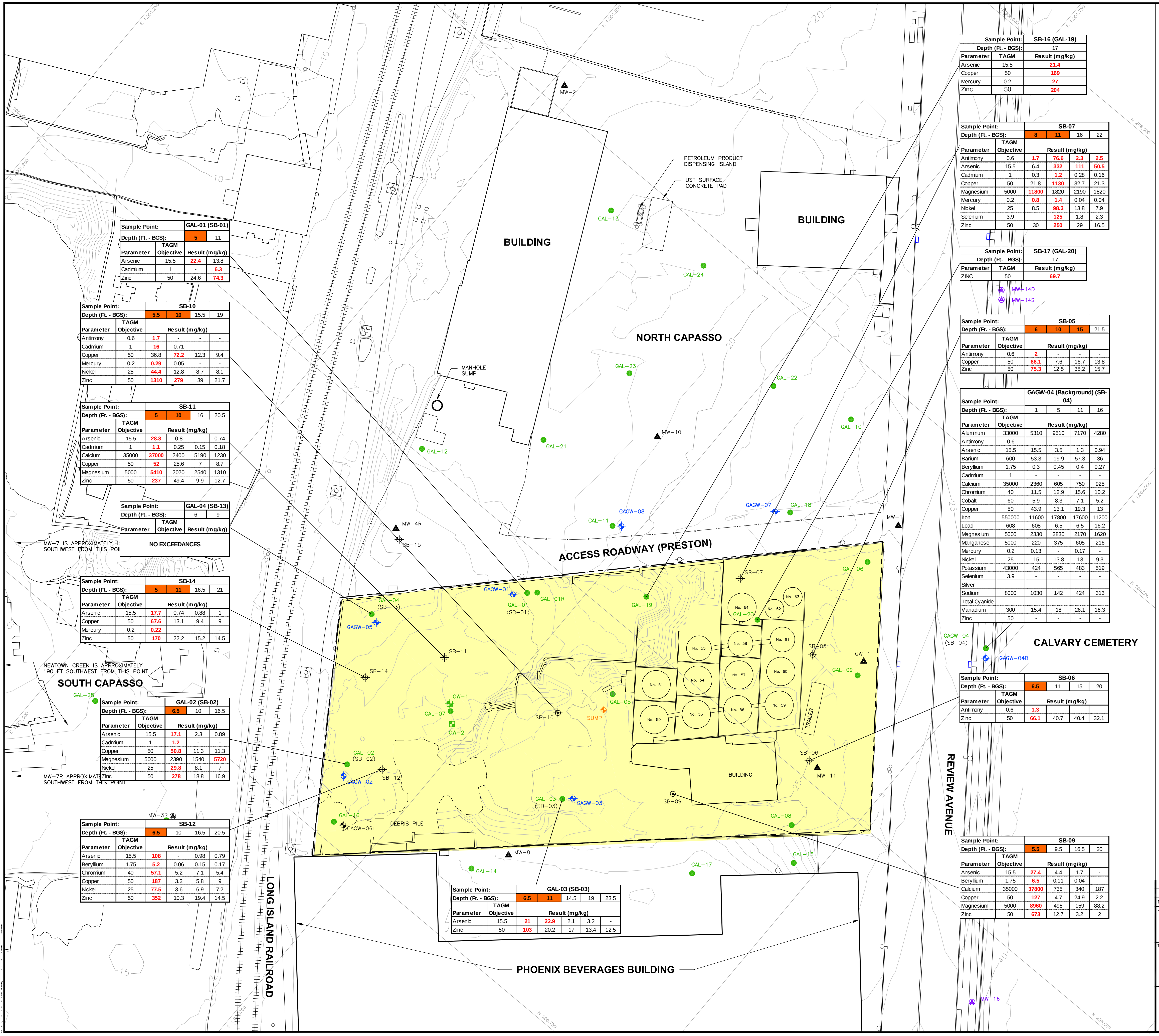
SUBSURFACE SOIL SVOC EXCEEDANCES NEW YORK STATE TAGM 4046 RECOMMENDED SOIL CLEANUP OBJECTIVES

Golder Associates
Philadelphia USA

PROJECT No.		023-6151
DESIGN	SDM	06/02/05
CADD	AM	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

FILE No. 0236151M015
SCALE AS SHOWN
REV. 0

FIGURE 17



Sample Point:		GAL-01 (SB-01)	
Depth (Ft. - BGS):		5	11
Parameter	TAGM Objective	Result (mg/kg)	
Arsenic	15.5	22.4	13.8
Cadmium	1	-	6.3
Zinc	50	24.6	74.3

Sample Point:		SB-10			
Depth (Ft. - BGS):		5.5	10	15.5	19
Parameter	TAGM Objective	Result (mg/kg)			
Antimony	0.6	1.7	-	-	-
Cadmium	1	16	0.71	-	-
Copper	50	36.8	72.2	12.3	9.4
Mercury	0.2	0.29	0.05	-	-
Nickel	25	44.4	12.8	8.7	8.1
Zinc	50	1310	279	39	21.7

Sample Point:		SB-11			
Depth (Ft. - BGS):		5	10	16	20.5
Parameter	TAGM Objective	Result (mg/kg)			
Arsenic	15.5	28.8	0.8	-	0.74
Cadmium	1	1.1	0.25	0.15	0.18
Calcium	35000	37000	2400	5190	1230
Copper	50	52	25.6	7	8.7
Magnesium	5000	5410	2020	2540	1310
Zinc	50	237	49.4	9.9	12.7

Sample Point:		GAL-04 (SB-13)	
Depth (Ft. - BGS):		6	9
Parameter	TAGM Objective	Result (mg/kg)	
NO EXCEEDANCES			

Sample Point:		SB-14			
Depth (Ft. - BGS):		5	11	16.5	21
Parameter	TAGM Objective	Result (mg/kg)			
Arsenic	15.5	17.7	0.74	0.88	1
Copper	50	67.6	13.1	9.4	9
Mercury	0.2	0.22	-	-	-
Zinc	50	170	22.2	15.2	14.5

Sample Point:		GAL-02 (SB-02)		
Depth (Ft. - BGS):		6.5	10	16.5
Parameter	TAGM Objective	Result (mg/kg)		
Arsenic	15.5	17.1	2.3	0.89
Cadmium	1	1.2	-	-
Copper	50	50.8	11.3	11.3
Magnesium	5000	2390	1540	5720
Nickel	25	29.8	8.1	7
Zinc	50	278	18.8	16.9

Sample Point:		SB-12			
Depth (Ft. - BGS):		6.5	10	16.5	20.5
Parameter	TAGM Objective	Result (mg/kg)			
Arsenic	15.5	108	-	0.98	0.79
Beryllium	1.75	5.2	0.06	0.15	0.17
Chromium	40	57.1	5.2	7.1	5.4
Copper	50	187	3.2	5.8	9
Nickel	25	77.5	3.6	6.9	7.2
Zinc	50	352	10.3	19.4	14.5

Sample Point:		GAL-03 (SB-03)				
Depth (Ft. - BGS):		6.5	11	14.5	19	23.5
Parameter	TAGM Objective	Result (mg/kg)				
Arsenic	15.5	21	22.9	2.1	3.2	-
Zinc	50	103	20.2	17	13.4	12.5

Sample Point:		SB-16 (GAL-19)
Depth (Ft. - BGS):		17
Parameter	TAGM	Result (mg/kg)
Arsenic	15.5	21.4
Copper	50	169
Mercury	0.2	27
Zinc	50	204

Sample Point:		SB-07			
Depth (Ft. - BGS):		8	11	16	22
Parameter	TAGM Objective	Result (mg/kg)			
Antimony	0.6	1.7	76.6	2.3	2.5
Arsenic	15.5	6.4	332	111	50.5
Cadmium	1	0.3	1.2	0.28	0.16
Copper	50	21.8	1130	32.7	21.3
Magnesium	5000	11800	1820	2190	1820
Mercury	0.2	0.8	1.4	0.04	0.04
Nickel	25	8.5	98.3	13.8	7.9
Selenium	3.9	-	125	1.8	2.3
Zinc	50	30	250	29	16.5

Sample Point:		SB-17 (GAL-20)
Depth (Ft. - BGS):		17
Parameter	TAGM	Result (mg/kg)
ZINC	50	69.7

Sample Point:		SB-05			
Depth (Ft. - BGS):		6	10	15	21.5
Parameter	TAGM Objective	Result (mg/kg)			
Antimony	0.6	2	-	-	-
Copper	50	66.1	7.6	16.7	13.8
Zinc	50	75.3	12.5	38.2	15.7

Sample Point:		GAGW-04 (Background) (SB-04)			
Depth (Ft. - BGS):		1	5	11	16
Parameter	TAGM Objective	Result (mg/kg)			
Aluminum	33000	5310	9510	7170	4280
Antimony	0.6	-	-	-	-
Arsenic	15.5	15.5	3.5	1.3	0.94
Barium	600	53.3	19.9	57.3	36
Beryllium	1.75	0.3	0.45	0.4	0.27
Cadmium	1	-	-	-	-
Calcium	35000	2360	605	750	925
Chromium	40	11.5	12.9	15.6	10.2
Cobalt	60	5.9	8.3	7.1	5.2
Copper	50	43.9	13.1	19.3	13
Iron	550000	11600	17800	17600	11200
Lead	608	608	6.5	6.5	16.2
Magnesium	5000	2330	2830	2170	1620
Manganese	5000	220	375	605	216
Mercury	0.2	0.13	-	0.17	-
Nickel	25	15	13.8	13	9.3
Potassium	43000	424	565	483	519
Selenium	3.9	-	-	-	-
Silver	-	-	-	-	-
Sodium	8000	1030	142	424	313
Total Cyanide	-	-	-	-	-
Vanadium	300	15.4	18	26.1	16.3
Zinc	50	-	-	-	-

Sample Point:		SB-06			
Depth (Ft. - BGS):		6.5	11	15	20
Parameter	TAGM Objective	Result (mg/kg)			
Antimony	0.6	1.3	-	-	-
Zinc	50	66.1	40.7	40.4	32.1

Sample Point:		SB-09			
Depth (Ft. - BGS):		5.5	9.5	16.5	20
Parameter	TAGM Objective	Result (mg/kg)			
Arsenic	15.5	27.4	4.4	1.7	-
Beryllium	1.75	6.5	0.11	0.04	-
Calcium	35000	37800	735	340	187
Copper	50	127	4.7	24.9	2.2
Magnesium	5000	8960	498	159	88.2
Zinc	50	673	12.7	3.2	2

LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON–SITE AND OFF–SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF–SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
⊞	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF–PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— – – —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.–MSL)
——	1 FOOT CONTOUR LINE (FT.–MSL)

NOTES

1.) FIGURE SHOWS SUBSURFACE SOIL EXCEEDANCES (RED) BASED ON COMPARISON OF REPORTED ANALYTICAL RESULTS TO THE NEW YORK STATE TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM #4046, RECOMMENDED SOIL CLEANUP OBJECTIVES AS DISCUSSED IN SECTION 4.2 OF THE DSR.

2.) ALL RESULTS ARE SHOWN IN mg/kg (ppm).

3.) THE TAGM 4046 SOIL OBJECTIVE FOR METALS IS THE LARGER OF THE NUMERIC VALUE IN TAGM 4046 TABLE 4 OR BACKGROUND. BACKGROUND IS EASTERN UNITED STATES/NEW YORK STATE BACKGROUND AS REPORTED IN TAGM #4046 OR AS IDENTIFIED IN SOIL SAMPLE GAGW–04 (BACKGROUND), IN WHICH EVER IS HIGHER.

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATIONS OF MW–7R AND MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE
SUBSURFACE SOIL METALS EXCEEDANCES OF
NEW YORK STATE TAGM 4046 RECOMMENDED
SOIL CLEANUP OBJECTIVES

Golder Associates
Philadelphia USA

PROJECT No.		023–6151
DESIGN	SDM	06/02/05
CADD	AM	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

FILE No. 0236151M014
SCALE AS SHOWN
REV. 0

FIGURE 18

LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
▲	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON–SITE AND OFF–SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
▲	EXISTING OFF–SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF–PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
—50—	INTERPRETED VISCOSITY CONTOUR (cSt) (DASHED WHERE INFERRED)
41.34	VISCOSITY VALUES (cSt)
— – – —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.–MSL)
——	1 FOOT CONTOUR LINE (FT.–MSL)

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8–23–04.xls AND 2148A 4–11–05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

7.) LANPL DATA USED FOR ISOCONCENTRATIONS WAS BASED ON LNAPL SAMPLES COLLECTED IN JULY 2004 FOR THE PHASE I WELLS AND MARCH/APRIL 2005 FOR THE PHASE II WELLS (GAL–19 THROUGH GAL–28).

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SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

INTERPRETED LNAPL VISCOSITY ISOCONCENTRATION CONTOUR MAP

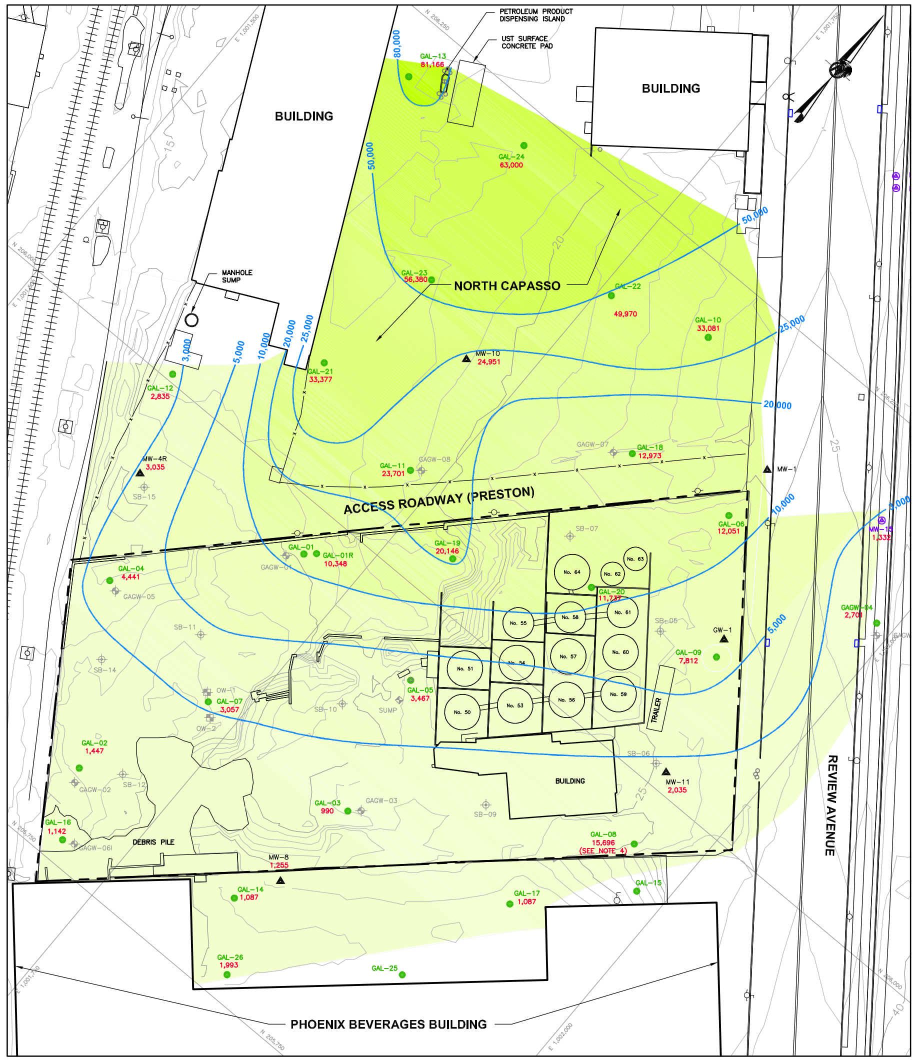
Golder Associates
Philadelphia USA

PROJECT No.		023–6151
DESIGN	JLH	06/02/05
CADD	RG	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

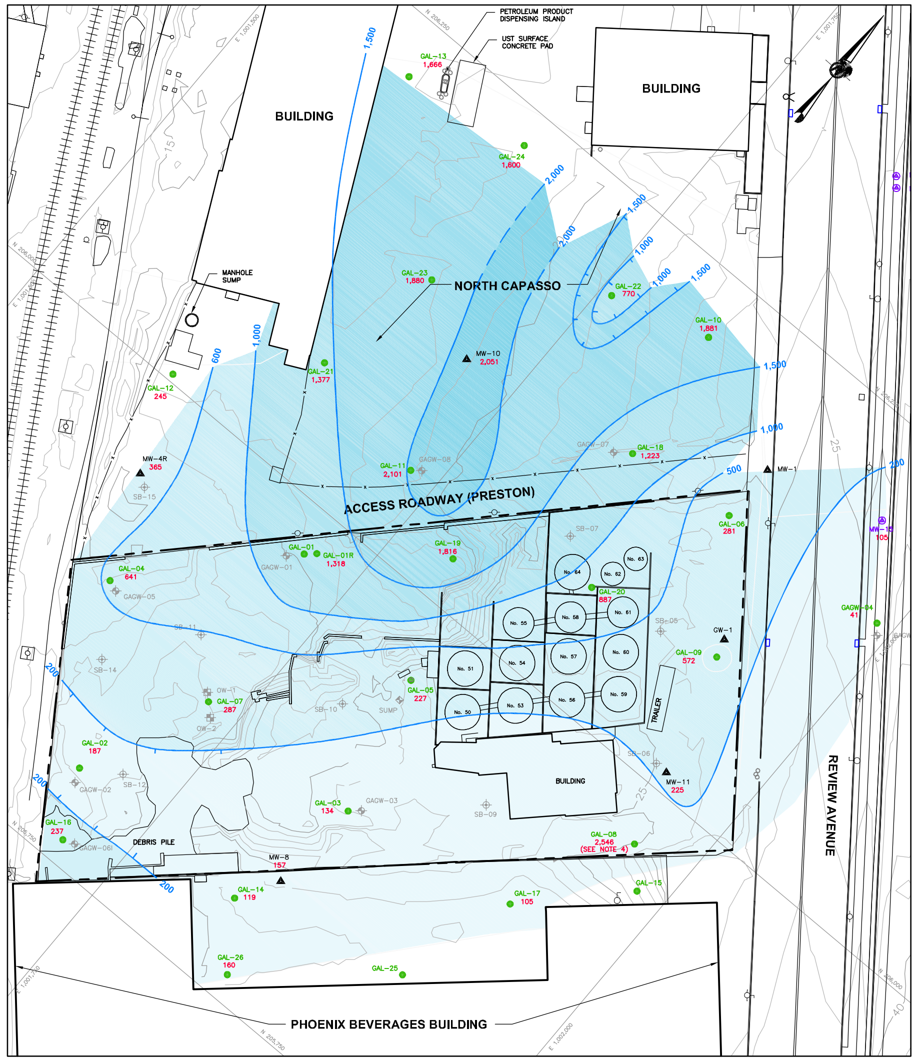
FILE No. 0236151M006
SCALE AS SHOWN
REV. 0

FIGURE 19

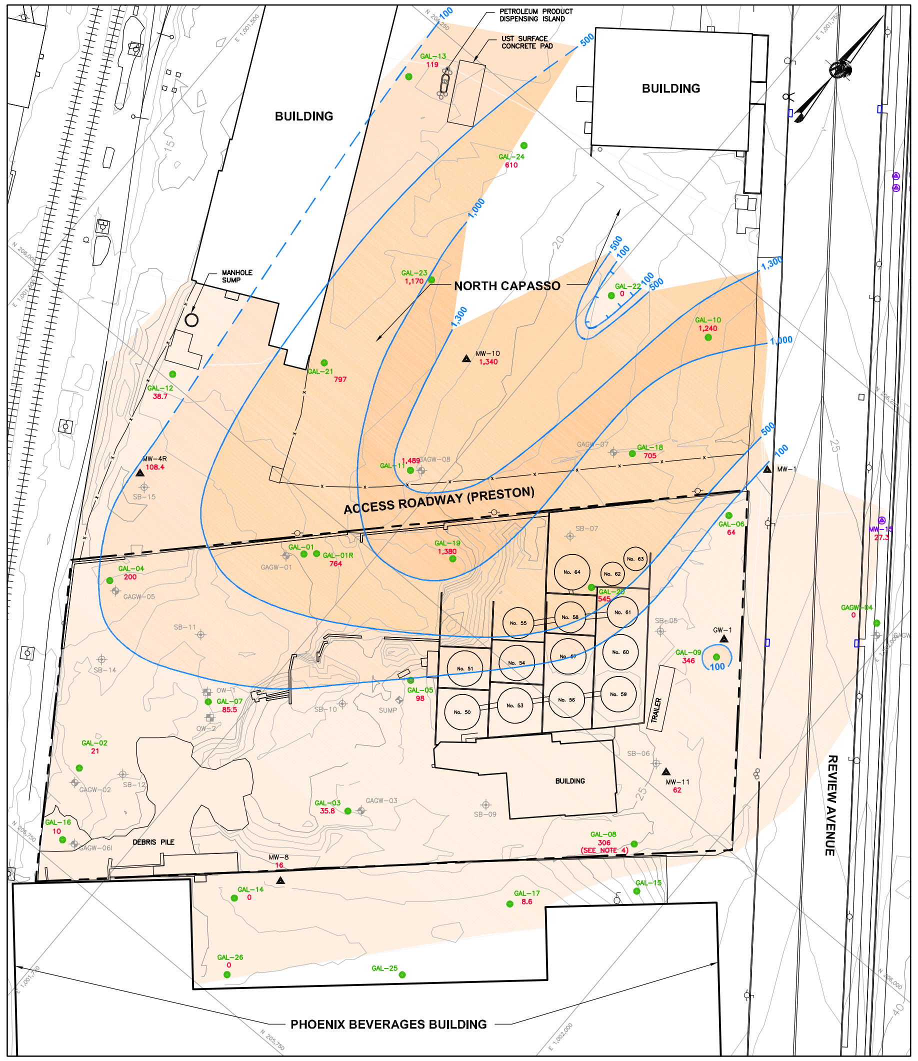
TOTAL VOCs PLUS TICs



TOTAL VOCs



BTEX



LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)	△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)	No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)	1,087	TOTAL VOCs PLUS TICs, TOTAL VOCs AND TOTAL BTEX CONCENTRATION (mg/kg)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)	— – – —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
▲	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)	┼┼┼┼┼┼	RAILROAD
▲	EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)	—x—x—	FENCE LINE
▲	EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)	—20—	5 FOOT CONTOUR LINE (FT.-MSL)
◆	SUMP (SEE REFERENCE 2)	——	1 FOOT CONTOUR LINE (FT.-MSL)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)	—100—	INTERPRETED TOTAL VOCs PLUS TICs, TOTAL VOCs AND TOTAL BTEX CONTOUR (MG/KG) (DASHED WHERE INFERRED)

NOTES

1.) VOC – VOLATILE ORGANIC COMPOUND

2.) TIC – TENTATIVELY IDENTIFIED COMPOUND

3.) BTEX – BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE.

4.) GAL–08 IS BELIEVED TO MONITOR A UNIQUE AND LOCALIZED CHEMICAL CONDITION AND THEREFORE IS NOT INCLUDED IN THE CONTOURING SCHEME.

5.) LANPL DATA USED FOR ISOCONCENTRATIONS WAS BASED ON LNAPL SAMPLES COLLECTED IN JULY 2004 FOR THE PHASE I WELLS AND MARCH/APRIL 2005 FOR THE PHASE II WELLS (GAL–19 THROUGH GAL–28).

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE QUANTA SAMPLES AND WELLS.XLS, 2148A 8–23–04.XLS AND 2148A 4–11–05.XLS, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

40 0 40 80
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

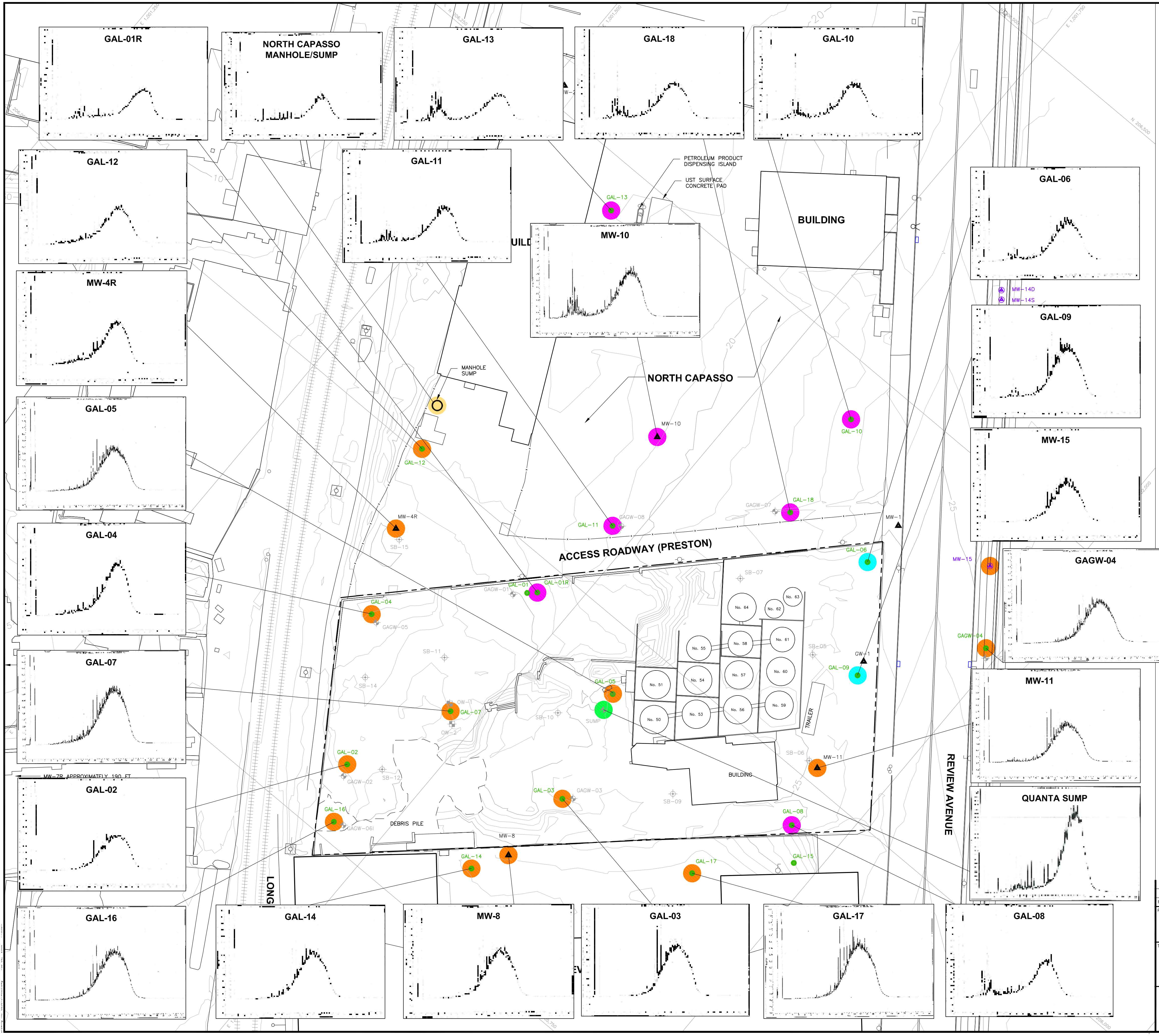
QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

INTERPRETED DISTRIBUTION OF TOTAL VOCs PLUS TICs; TOTAL VOCs; AND BTEX IN LNAPL

Golder Associates
Philadelphia USA

PROJECT No.		023–6151	FILE No.	0236151M012
DESIGN	SDM	06/02/05	SCALE AS SHOWN	REV. 0
CADD	AM	06/20/05	**FIGURE 20**	
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

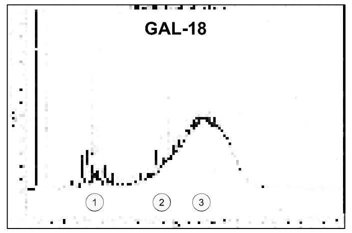


LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON–SITE AND OFF–SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF–SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
⊞	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF–PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.–MSL)
——	1 FOOT CONTOUR LINE (FT.–MSL)

LABORATORY DESCRIPTION OF GC FINGERPRINTS (SEE REFERENCE 7):

●	MOST CLOSELY RESEMBLES A LUBE OIL/MINERAL OIL WITH LESSER AMOUNTS OF A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF DEGRADED DIESEL/#2 FUEL OIL
●	MOST CLOSELY RESEMBLES A MIXTURE OF LUBE OIL/MINERAL OIL AND A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF MINERAL SPIRITS WITH LESSER AMOUNTS OF A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF DEGRADED DIESEL/#2 FUEL OIL
●	MOST CLOSELY RESEMBLES A LUBE OIL/MINERAL OIL WITH LESSER AMOUNTS OF A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF DEGRADED DIESEL/#2 FUEL OIL AND MINERAL SPIRITS
●	MOST CLOSELY RESEMBLES A LUBE OIL/MINERAL OIL WITH LESSER AMOUNTS OF MIXTURE OF LIGHT PETROLEUM PRODUCTS IN THE BOILING RANGE OF GASOLINE TO DIESEL/#2 FUEL OIL
●	MOST CLOSELY RESEMBLES A MIXTURE OF A DIESEL/#2 FUEL OIL AND LUBE OIL/MINERAL OIL



EXAMPLE FINGERPRINT GAL–18:

① LIGHT FRACTION

② THREE MID–RANGE PEAKS

③ MINERAL OIL HUMP

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls AND 2148A 8–23–04.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW–9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW–7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

7.) LNAPL DESCRIPTIONS PROVIDED BY STL EDISON, NEW JERSEY.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

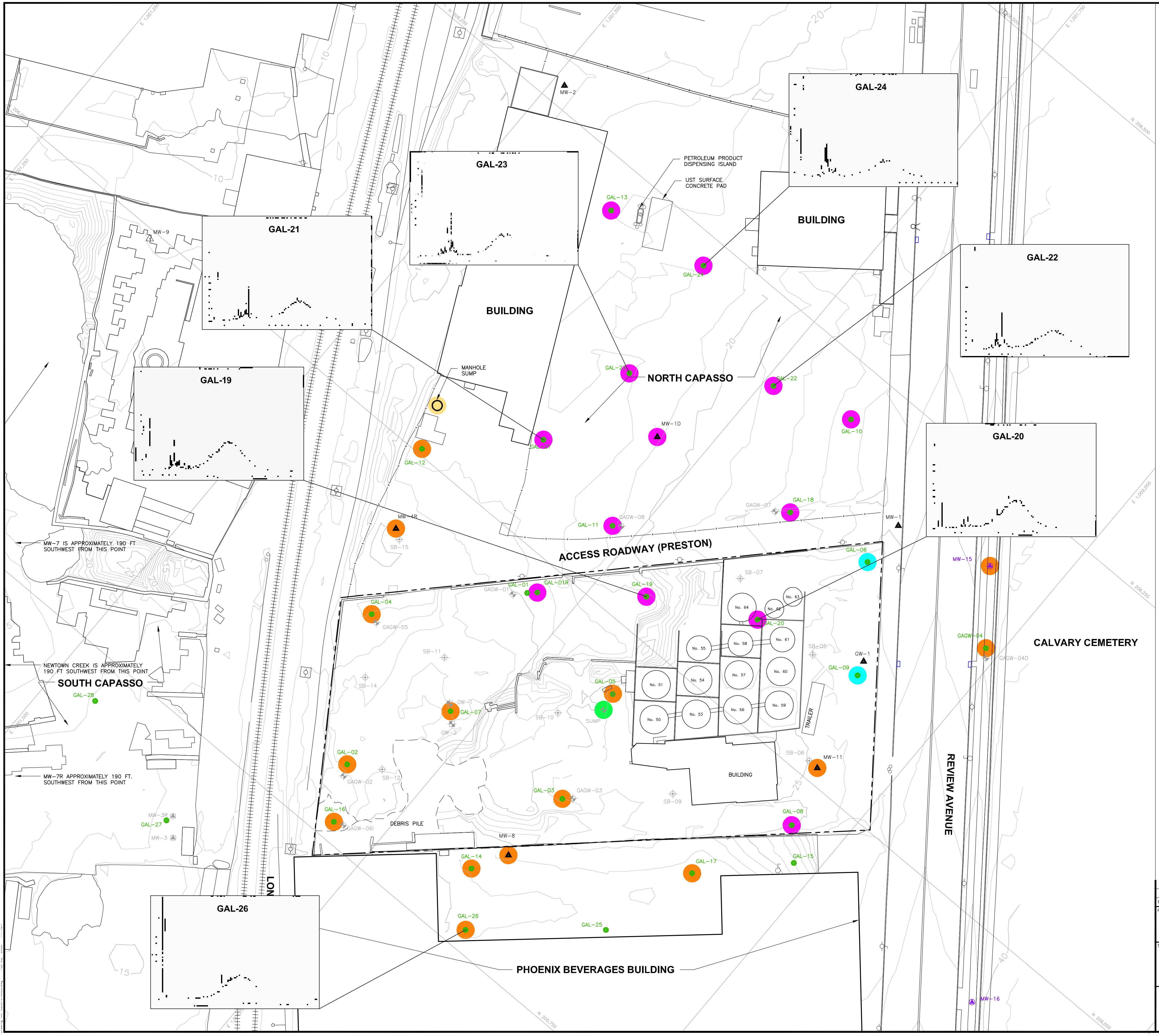
LNAPL GC FINGERPRINT CHROMATOGRAMS - PHASE I RI

Golder Associates
Philadelphia USA

PROJECT No.		023–6151
DESIGN	SDM	06/02/05
CADD	AM	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

FILE No. 0236151M023
SCALE AS SHOWN
REV. 0

FIGURE 21

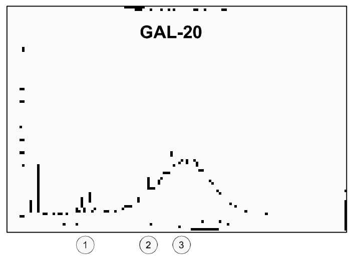


LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊕	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⊚	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
⊚	EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCES 5 AND 6)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY AND DECONTAMINATED)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
++++++	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.-MSL)
—	1 FOOT CONTOUR LINE (FT.-MSL)

LABORATORY DESCRIPTION OF GC FINGERPRINTS (SEE REFERENCE 7):

🟠	MOST CLOSELY RESEMBLES A LUBE OIL/MINERAL OIL WITH LESSER AMOUNTS OF A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF DEGRADED DIESEL/#2 FUEL OIL
🟣	MOST CLOSELY RESEMBLES A MIXTURE OF LUBE OIL/MINERAL OIL AND A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF MINERAL SPIRITS WITH LESSER AMOUNTS OF A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF DEGRADED DIESEL/#2 FUEL OIL
🔵	MOST CLOSELY RESEMBLES A LUBE OIL/MINERAL OIL WITH LESSER AMOUNTS OF A LIGHT PETROLEUM PRODUCT IN THE BOILING RANGE OF DEGRADED DIESEL/#2 FUEL OIL AND MINERAL SPIRITS
🟢	MOST CLOSELY RESEMBLES A LUBE OIL/MINERAL OIL WITH LESSER AMOUNTS OF MIXTURE OF LIGHT PETROLEUM PRODUCTS IN THE BOILING RANGE OF GASOLINE TO DIESEL/#2 FUEL OIL
🟡	MOST CLOSELY RESEMBLES A MIXTURE OF A DIESEL/#2 FUEL OIL AND LUBE OIL/MINERAL OIL



EXAMPLE FINGERPRINT GAL-20:

① LIGHT FRACTION

② THREE RECALCIDRANTY MID-RANGE PEAKS

③ MINERAL OIL HUMP

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples, Wells.xls, 2148A 8-23-04.xl AND Wells.xls AND 2148A 4-11-05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW-9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW-7 DIGITILED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

7.) LNAPL DESCRIPTIONS PROVIDED BY STL EDISON, NEW JERSEY.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

LNAPL GC FINGERPRINT CHROMATOGRAMS - PHASE II RI

Golder Associates
Philadelphia USA

PROJECT No.		023-6151	FILE No.	0236151M022
DESIGN	SDM	06/02/05	SCALE AS SHOWN	REV. 0
CADD	AM	06/20/05		
CHECK	SDM	06/20/05		
REVIEW	RSW	06/20/05		

FIGURE 22

Figure 23
LNAPL Recovery Pilot Study Results at
GAL-07
Measured LNAPL Thickness vs. Time
Quanta Resources Site
Long Island City, New York

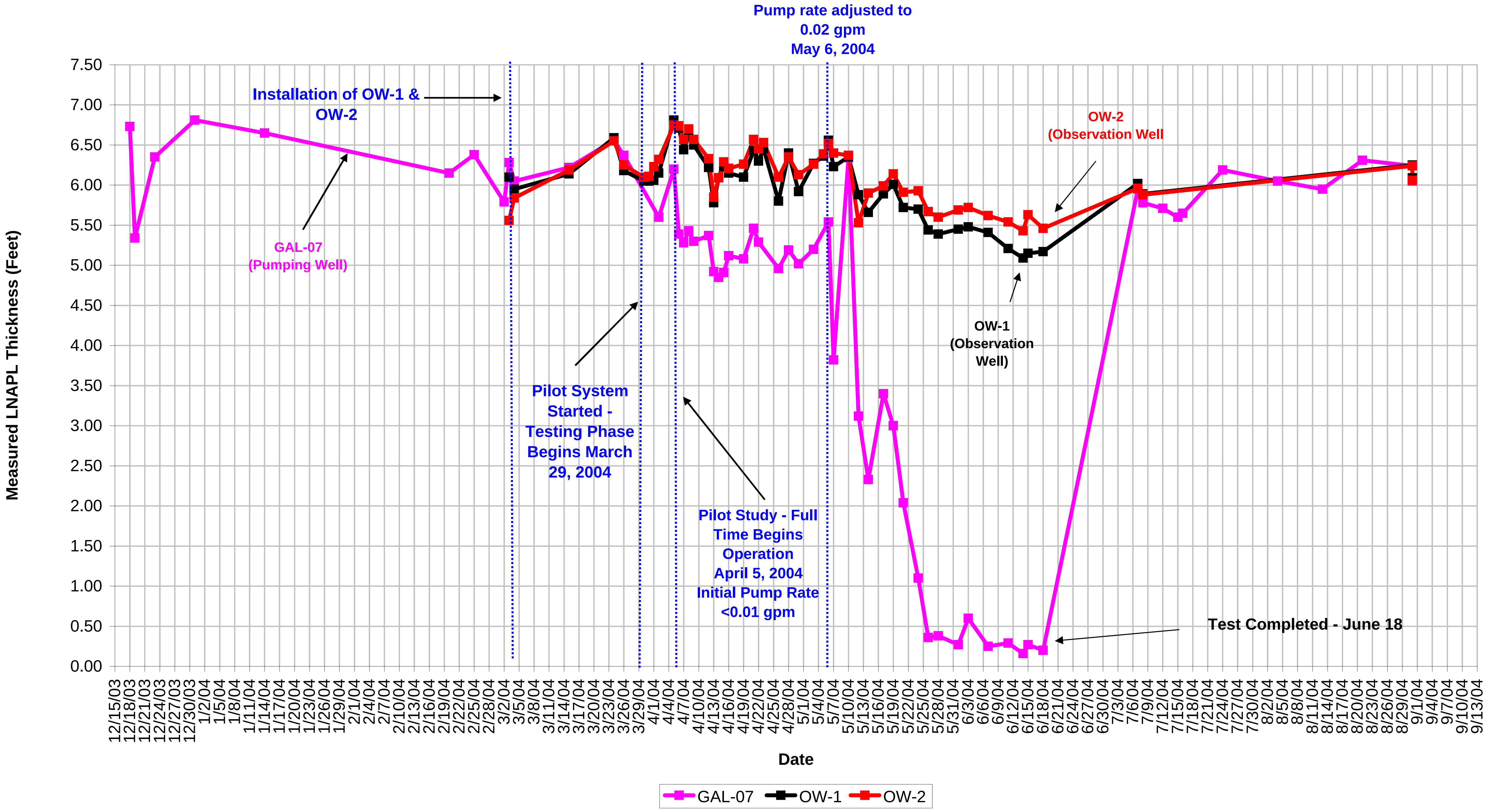
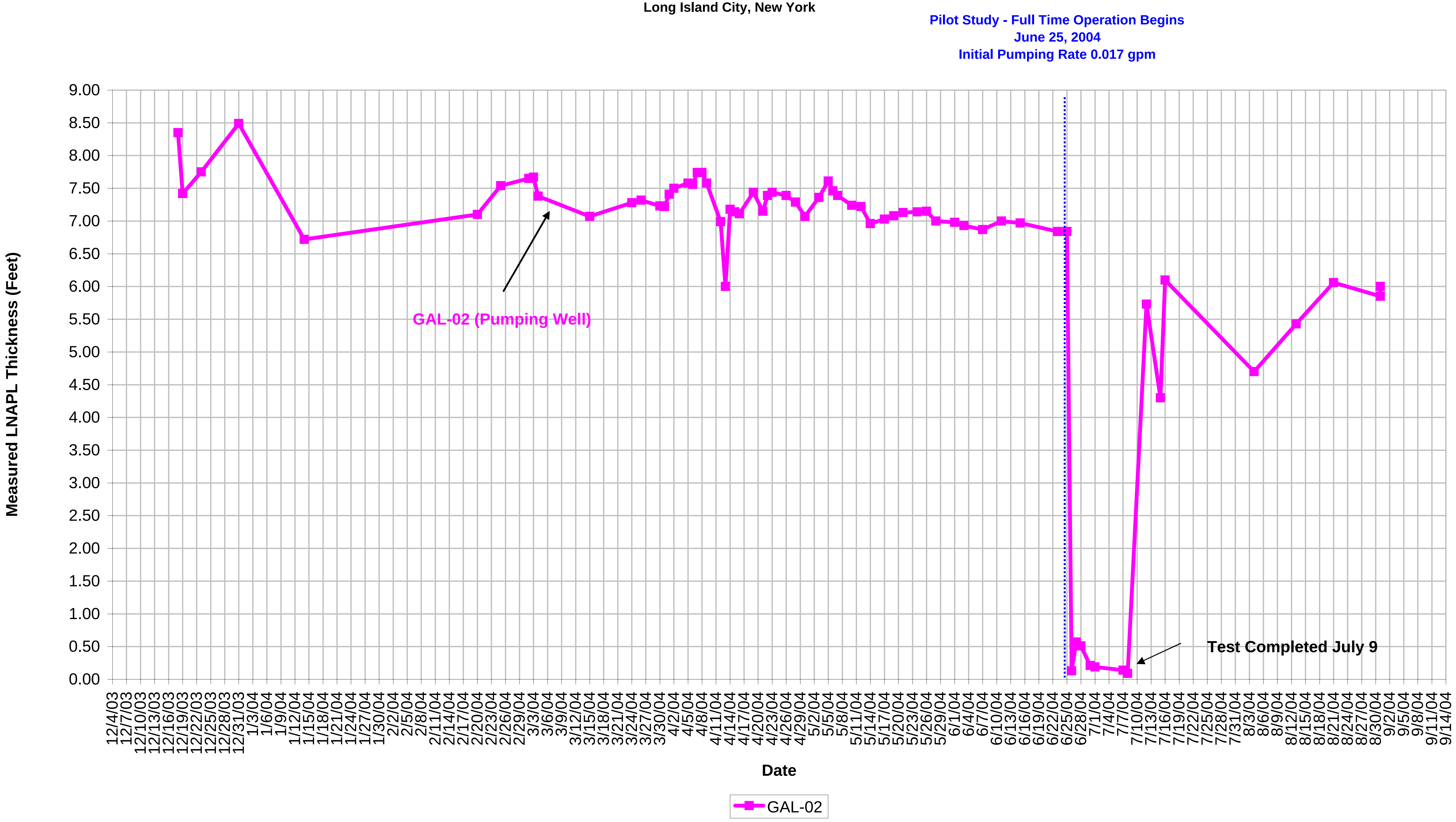


Figure 24
LNAPL Recovery Pilot Study Results at
GAL-02
Measured LNAPL Thickness vs. Time
Quanta Resources Site
Long Island City, New York



LEGEND

●	LNAPL MONITORING WELL (GOLDER ASSOCIATES 2003/2004/2005) (SEE REFERENCE 2)
⊕	SHALLOW GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2004) (SEE REFERENCE 2)
⊕	DEEP GROUNDWATER MONITORING WELL (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
⌖	SOIL BORING (GOLDER ASSOCIATES 2003/2004) (SEE REFERENCE 2)
◬	ROEHR CHEMICAL INVESTIGATION WELL LOCATION (NOVEMBER 2000) (SEE REFERENCE 2)
▲	EXISTING ON-SITE AND OFF-SITE MONITORING WELL LOCATION (SEE REFERENCE 2)
◬	EXISTING OFF-SITE MONITORING WELL LOCATION (LOCATION APPROXIMATE)
◆	SUMP (SEE REFERENCE 2)
▨	LNAPL PILOT TEST STUDY OBSERVATION WELL (SEE REFERENCE 2)
△	EXISTING OFF-PROPERTY MONITORING WELL LOCATIONS (SEE REFERENCE 5)
No. 63	EXISTING ABOVE GROUND TANK (REPORTED TO BE EMPTY)
— — —	QUANTA PROPERTY BOUNDARY (SEE REFERENCE 3)
┼┼┼┼	RAILROAD
—x—x—	FENCE LINE
—20—	5 FOOT CONTOUR LINE (FT.-MSL)
—	1 FOOT CONTOUR LINE (FT.-MSL)
▬	SPECIFIC FREE-PRODUCT VOLUME OF LNAPL IN SOIL (SEE NOTES 1 AND 2)
0.652	SPECIFIC FREE-PRODUCT VOLUME OF LNAPL IN SOIL (FT.) (SEE NOTES 1 AND 2)
🟥 GAL-25	LNAPL NOT PRESENT (SEE NOTE 3)

NOTES

1.) REFER TO APPENDIX L OF THE RI FOR DISCUSSION OF THE ESTIMATION OF SPECIFIC FREE-PRODUCT VOLUME. THE MODEL PREDICTION VALUES ADJUSTED FOR TPH CONCENTRATIONS WERE USED.

2.) THE SPECIFIC FREE-PRODUCT VOLUME IS BY DEFINITION PER UNIT AREA AND THEREFORE HAS A UNIT LENGTH OF FEET.

3.) DURING THE RI, LNAPL WAS NOT OBSERVED IN WELLS MW-2, MW-7R, MW-14S, MW-16S, GAL-15, GAL-27 AND GAL-28. PRIOR TO THE RI, LNAPL HAD NOT BEEN OBSERVED IN WELLS MW-7 AND MW-9. THE LAST MEASUREMENT COLLECTED AT MW-7 WAS ON OCTOBER 3, 2000 AND FEBRUARY 11, 2003 AT MW-9. GOLDER WAS NOT ABLE TO LOCATE MW-7 AND WAS NOT PROVIDED ACCESS TO THE PROPERTY WHERE MW-9 IS LOCATED.

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 2148.dwg, ENTITLED TOPOGRAPHIC SURVEY OF QUANTA RESOURCES SUPERFUND SITE, LONG ISLAND CITY, NY, PROVIDED BY GEOD CORPORATION, DATED JANUARY 11, 2004.

2.) WELL COORDINATES TAKEN FROM A MICROSOFT EXCEL FILE Quanta Samples and Wells.xls, 2148A 8-23-04.xls AND 2148A 4-11-05.xls, PROVIDED BY GEOD CORP.

3.) PROPERTY BOUNDARY TAKEN FROM DIGITAL FILE 2148 Boundary.dwg, TITLED "MAP SHOWING BOUNDARY OF BLOCK 312 LOT 69", DATED APRIL 29, 2004, PROVIDED BY GEOD CORP.

4.) DEBRIS PILE BOUNDARY REVISED PER FIELD OBSERVATIONS MADE BY GOLDER ASSOCIATES PERSONNEL DURING SITE VISITS.

5.) LOCATION OF MW-9 DIGITIZED FROM HARDCOPY FIGURE TITLED "GROUNDWATER CONTOURS", PROVIDED BY HALEY & ALDRICH, DATED FEBRUARY 2004.

6.) LOCATION OF MW-7 DIGITIZED FROM HARDCOPY FIGURE TITLED "SITE PLAN WITH SITE INVESTIGATION BORING LOCATIONS", PROVIDED BY ENVIRON, DATED SEPTEMBER 2000.

25 0 25 50
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

QUANTA RESOURCES SITE
REMEDIAL INVESTIGATION REPORT
QUEENS COUNTY, NEW YORK

TITLE

TOTAL SPECIFIC LNAPL VOLUME AT
LNAPL MONITORING WELLS

Golder Associates
Philadelphia USA

PROJECT No.		023-6151
DESIGN	SDM	06/01/05
CADD	RG	06/20/05
CHECK	SDM	06/20/05
REVIEW	RSW	06/20/05

FILE No. 0236151M007
SCALE AS SHOWN REV. 0

FIGURE 25

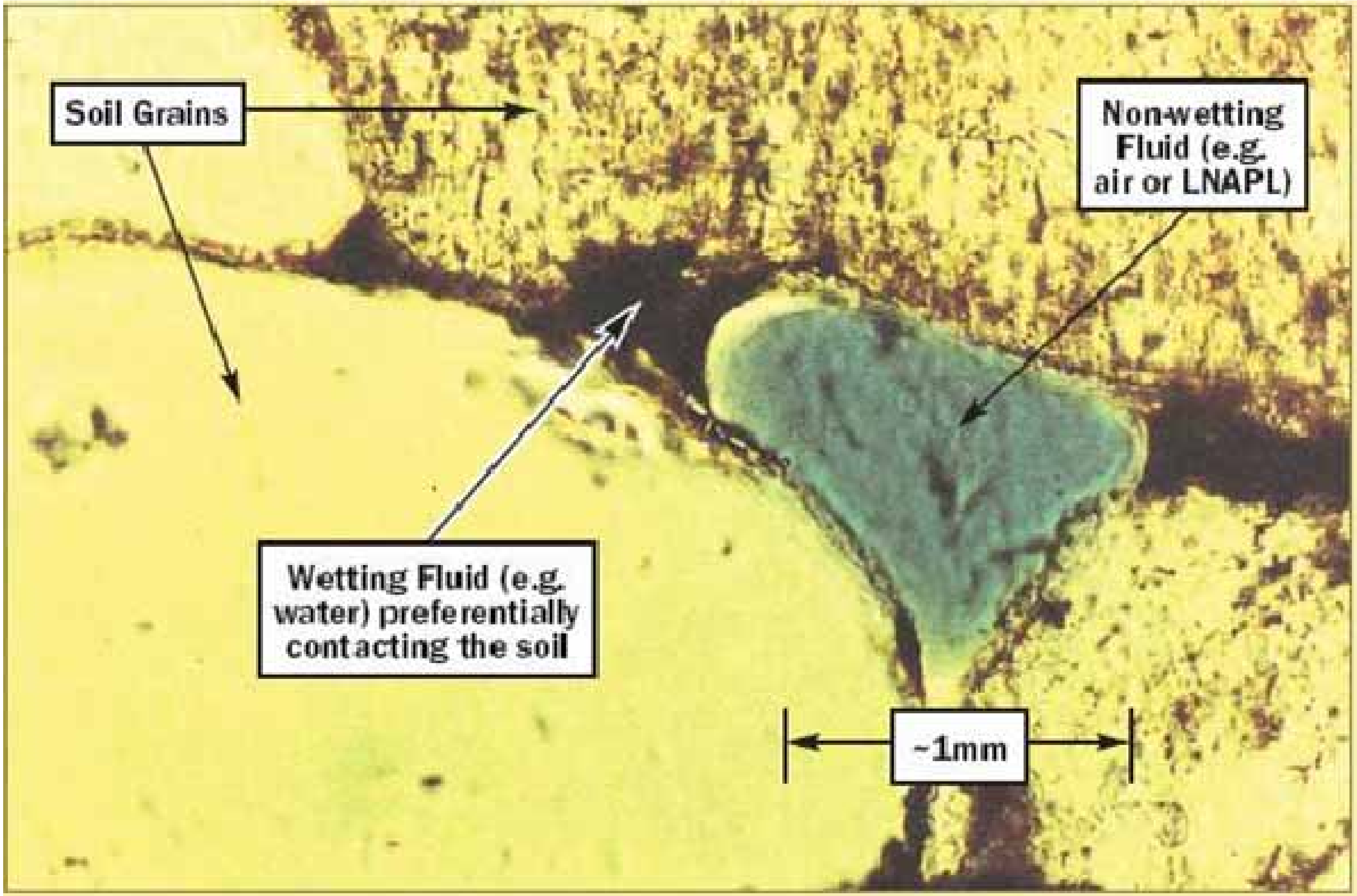


Figure 1 – Multiple fluids in the pore space of a granular porous media (From Wilson et al., 1990)

Golder Associates
Philadelphia USA

FILE No.	0236151M020
PROJECT No.	023-6151
REV.	0
SCALE	AS SHOWN
DATE	06/20/05
DESIGN	RSW
CADD	AM
CHECK	SDM
REVIEW	RSW

TITLE

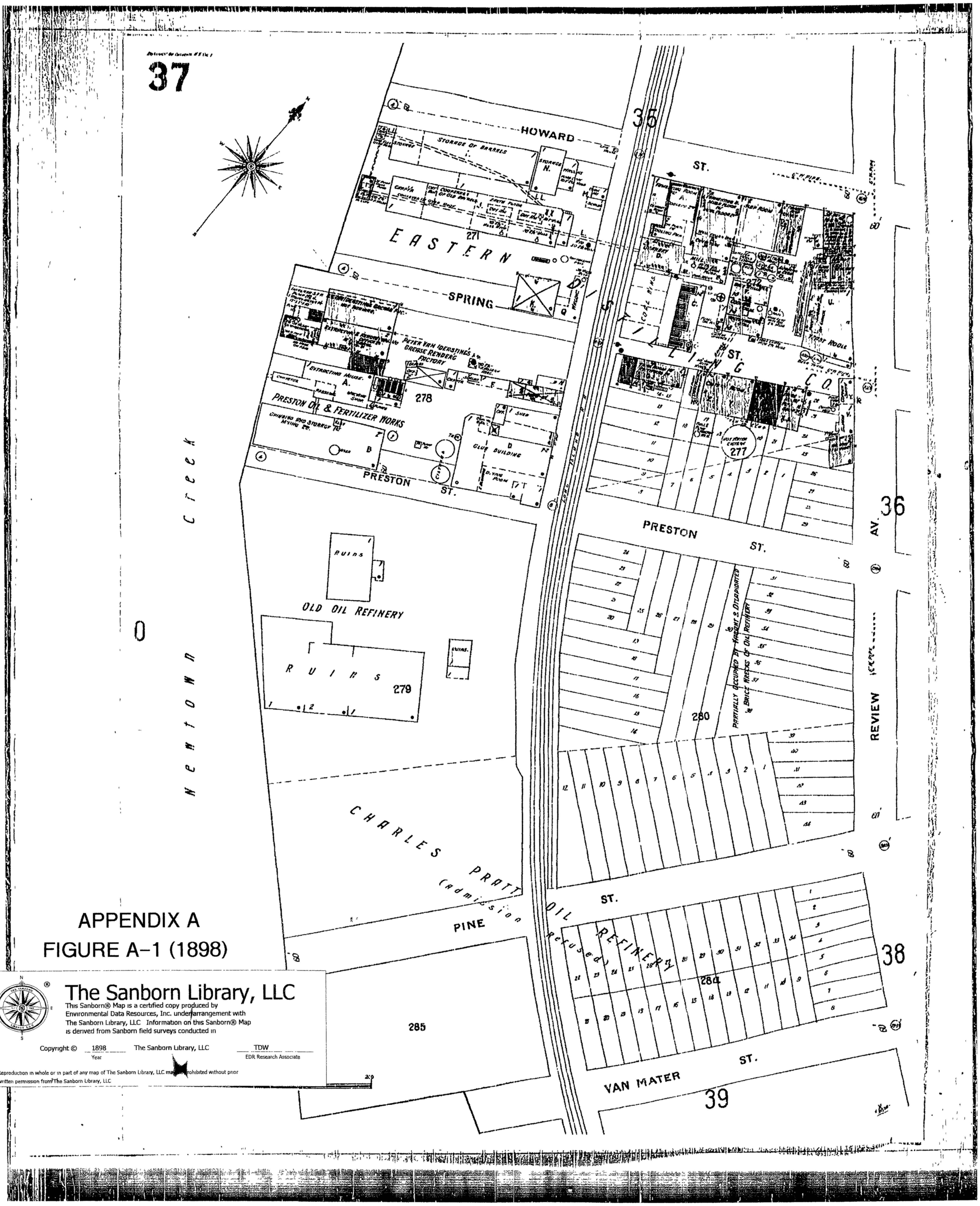
LNAPL DISTRIBUTION IN SOIL PORES

QUANTA RESOURCES SITE

FIGURE 26

APPENDIX A

SANBORN MAPS



APPENDIX A
FIGURE A–1 (1898)

The Sanborn Library, LLC

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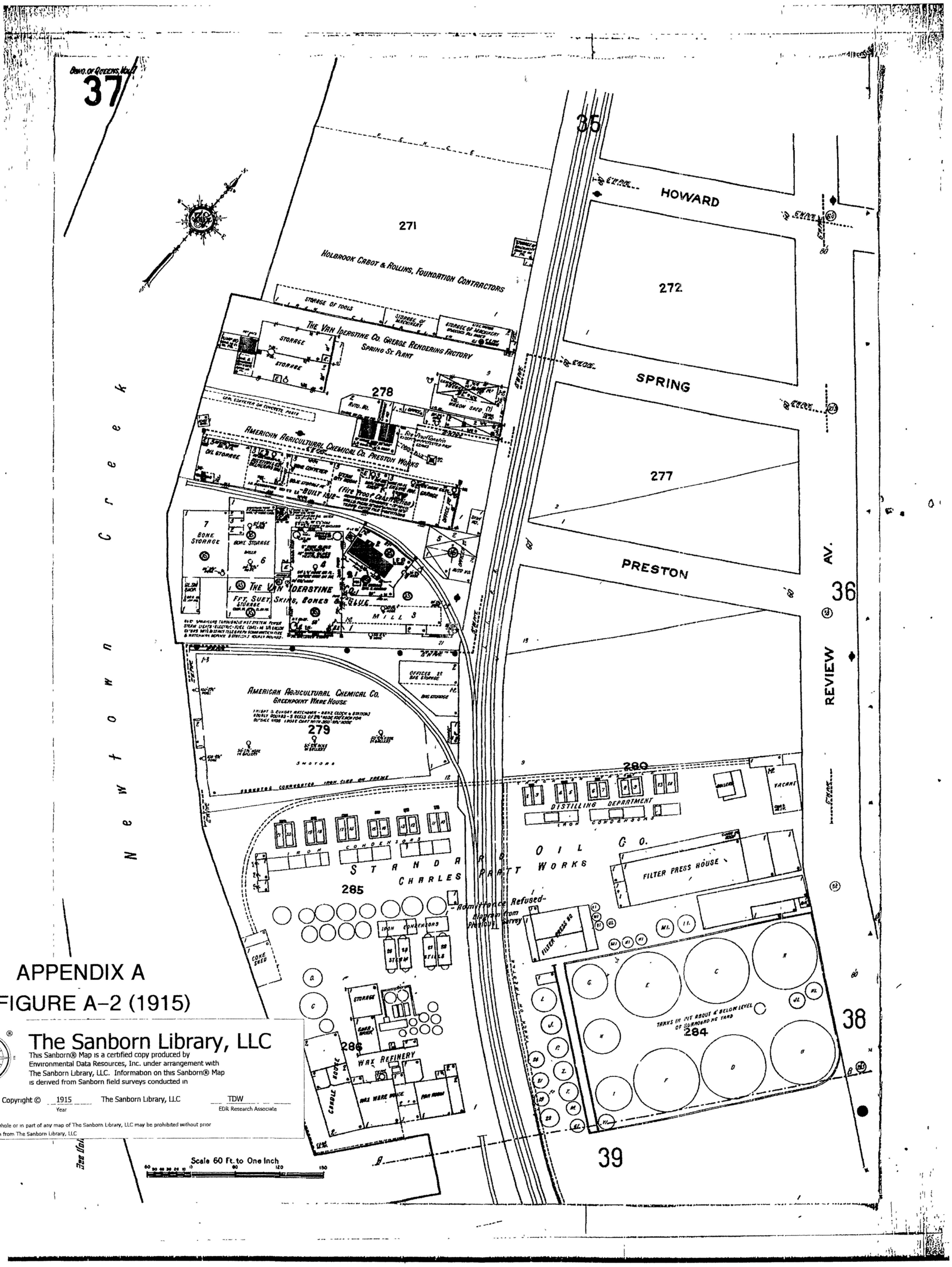
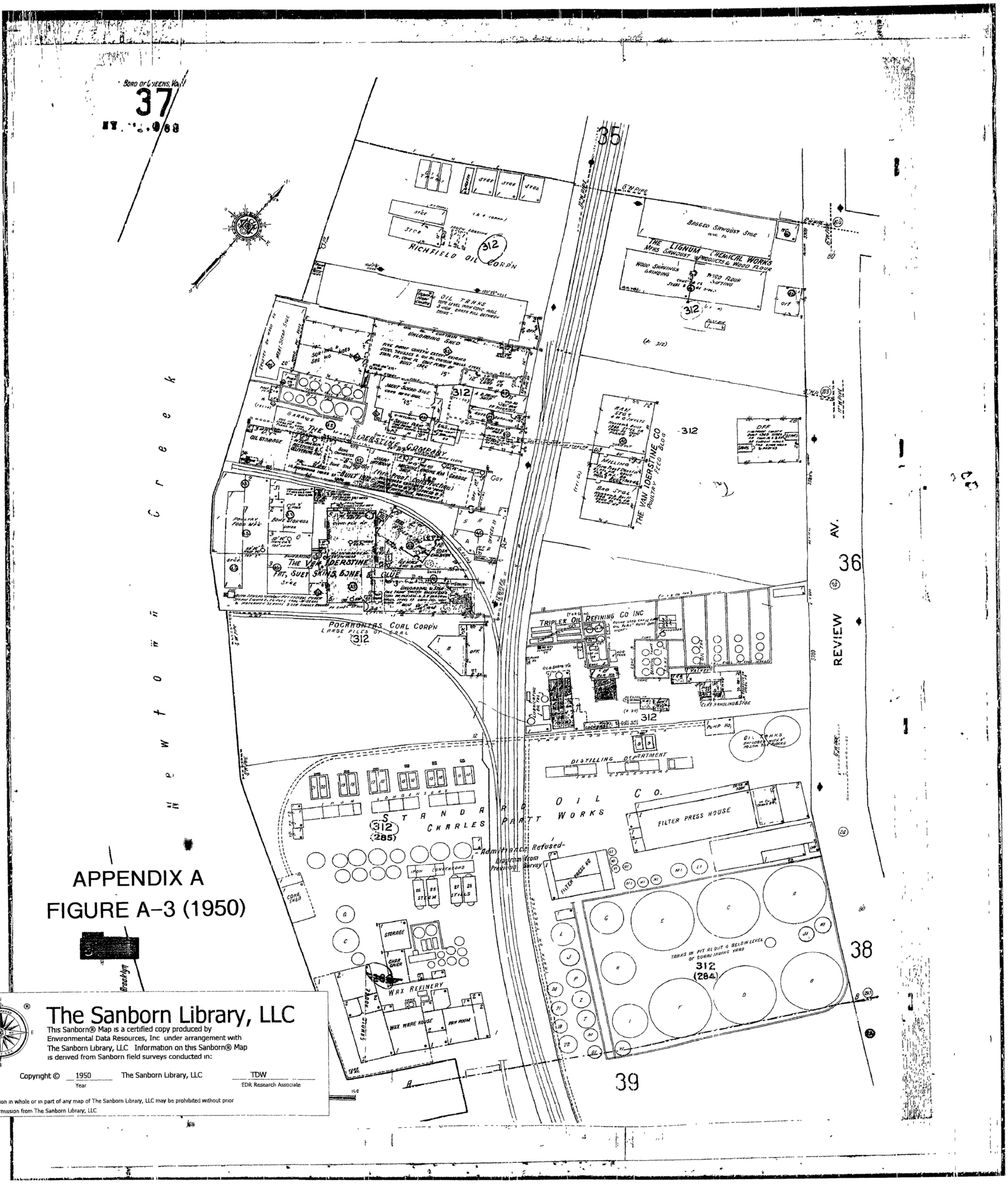
Year EDR Research Associate



APPENDIX A

FIGURE A–2 (1915)



APPENDIX A
FIGURE A-3 (1950)

[redacted]

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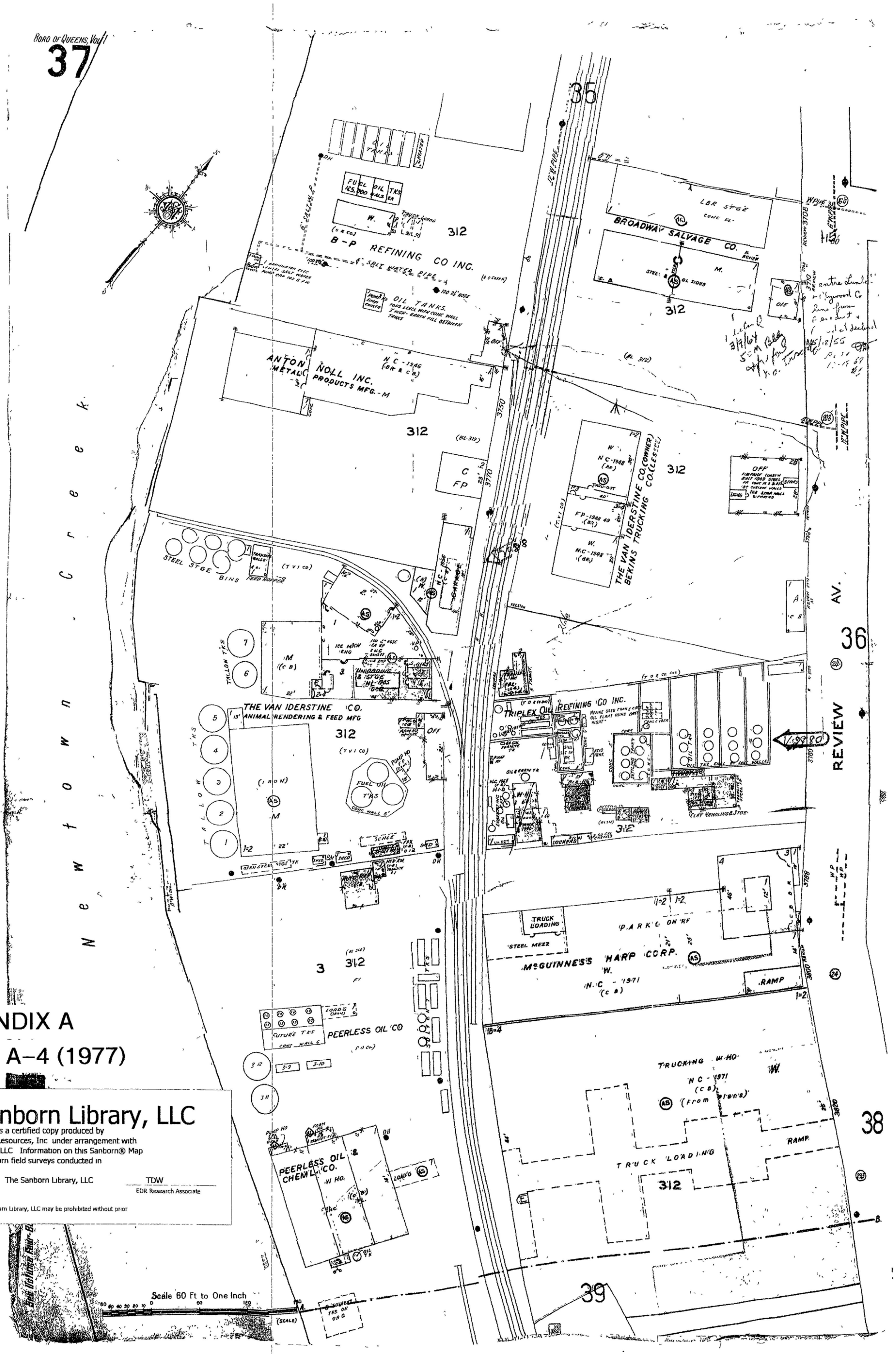
APPENDIX A

FIGURE A–4 (1977)



The Sanborn Library, LLC

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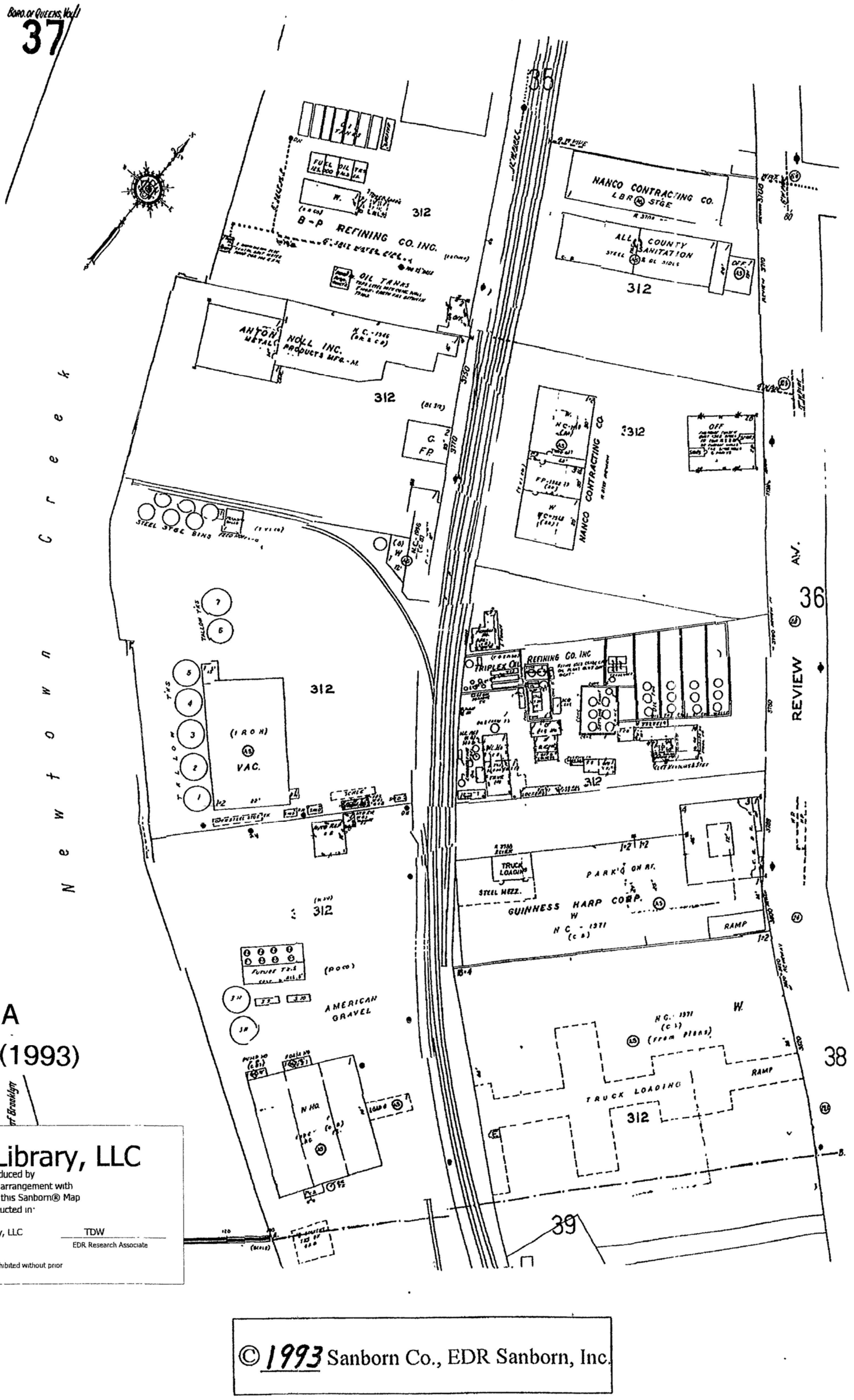
Year

TDW

EDR Research Associate



APPENDIX A

FIGURE A-5 (1993)

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APPENDIX B

HAZARDOUS MATERIALS MANIFEST AND CYLINDER REUTILIZATION CERTIFICATION

MG Industries

3 Great Valley Parkway, Malvern, PA 19355

Hazardous Materials Manifest

Page 1 of 2

IN THE EVENT OF FIRE, SPILL, OR RELEASE, CONTACT **1-800-641-4357**

TRUCK 1457
TRAILER
LOCATION Millsville Pa
DRIVER Robert J. Lynch
DATE 10/6/03

H/M	PRODUCT SHIPPING NAME	HMID CLASS	HMID UN	SPECIAL PROVISIONS	QTY.
X	Acetylene, dissolved	2.1	1001		5
	Air, compressed	2.2	1002		
	Argon, compressed	2.2	1006		
	Argon, refrigerated liquid	2.2	1951		
	Carbon dioxide	2.2	1013		
	Carbon dioxide, refrigerated liquid	2.2	2187		
	Carbon monoxide	2.3	1016	Poison Inhalation Hazard Zone D	
	Chlorine	2.3	1017	Poison Inhalation Hazard Zone B	
	Helium, compressed	2.2	1046		
	Helium, refrigerated liquid	2.2	1963		
	Hydrogen, compressed	2.1	1049		
	Methane, compressed	2.1	1971		
	Nitrogen, compressed	2.2	1066		
	Nitrogen, refrigerated liquid	2.2	1977		
	Nitrous oxide	2.2	1070		
	Nitrous oxide, refrigerated liquid	2.2	2201		
	Oxygen, compressed	2.2	1072		
	Oxygen, refrigerated liquid	2.2	1073		
	Propane	2.1	1978		
	Propylene	2.1	1077		
	Carbon dioxide and Oxygen mixtures, compressed	2.2	1014		
	Compressed gases, n.o.s. (Carbon dioxide, Argon)	2.2	1956		
	Compressed gases, n.o.s. (Oxygen, Argon)	2.2	1956		
	Compressed gases, n.o.s. (Helium,)	2.2	1956		
	Compressed gases, n.o.s. (Nitrogen,)	2.2	1956		
	Compressed gases, n.o.s. (Methane, Argon)	2.2	1956		
	Compressed gases, flammable n.o.s. (Hydrogen,)	2.1	1954		
	Compressed gases, flammable n.o.s. ( )	2.1	1954		
	Ammonia, anhydrous	2.2	1005	Inhalation Hazard	
	Sulfur dioxide	2.3	1079	Poison Inhalation Hazard Zone C	
	Liquefied gases, n.o.s (Chlorotetraflouroethane, Chlorodiflouromethane, Ethylene oxide)	2.2	3163		
	Hydrogen chloride, anhydrous	2.3	1050	Poison Inhalation Hazard Zone C	
	Butane	2.1	1011		
	Isobutane	2.1	1969		
	Sulfur hexaflouride	2.2	1080		

*2.1 – Flammable Gas   2.2 – Non-Flammable Gas   2.3 – Poison Gas

Continuation see other side

HAZMAT REV 1 10/98

MG Industries

3 Great Valley Parkway, Malvern, PA 19355

Hazardous Materials Manifest

Page 2 of 2

H/M	PRODUCT SHIPPING NAME	HMID CLASS	HMID UN	SPECIAL PROVISIONS	QTY.
	Ethane	2.1	1035		
	Ethylene, compressed	2.1	1962		
	Neon, compressed	2.2	1065		
	Xenon, compressed	2.2	2036		
	Krypton, compressed	2.2	1056		
	Hydrogen sulfide	2.3	1053	Poison Inhalation Hazard Zone B	
	Methyl acetylene and propadiene mixtures, stabilized	2.1	1060		
	Carbon dioxide and Ethylene oxide mixtures with more than 9% but not more than 87% Ethylene oxide	2.1	1041		
	Ethylene Oxide	2.3	1040	Poison Inhalation Hazard Zone D	
	Hydrogen and Methane mixtures, compressed	2.1	2034		
	Compressed gases, flammable, n.o.s. ( )	2.1	1954		
	Compressed gases, flammable, n.o.s. ( )	2.1	1954		
	Compressed gases, flammable, n.o.s. ( )	2.1	1954		
x	Compressed gases, n.o.s. (Oxygen, Nitrogen)	2.2	1956		1
	Compressed gases, n.o.s. ( )	2.2	1956		
	Compressed gases, n.o.s. ( )	2.2	1956		
	Compressed gases, n.o.s. ( )	2.2	1956		
	Compressed gases, n.o.s. ( )	2.2	1956		
	Compressed gases, n.o.s. ( )	2.2	1956		

*2.1 – Flammable Gas 2.2 – Non-Flammable Gas 2.3 – Poison Gas

This is to certify that the preceding named materials are properly classified, described, packaged, marked, labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

By

MG Industries

RECEIVED

MESSER
Gas Technology &
Services Group

Cylinder Reutilization Certificate

Contractor:	Panther Technologies	***PO#:***	3772
Contact:	Mark Prostko	***Quote#:***	100303P
Customer:			
Receiving Date :	10/6/2003	***Completion Date:***	10/16/2003

Cylinder Number(s)	***Description***	***Size***	***Method***
1	Oxygen/Nitrogen	Lrg	4,1
2	Acetylene	Lrg	1,1
3	Acetylene	Lrg	1,1
4	Acetylene	Lrg	3,1
5	Acetylene	Med	3,1
6	Acetylene	Med	1,1

One Steel Road East
Morrisville, PA 19067

Tel (215) 736-5200
Fax (215) 736-5240
www.mgindustries.com

The above 6 cylinder contents were processed according to legend. Cylinders scrubbed or processed through the Guardian (thermal processor) were done so in accordance with operating permits.

Legend:

Product

1 - Product Reclaimed/Recovered
2 - Product Scrubbed
3 - Product Processed through Guardian
4 - Residual Vented

Cylinder

1 -Cylinder Added to Inventory
2 - Cylinder Recycled

Rick O'Connor
Cylinder Remediation Program Manager

APPENDIX C

BORING AND WELL INSTALLATION LOGS

RI WELL AND BORING LOGS

RECORD OF BOREHOLE GAGW-01

SHEET 1 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/14/03
DATE COMPLETED: 11/15/03
WEATHER: Sunny and Windy

DATUM: Local
COORDS: N: 205,966.9 E: 1,001,710.9
GS ELEVATION: 19.9 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)
0	
5	15
10	10
15	5
20	0

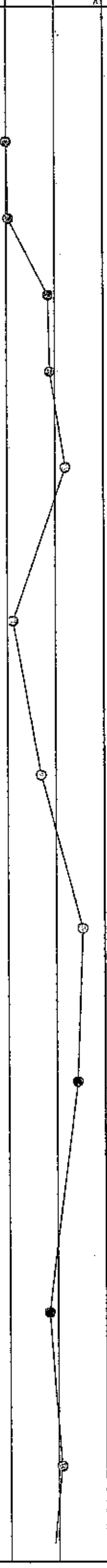
DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
1.5 - 2.0 dry, compact, olive gray CONCRETE AND DEBRIS FRAGS (>3" size) AND olive gray to black fine to very fine SAND; No HC odor	FILL	▨	17.9
2.5 - 3.0 wet, black (n1) to olive black, fine to very fine silty SAND AND medium GRAVEL, trace wood debris and plastic debris; Moderate HC odor	FILL	▨	16.9
3.5 - 5.0 wet, black (n1), well graded, angular, medium to coarse SAND AND GRAVEL; strong HC odor	FILL	▨	14.9 5.0
5.0 - 6.0 moist to wet, black(n1), poorly sorted, silty SAND to coarse sand layered in ~3" intervals with poorly sorted, angular, coarse SAND with trace gravel; Strong HC odor	FILL	▨	13.9 6.0
6.0 - 7.0 dry, compact, poorly sorted, highly angular, brownish gray to olive gray, fine SAND AND coarse GRAVEL and crushed concrete debris; Moderate HC odor	FILL	▨	12.9 7.0
7.0 - 10.0 oil wet to moist, black (n1), poorly sorted, highly angular, fine SAND AND coarse GRAVEL, and crushed concrete debris; Moderate to heavy HC odor	FILL	▨	9.9 10.0
10.0 - 13.0 damp to moist, loose to moderately compact, well graded, olive gray to olive black, medium SAND and trace medium gravel; Moderate HC odor	SW	⁘	6.9 13.0
13.0 - 14.0 damp to moist, well graded, dark gray to grayish black, fine SAND to medium sand; Strong to moderate HC odor	SW	⁘	5.9 14.0
14.0 - 15.0 damp to moist, loose to moderately compact, well graded, olive gray to olive black medium SAND and trace medium gravel; Moderate to strong HC odor	SW	⁘	4.9 15.0
15.0 - 18.0 oil wet, subangular, well graded, black (n1), medium to coarse SAND AND fine GRAVEL with some coarse gravel; Moderate HC odor	SWG	⁘	1.9 18.0
18.0 - 20.0 oil wet, well graded, black (n1) to grayish black, medium SAND with some coarse gravel; Moderate HC odor	SW	⁘	-0.1

Log continued on next page

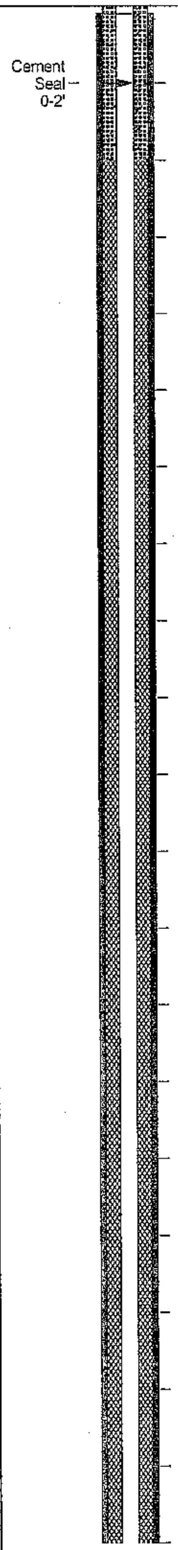
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
GRAB		-/0.5	0			
GRAB		-/0.5	4.1			
GRAB		-/0.5	86.2	☒	SBGAL010204 10/14/2003 12:40:00 PM	
GRAB		-/0.5	89.4			
SS	15 6 6 10	1.8/2.0	121 48 27	☒	SBGAL010306 10/17/2003 2:30:00 PM	
SS	5 3 2 6	0.8/2.0	12	☒	SBGAL010408 10/20/2003 8:30:00 AM	
SS	2 4 15 16	0.8/2.0	69.1	☒	SBGAL012010 10/17/2003 8:35:00 AM	
SS	13 34 26 24	1.5/2.0	59.8 154 142	☒	SBGAL010512 10/21/2003 8:45:00 AM	
SS	17 30 47 55	0.9/2.0	143 104.0	☒	SBGAL012114 10/17/2003 9:00:00 AM	
SS	24 87 80 75	0.0/1.0				
SS	57 48 46 46	1.7/2.0	29 78.4 82.2	☒	SBGAL010618 10/21/2003 9:45:00 AM	
SS	36 24 32 28	1.8/2.0	85.4 107.0 92.1	☒	SBGAL012220 10/17/2003 10:10:00 AM	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-64 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 64-74 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 63-74.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 62-63 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-62 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-01

SHEET 2 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/14/03
DATE COMPLETED: 11/15/03
WEATHER: Sunny and Windy

DATUM: Local
COORDS: N: 205,966.9 E: 1,001,710.9
GS ELEVATION: 19.9 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 50-55 F

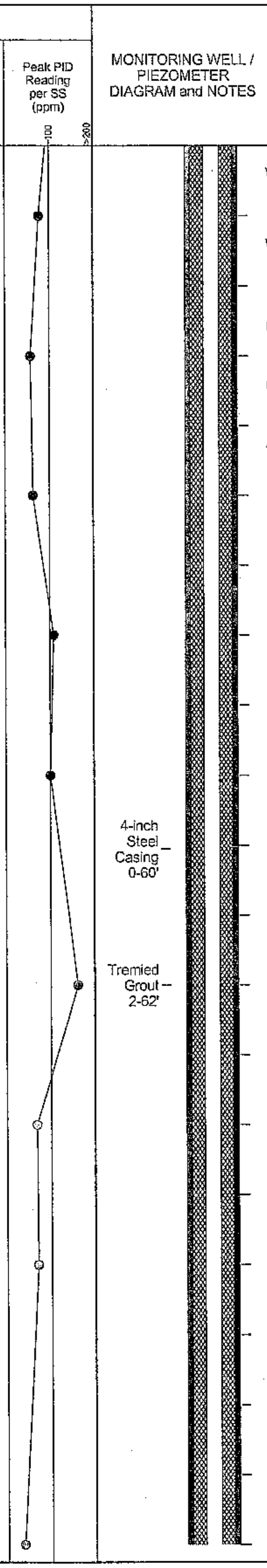
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
20		20.0 - 22.0 oil wet, well sorted, black (n1) to grayish black, medium SAND with some coarse gravel (>3"); Moderate HC odor	SP		20.0 -2.1
		22.0 - 24.0 saturated to oil wet, well sorted, black (n1), medium SAND and trace medium gravel; Strong HC odor	SP		22.0 -4.1
25	-5	24.0 - 33.0 (same as above) Strong burnt HC odor	SP		24.0 -13.1
30	-10				
		33.0 - 37.0 (same as above), olive black to olive gray	SP		33.0 -17.1
35	-15				
		37.0 - 39.0 (very little recovery) saturated, grayish black, well sorted, medium SAND and trace fine gravel (all may be sluff); Moderate to heavy HC odor	SP		37.0 -19.1
			SP		39.0
40	-20	Log continued on next page			

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	46 69 60 42	0.8 / 2.0	77.3	☒	SBGAL012322 10/17/2003 10:45:00 AM	
SS	8 16 23 28	1.5 / 2.0	58 51.6 38.1	☒	SBGAL010723 10/21/2003 11:05:00 AM	
SS	18 16 16 19	2.0 / 2.0	38 57.9 63.4	☒	SBGAL012425 10/17/2003 11:30:00 AM	
SS	22 30 30 64	2.0 / 2.0	28 48.6 109	☒	SBGAL010828 10/21/2003 11:50:00 AM	
SS	5 17 30 35	1.8 / 2.0	101 70.2 29.9	☒	SBGAL012530 10/17/2003 12:55:00 PM	
SS	14 29 25 31	2.0 / 2.0	121 94.9 162	☒	SBGAL010933 10/21/2003 1:55:00 PM	
SS	2 8 15 16	1.2 / 2.0	62 68			
SS	10 8 14 24	2.0 / 2.0	60.3 60.1 69.8	☒	SBGAL011037 10/21/2003 3:00:00 PM	
SS	10 7 6 13	0.3 / 2.0				
SS	3 3 7 9	1.3 / 2.0	37.1 34.5			



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-64 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 64-74 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 63-74.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 62-63 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-62 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-01

SHEET 3 of 4

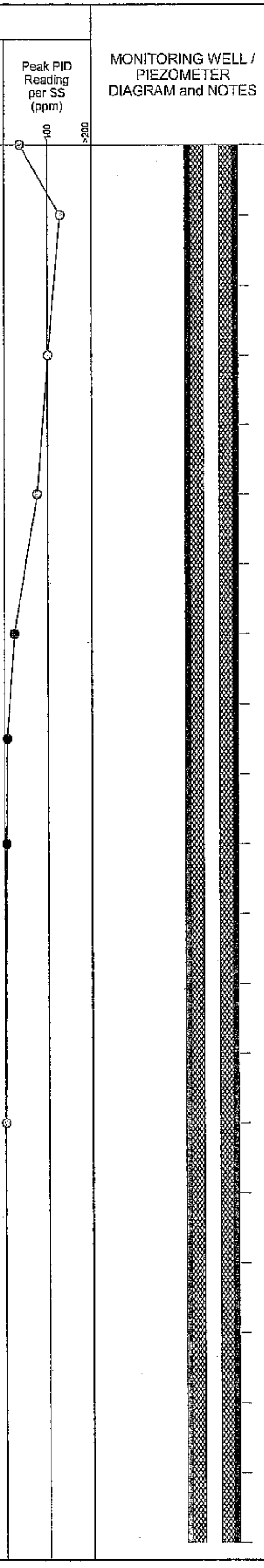
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/14/03
DATE COMPLETED: 11/15/03
WEATHER: Sunny and Windy

DATUM: Local
COORDS: N: 205,966.9 E: 1,001,710.9
GS ELEVATION: 19.9 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES					
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
40		39.0 - 41.0 saturated, grayish black to black, well sorted, fine to medium SAND and trace medium gravel, trace brick frags; Moderate to heavy HC odor *(Continued)*	SP	-21.1	SS SS	3 3 7 9	1.3/2.0 0.4/2.0	37.1 34.5 129	☒	SBGAGW012042 11/18/2003 10:20:00 AM	
		40.0 - 42.0 (little recovery), saturated, blackt to grayish black, well sorted medium SAND and trace fine gravel; Moderate to strong HC odor	SP	-22.1	SS	16 15 60/5 80	0.0/1.0				
		42.0 - 44.0 (very little recovery) heavy GRAVEL AND rock FRAGS (>3" dia), black (n1) staining on rocks	GP	42.0 -24.1	SS	55 60/2	0.2/2.0	101			
45	-25	44.0 - 46.0 saturated, grayish black, well sorted, medium SAND and trace fine gravel; HC odor decreasing from strong at 44 ft. BGS to moderate at 46 ft BGS	SP	44.0 -26.1	SS	12 12 29 60/5	2.0/2.0	76.4 19 15.2	☒ ☒	SBGAGW012145 11/18/2003 11:00:00 AM SBGAGW012246 11/18/2003 11:05:00 AM	
		46.0 - 47.0 saturated, grayish black, well sorted, medium SAND and trace fine gravel; Moderate HC odor	SP	46.0 -27.1	SS	5 30 29 51	1.8/2.0	23.3 6 2.3			
		47.0 - 47.5 saturated to wet, grayish black (stained), well graded, very coarse SAND AND coarse GRAVEL; Light HC odor	SWG	47.0 -27.6					☒	SBGAGW012348 11/18/2003 11:30:00 AM	
		47.5 - 48.0 saturated, black to grayish black, well graded medium SAND AND medium GRAVEL; Faint HC odor	SWG	47.5 -28.1	SS	31 50 39 32	0.3/1.0	6.3			
50	-30	49.0 - 50.0 saturated, grayish black to dark gray, well graded medium sand to coarse SAND and some medium to coarse gravel; Moderate to light HC odor	SW	-30.1	SS	9 19 39 39	1.8/2.0	2.9 4.2 1.7			
		50.0 - 51.0 saturated, moderate yellowish brown, well graded coarse SAND AND medium GRAVEL; Faint HC odor	SWG	50.0 -31.1					☒	SBGAGW012451 11/18/2003 1:00:00 PM	
		51.0 - 55.0 saturated, moderate yellowish brown, moderately graded coarse sand to medium SAND and some coarse gravel; Faint HC odor	SW	51.0	SS	11 25 30 36	0.0/2.0				
				-35.1	SS	8 10 13 11	1.0/2.0	1.2 1.5	☒	SBGAGW012555 11/18/2003 1:55:00 PM	
55	-35	55.0 - 74.0 LOGGED FROM CUTTINGS: (same as above)	SW	55.0							
60	-40	Log continued on next page									



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-64 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 64-74 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 63-74.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 62-63 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-62 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-01

SHEET 4 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

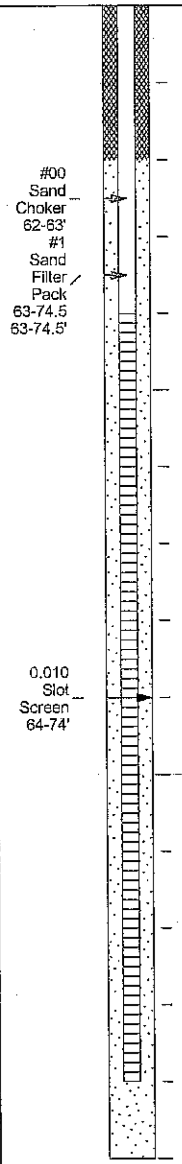
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/14/03
DATE COMPLETED: 11/15/03
WEATHER: Sunny and Windy

DATUM: Local
COORDS: N: 205,966.9 E: 1,001,710.9
GS ELEVATION: 19.9 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
60		55.0 - 74.0 LOGGED FROM CUTTINGS: (same as above) *(Continued)*	SW	▒	-54.1 74.0								
65	-45												
70	-50												
		74.0 - 75.0 LOGGED FROM CUTTINGS: white to very light gray, CLAY	CL	▨	-55.1								
75	-55	Boring completed at 75.0 ft											
80	-60												

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-64 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 64-74 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 63-74.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 62-63 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-62 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-02

SHEET 1 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/21/03
DATE COMPLETED: 11/24/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,792.4 E: 1,001,701.9
GS ELEVATION: 17.7 ft
TOC ELEVATION: 20.4 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DESCRIPTION	USCS	ELEV.	DEPTH (ft)
0.0 - 2.0 damp, olive gray to brownish gray, loose, well graded, medium SAND AND GRAVEL with concrete frags (>3" dia); No HC odor	FILL	15.7	
2.0 - 3.0 CONCRETE SLAB with wire mesh	CONCRETE	14.7	2.0
3.0 - 6.5 saturated, olive gray to grayish black, angular, well graded, fine to silty SAND AND medium GRAVEL with plastic, wire, brick debris; Moderate HC odor	FILL	11.2	3.0
6.5 - 7.0 damp,olive gray to olive black, moderately compact, well graded, angular, fine SAND AND medium GRAVEL, some brick frags (≤1" dia); Moderate HC odor	FILL	10.7	6.5
7.0 - 8.0 moist to oil wet, grayish black and brownish gray, moderately compact, well graded fine SAND and some fine gravel; Faint HC odor	SW	9.7	7.0
8.0 - 9.0 moist to wet, brownish gray and (brick colored) reddish brown and light olive gray, angular, well graded coarse GRAVEL AND medium SAND; Faint HC odor	GWS	8.7	8.0
9.0 - 10.0 moist, poorly sorted, highly angular light olive brown to olive gray with some olive black, fine SAND AND coarse GRAVEL FRAGS (>3" dia) with trace silty clay; Moderate to Faint HC odor (see note **)	SWG	7.7	9.0
10.0 - 11.0 wet, well sorted, olive black to olive gray, fine SAND and trace medium gravel; Moderate to Heavy HC odor (see note **)	SP	6.7	10.0
11.0 - 13.0 wet, black to olive gray, fine sand to silty fine SAND AND medium to coarse subrounded GRAVEL (>3" dia)	SWG	4.7	11.0
13.0 - 15.0 moist to wet, olive gray, loose to moderately compact, fine to medium SAND AND fine to coarse (>3") GRAVEL; Moderate HC odor	SWG	2.7	13.0
15.0 - 17.0 wet, olive gray, well sorted, medium SAND and some fine gravel with trace coarse sand; Moderate sweet HC odor	SP	0.7	15.0
17.0 - 18.0 wet, saturated, olive gray and moderate olive brown grains, well graded fine to coarse SAND AND fine to coarse GRAVEL; Moderate HC odor, Fining to 19 ft	SWG	-0.3	17.0
18.0 - 19.0 wet, saturated, olive gray, well sorted medium SAND and trace to some fine to medium gravel; Moderate HC odor	SP	-1.3	18.0
	SP		19.0

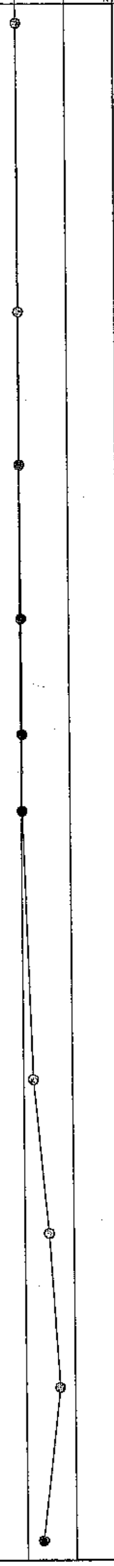
Log continued on next page

SAMPLES

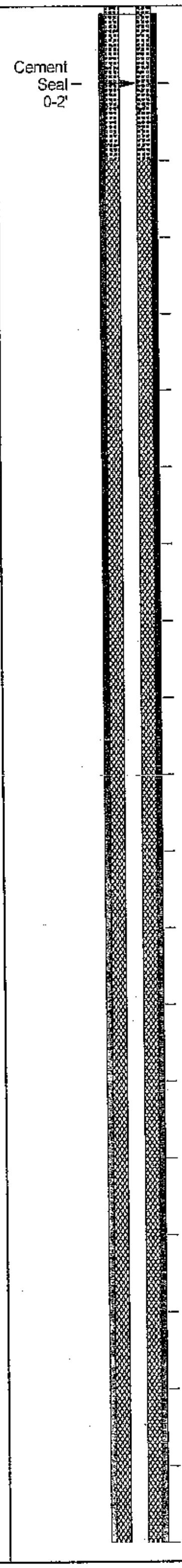
TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
GRAB		$\frac{}{0.5}$	0.7	
SS	1 1 3 16	$\frac{1.0}{2.0}$	1.3 1.4	SBGAL020305 10/29/2003 8:30:00 AM
SS	2 2 8 15	$\frac{1.3}{2.0}$	1.4 1.1	SBGAL020407 10/29/2003 8:40:00 AM
SS	8 10 10 11	$\frac{1.2}{2.0}$	2.4 0.8	SBGAL020509 10/29/2003 9:00:00 AM
SS	30 17 17 16	$\frac{0.3}{1.0}$	2.8	SBGAL020611 10/29/2003 9:15:00 AM
SS	7 8 7 20	$\frac{0.3}{1.0}$	1.8	
SS	60/6	$\frac{0.3}{2.0}$		
SS	30 15 15 17	$\frac{0.3}{2.0}$	19.9	SBGAL020715 10/29/2003 10:10:00 AM
SS	12 12 13 13	$\frac{0.8}{2.0}$	46.6 46.8 49.5	SBGAL020817 10/29/2003 10:20:00 AM
SS	21 26 27 23	$\frac{2.0}{2.0}$	27.2 47.0 69.1	SBGAL020919 10/29/2003 11:00:00 AM
SS	10 11 15 20	$\frac{2.0}{2.0}$	30.6 33.2 30.8	

Analyses

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63.5-73.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-74 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-02

SHEET 2 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/21/03
DATE COMPLETED: 11/24/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,792.4 E: 1,001,701.9
GS ELEVATION: 17.7 ft
TOC ELEVATION: 20.4 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

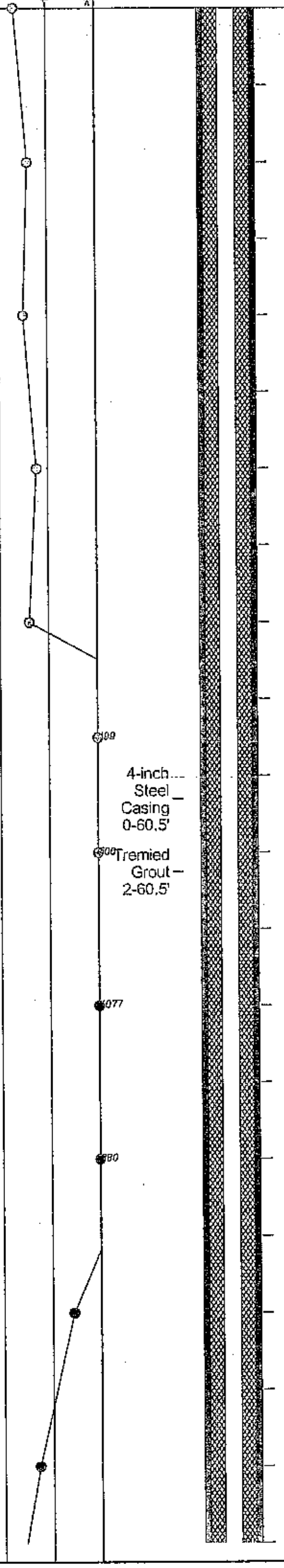
SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
19.0 - 21.0 wet, saturated, well sorted, olive gray, medium SAND and coarse sand with trace fine gravel; 1 large (>2" dia) rock frag at 20.5 ft.; some black staining; Strong to Moderate HC odor *(Continued)*	SP	-3.3
21.0 - 23.0 wet, loose, olive gray and olive black and brownish black, well sorted, medium SAND and some fine gravel; Moderate HC odor	SP	21.0 -5.3
23.0 - 23.5 wet, loose, olive gray, well graded, medium SAND AND medium GRAVEL; Moderate HC odor, Fining to 25 ft	SWG	23.0 -5.8
23.5 - 25.0 wet, loose, olive gray, well sorted, medium SAND to coarse sand and some trace fine gravel; Moderate HC odor	SP	23.5 -7.3
25.0 - 27.0 wet, olive gray, moderately compact, well sorted medium to coarse SAND and some to trace medium gravel; Moderate HC odor	SP	25.0 -9.3
27.0 - 27.5 wet, olive gray, well sorted, medium SAND and some coarse gravel; Moderate HC odor	SP	27.0 -9.8
27.5 - 28.0 wet, black, well sorted, fine SAND with trace fine gravel; Heavy HC odor	SP	27.5 -10.3
28.0 - 29.0 wet, olive gray, well sorted very fine SAND; Moderate to Light HC odor	SP	28.0 -11.3
29.0 - 31.0 wet, olive gray, well sorted, medium SAND and trace medium gravel; Very Heavy HC odor	SP	29.0 -13.3
31.0 - 34.0 wet to saturated, olive gray to brownish gray, very well sorted, fine to medium SAND; Very strong HC odor	SP	31.0 -16.3
34.0 - 35.0 saturated, olive gray , well graded, coarse to fine SAND and trace fine gravel; Strong HC odor	SW	34.0 -17.3
35.0 - 36.0 saturated, olive gray, well graded, medium to fine SAND and trace fine gravel; Strong HC odor	SW	35.0 -18.3
36.0 - 38.0 saturated, olive gray to olive black, well graded, fine to coarse SAND and trace fine to medium gravel; HC odor decreasing from faint at 36 ft. bgs to trace (if any) at 38 ft. bgs	SW	36.0 -20.3
38.0 - 40.0 saturated, brownish gray to olive gray, well graded, coarse to fine SAND and trace medium to fine gravel; 1 rock frag (>3" dia) at 39.5 ft. bgs; Little to no HC odor	SW	38.0 -22.3

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
SS	10 11 15 20	2.0 / 2.0	30.6 33.2 30.8	SBGAL021021 10/29/2003 11:15:00 AM	
SS	17 18 21 27	2.0 / 2.0	40.1 60.8 41.4	SBGAL021123 10/29/2003 12:20:00 PM	
SS	31 22 20 19	2.0 / 2.0	19.4 20.6 50.9	SBGAL021325 10/29/2003 12:30:00 PM SBGAL021225 10/29/2003 12:30:00 PM	
SS	66 20 17 27	2.0 / 2.0	56.4 76.9	SBGAL021427 10/29/2003 1:00:00 PM	
SS	16 23 22 33	2.0 / 2.0	23.1 52 60.5	SBGAL021529 10/29/2003 1:25:00 PM	
SS	16 22 27 40	2.0 / 1.0	129 499 456	SBGAL021631 10/29/2003 1:40:00 PM	
SS	10 15 25 25	1.9 / 2.0	386 322.0 500		
SS	6 16 26 42	2.0 / 2.0	337 993.0 1077		
SS	14 12 28 47	2.0 / 2.0	69 280.0 250.0	SBGAGW020335 11/24/2003 8:50:00 AM	
SS	6 14 30 33	2.0 / 2.0	52 144.0 10.0	SBGAGW020438 11/24/2003 9:15:00 AM	
SS	13 18 27 36	1.7 / 2.0	14 72.0 2.0	SBGAGW020540 11/24/2003 9:45:00 AM	



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63.5-73.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-74 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-02

SHEET 3 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/21/03
DATE COMPLETED: 11/24/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,792.4 E: 1,001,701.9
GS ELEVATION: 17.7 ft
TOC ELEVATION: 20.4 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

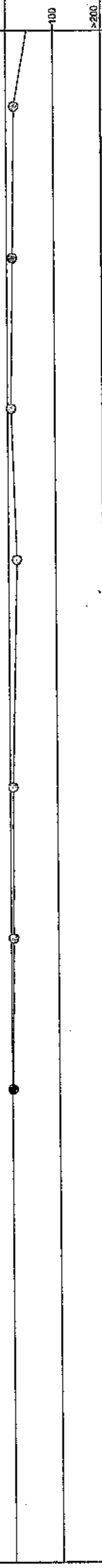
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
40		40.0 - 41.0 saturated, olive gray, well graded, coarse to fine SAND and trace fine gravel; Light HC odor	SW	40.0 -23.3
		41.0 - 42.0 saturated,, olive gray, coarse to medium SAND and some fine sand with little fine gravel; Light HC odor	SW	41.0 -24.3
	-25	42.0 - 42.5 saturated, light brownish gray to dark gray, medium fine SAND and trace fine gravel; very light HC odor	SW	42.0 -24.8
		42.5 - 43.0 saturated, light brownish gray to dark gray, well graded, coarse to fine SAND with some fine gravel and trace coarse gravel, 1 (>3" dia.) rock frag at 43.5 ft bgs	SW	42.5 -25.3
		43.0 - 44.0 saturated, light brownish gray to dark gray, medium fine SAND and trace fine gravel; very light HC odor	SW	43.0 -26.3
45		44.0 - 44.5 saturated, olive gray, well graded, coarse to fine SAND and trace fine gravel; very faint HC odor	SW	44.0 -26.8
		44.5 - 45.0 saturated, (slightly brownish) olive gray, coarse to medium SAND and little fine sand and little fine gravel; very faint HC odor	SW	44.5 -27.3
	-30	45.0 - 46.0 saturated, (slightly brownish) olive gray, coarse to medium SAND AND fine GRAVEL with little to trace subrounded coarse gravel; very faint HC odor	SWG	45.0 -28.3
		46.0 - 46.7 wet to saturated, dark yellowish brown to light yellowish gray, fine to medium SAND; very faint HC odor, if any	SW	46.0 -29.0
		46.7 - 47.0 wet to saturated, dark yellowish brown, well graded, coarse to fine SAND and trace fine gravel; very faint HC odor	SW	-29.3
50		47.0 - 47.5 saturated, dark yellowish brown, coarse to medium GRAVEL AND coarse to medium SAND with little fine gravel	GPS	47.0 -29.8
		47.5 - 51.0 wet to saturated, moderate yellowish brown, well graded coarse to fine SAND AND fine GRAVEL with trace coarse to medium gravel; Very faint HC odor, if any	SWG	47.5 -33.3
	-35	51.0 - 55.0 saturated, moderate light brown, well graded, coarse to fine SAND and some to little fine gravel with tace coarse to medium gravel; Very faint HC odor, if any	SW	51.0 -37.3
55 60	-40	55.0 - 74.0 LOGGED FROM CUTTINGS: (same as above)	SW	55.0

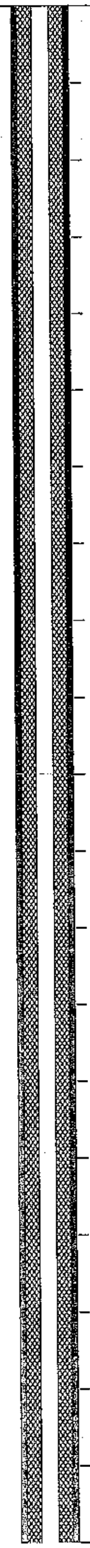
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	16 16 27 32	$\frac{1.8}{2.0}$	12 10.0 17.0	SBGAGW020642 11/24/2003 10:00:00 AM
SS	12 29 34 60/3	$\frac{1.5}{2.0}$	12 10.0 0.2	SBGAGW020744 11/24/2003 10:15:00 AM
SS	16 16 28 31	$\frac{2.0}{2.0}$	6 2.9 7.5	SBGAGW020846 11/24/2003 10:30:00 AM
SS	54 43 33 35	$\frac{1.5}{2.0}$	18 13.5	SBGAGW020947 11/24/2003 11:00:00 AM
SS	21 27 28 38	$\frac{0.0}{1.0}$		
SS	5 20 22 43	$\frac{1.3}{2.0}$	1.2 6.6	SBGAGW021051 11/24/2003 1:00:00 PM
SS	11 18 18 29	$\frac{1.5}{2.0}$	5.6 2.9 1.4	SBGAGW021152 11/24/2003 1:15:00 PM
SS	20 24 29 17	$\frac{1.0}{2.0}$	1.9	SBGAGW021254 11/24/2003 1:30:00 PM

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63.5-73.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-74 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-02

SHEET 4 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/21/03
DATE COMPLETED: 11/24/03
WEATHER: Sunny

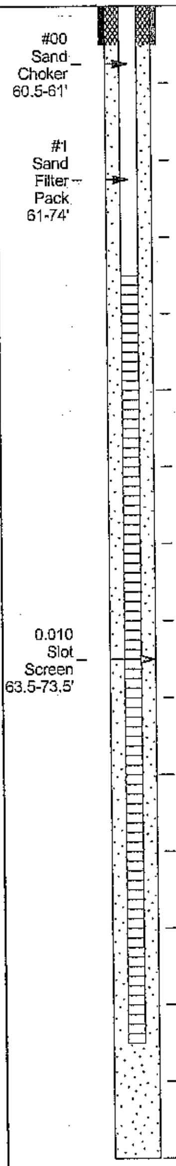
DATUM: Local
COORDS: N: 205,792.4 E: 1,001,701.9
GS ELEVATION: 17.7 ft
TOC ELEVATION: 20.4 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
60		55.0 - 74.0 LOGGED FROM CUTTINGS: (same as above) *(Continued)*	SW										
	-45												
65													
	-50												
70													
	-55				-56.3 74.0								
		74.0 - 75.0 LOGGED FROM CUTTINGS: white to very light gray, CLAY	CL		-57.3								
75		Boring completed at 75.0 ft											
	-60												
80													

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS



WELL CASING
Interval: AGS-63.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63.5-73.5 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-74 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-03

SHEET 1 of 5

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/12/03
DATE COMPLETED: 11/13/03
WEATHER: Rain

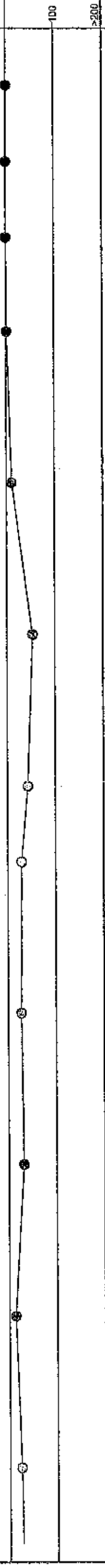
DATUM: Local
COORDS: N: 205,884.0 E: 1,001,835.6
GS ELEVATION: 24.0 ft
TOC ELEVATION: 26.5 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

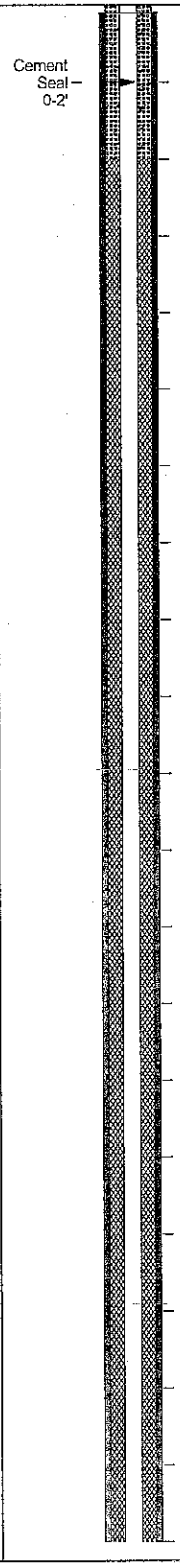
DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0		0.0 - 0.5 ASPHALT	ASPHA	23.5							
		0.5 - 1.0 black (n1), dry, compact, angular,well graded, fine to medium SAND AND and medium GRAVEL; Light HC odor	FILL	0.5 23.0	GRAB		0.5	0.9			
		1.0 - 2.0 olive gray, damp to moist, BRICKS AND fine to medium SAND; Very faint HC odor	FILL	1.0 22.0	GRAB		0.5	0			
		2.0 - 3.0 (same as above); No HC odor	FILL	2.0 21.0	GRAB		0.5	0			
	20	3.0 - 4.5 (cuttings to 5 ft.) moist to damp, angular, poorly sorted, light olive brown to moderate olive brown, silty SAND AND coarse angular GRAVEL, debris, wire, cloth, coloring black (n1) in shoe; No HC odor	FILL	3.0 19.5	SS	1 1 1 3	0.3/2.0	1.2			
		4.5 - 5.0 wet, black, very coarse SAND AND (very coarse sand-sized) SLAG fragments; Well sorted below 4.5; No HC odor	FILL	4.5 19.0							
5		5.0 - 6.5 wet to oil wet, black (n1), poorly sorted, angular, SLAG AND silty to medium SAND, BRICK FRAGS, DEBRIS; Faint HC odor	FILL	5.0 17.5	SS	1 5 2 3	1.4/2.0	3.8 11.1			
		6.5 - 7.0 wet to oil wet, olive gray to olive black, well graded, silty SAND, DEBRIS, CLOTH, trace fine gravel; Moderate HC odor	FILL	6.5 17.0							
		7.0 - 9.0 wet to oil wet, grayish black to olive black, angular to subangular, silty SAND and some very coarse sand with trace medium gravel, large brick frag (>3" dia) at 8.5 ft; Moderate HC odor	FILL	7.0 15.0	SS	3 1 3 10	1.2/2.0	36.3 54.1			
	15	9.0 - 9.5 (little recovery) black (n1) wet to oil wet, very fine silty SAND and some angular gravel; Moderate HC odor	FILL	9.0 14.5							
		9.5 - 10.0 3 ROCK FRAGS, each approx 3" Dia, oil wet, some brick frags	FILL	9.5 14.0	SS	10 50/1	0.6/2.0	43.3			
10		10.0 - 12.0 oil wet to saturated, black (n1) to olive gray and brick colored, well sorted fine SAND, with some very coarse (>3" dia) cobbles and brick frags; Heavy HC (gasoline odor?)	FILL	10.0 12.0	SS	3 13 20 20	1.5/2.0	22 25.0 29.5			
		12.0 - 13.0 oil wet to saturated, black to grayish black, angular, poorly sorted, fine SAND AND very coarse GRAVEL, crushed brick frag (>3"dia) @ 13 ft; Moderate burnt HC odor	FILL	12.0 11.0	SS	31 30 16 16	2.0/2.0	10.5 12.0 28.0			
	10	13.0 - 14.5 moist, olive gray to light olive gray, well graded, medium to coarse SAND AND coarse GRAVEL; Moderate burnt HC odor	SWG	13.0 9.5							
		14.5 - 15.0 damp to moist, olive gray to light olive gray, well sorted, medium SAND; Moderate burnt HC odor	SP	14.5 9.0	SS	37 27 12 12	2.0/2.0	4.8 13.5 32.2			
15		15.0 - 18.0 damp to slightly moist, olive gray to light olive gray, well sorted, fine to medium SAND and trace fine to medium gravel, slight to moderate HC odor	SP	15.0 6.0	SS	15 16 10 11	2.0/2.0	13.6 7.4 10.4			
	5	18.0 - 20.0 (same as above); 1 large cobble (2-3" dia) at 19.5; Moderate burnt (sweet?) HC odor	SP	18.0 4.0	SS	15 12 27 20	1.9/2.0	20.4 25.3 20.5			
20											

Log continued on next page

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-65 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 65-75 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 62-75.5 ft bgs
Type: #1 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 61-62 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-61 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-03

SHEET 2 of 5

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

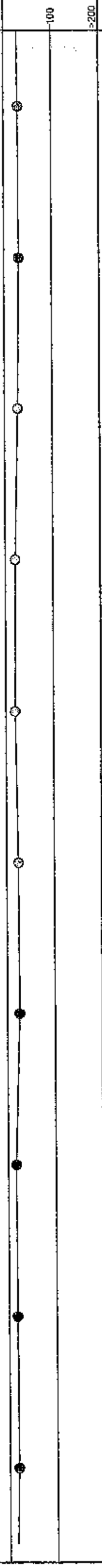
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/12/03
DATE COMPLETED: 11/13/03
WEATHER: Rain

DATUM: Local
COORDS: N: 205,884.0 E: 1,001,835.6
GS ELEVATION: 24.0 ft
TOC ELEVATION: 26.5 ft
TEMPERATURE: 50-55 F

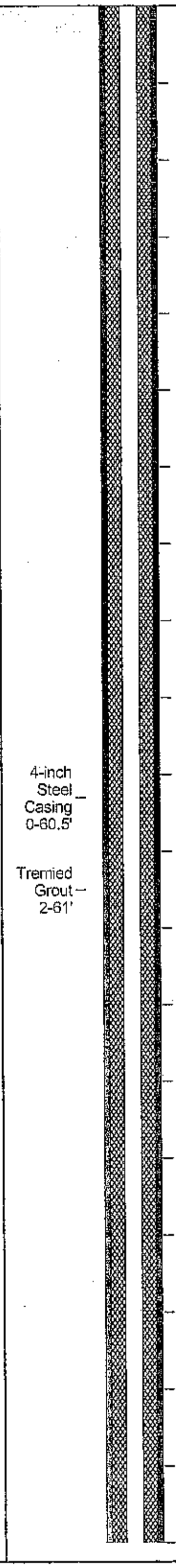
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample interval	Laboratory Sample ID Date/Time Collected	Analyses
20		20.0 - 22.0 saturated, olive gray, well sorted, medium SAND and trace medium gravel; Moderate (sweet?) HC odor, faint burnt HC odor	SP	20.0 2.0	SS	5 8 10 12	1.2/2.0	27.1 30.3			
	0	22.0 - 26.0 saturated, olive gray to black (n1), well sorted, fine to medium SAND; Moderate (sweet?) HC odor, faint burnt HC odor	SP	22.0 -2.0	SS	5 6 8 12	1.9/2.0	27.2 23.7 31.3			
25					SS	6 6 8 10	2.0/2.0	19 28.2 16.5			
		26.0 - 28.0 saturated, light olive gray, poorly sorted, fine to coarse SAND AND fine GRAVEL, Light HC odor, very faint (sweet?) HC odor	SWG	26.0 -4.0	SS	6 12 24 20	2.0/2.0	20.8 21.4 17.3			
	-5	28.0 - 30.0 saturated, dark olive gray to olive black, well sorted fine to medium SAND, little to some fine to medium gravel; Strong burnt HC odor	SP	28.0 -6.0	SS	6 26 16 16	2.0/2.0	10.9 12.5 19.9			
30		30.0 - 32.0 saturated, dark gray to medium dark gray, well sorted medium SAND and trace fine gravel, Moderate to strong HC odor	SP	30.0 -8.0	SS	57 15 15 15	1.1/2.0	15 25.0			
		32.0 - 33.5 saturated, olive gray to brownish gray, well sorted medium SAND and some medium gravel, moderately compact; Moderate to strong HC odor; color darkening to 34 ft. BGS	SP	32.0 -9.5	SS	12 15 17 28	1.6/2.0	15.1 25.7 10.1			
	-10	33.5 - 34.0 saturated, dark gray to grayish black well sorted medium SAND and trace medium gravel; Moderate HC odor	SP	33.5 -10.0							
35		34.0 - 36.0 saturated, medium dark gray, well sorted, medium SAND and little fine to medium gravel, slight coarsing of SAND to 36 ft BGS (to coarse SAND); Moderate to strong HC odor	SP	34.0 -12.0	SS	12 8 11 30	2.0/2.0	10.6 8.7 17.0			
		36.0 - 38.0 saturated, dark gray, well graded, fine to coarse SAND and trace very coarse gravel frags, trase to little fine gravel; Moderate to strong HC odor	SP	36.0 -14.0	SS	23 16 18 24	1.9/2.0	17.8 16.1 12.7			
		38.0 - 39.0 saturated, medium dark gray to dark gray, well sorted fine to medium SAND and trace fine gravel; Moderate HC odor	SP	38.0 -15.0	SS	8 10 24 34	1.6/2.0	14.8 18.0 19.4			
	-15	39.0 - 40.0 saturated, olive gray to medium gray, well graded, coarse SAND and some medium gravel; Moderate HC odor	SW	39.0 -16.0							
40		Log continued on next page									

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-65 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 65-75 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 62-75.5 ft bgs
Type: #1 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 61-62 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-61 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

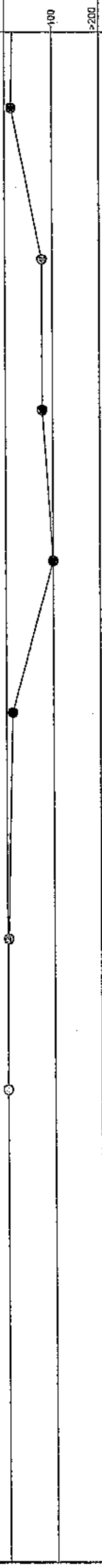
Golder Associates

RECORD OF BOREHOLE GAGW-03

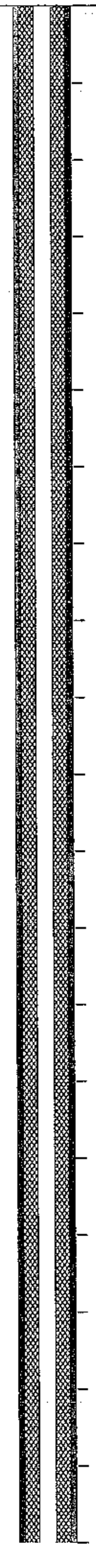
SHEET 3 of 5

PROJECT: Quanta Resources Site	DRILL METHOD: HSA/Mud Rotary	DATUM: Local	INCLINATION: -90
PROJECT NUMBER: 023-6151	DRILL RIG: CME 75	COORDS: N: 205,884.0 E: 1,001,835.6	DEPTH W.L.:
DRILLED DEPTH: 75.0 ft	DATE STARTED: 11/12/03	GS ELEVATION: 24.0 ft	ELEVATION W.L.:
AZIMUTH: N/A	DATE COMPLETED: 11/13/03	TOC ELEVATION: 26.5 ft	DATE W.L.:
LOCATION: Quanta Property	WEATHER: Rain	TEMPERATURE: 50-55 F	TIME W.L.:

		SOIL PROFILE			SAMPLES							
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
40		40.0 - 43.0 saturated, medium dark gray to olive gray, well sorted medium SAND and trace medium gravel; Moderate HC odor	SP	40.0 -19.0	SS	16 17 23 26	2.0/2.0	7.7 14.2 10.3				
		43.0 - 44.0 saturated, olive gray to medium dark gray, well sorted, medium SAND and trace medium gravel; Strong to Moderate HC odor	SP	43.0 -20.0	SS	6 18 23 35	2.0/2.0	78.2 54 48.6				
45	-20	44.0 - 46.0 saturated, olive gray, very well sorted, fine SAND; Strong to Moderate HC odor	SP	44.0 -22.0	SS	11 18 36 64	2.0/2.0	62 70.4 78.0				
		46.0 - 48.0 (same as above) ; coarsing to 48 ft to very well sorted coarse SAND; odor grading from Very strong HC odor @ 46 to moderately faint HC odor @ 48	SP	46.0 -24.0	SS	19 35 60 60/3	2.0/2.0	100 79.0 4.9				
	-25	48.0 - 49.5 saturated, olive gray, well sorted medium SAND (48 ft. BGS) grading to coarse SAND AND medium GRAVEL (49.5 ft. BGS); faint HC odor	SWG	48.0 -25.5	SS	10 24 45 60	2.0/2.0	11.8 13.3 4.4				
50		49.5 - 50.0 wet, well graded, olive gray and light olive gray coarse SAND AND medium GRAVEL; Very faint HC odor	SWG	49.5 -26.0								
		50.0 - 55.0 saturated, olive gray, well sorted, coarse SAND; 1 large (>4" qtz. Rock frag in shoe); Very faint HC odor, if any	SP	50.0 -31.0	SS	33 44 60/5	0.0/2.0					
					SS	3 9 36 60/3	1.0/2.0	2.7/1.0				
	-30				SS	50 30 50 50	1.0/2.0	0.1 0.3				
55	-35	55.0 - 85.0 LOGGED FROM CUTTINGS: saturated, moderate light brown, well graded, coarse to fine SAND and medium GRAVEL	SWG	55.0								
60												



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-65 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 65-75 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 62-75.5 ft bgs
Type: #1 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 61-62 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-61 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-03

SHEET 4 of 5

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

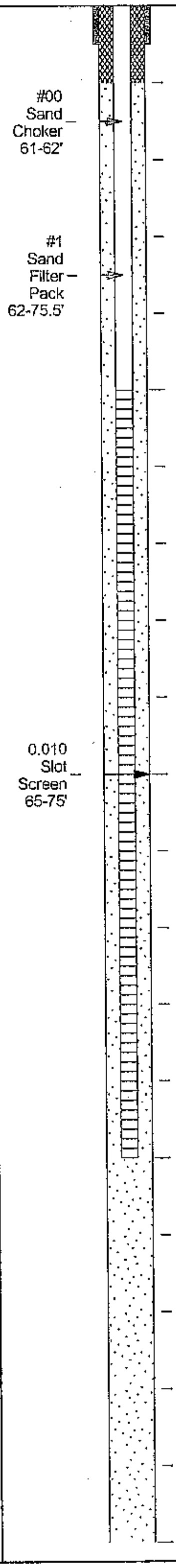
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/12/03
DATE COMPLETED: 11/13/03
WEATHER: Rain

DATUM: Local
COORDS: N: 205,884.0 E: 1,001,835.6
GS ELEVATION: 24.0 ft
TOC ELEVATION: 26.5 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
60		55.0 - 85.0 LOGGED FROM CUTTINGS: saturated, moderate light brown, well graded, coarse to fine SAND and medium GRAVEL *(Continued)*											
	-40												
65													
	-45												
70			SWG										
	-50												
75													
	-55												
80		Log continued on next page											

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-65 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 65-75 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 62-75.5 ft bgs
Type: #1 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 61-62 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-61 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-03

SHEET 5 of 5

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

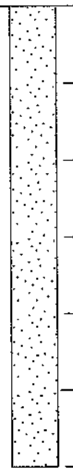
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/12/03
DATE COMPLETED: 11/13/03
WEATHER: Rain

DATUM: Local
COORDS: N: 205,884.0 E: 1,001,835.6
GS ELEVATION: 24.0 ft
TOC ELEVATION: 26.5 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
80		55.0 - 85.0. LOGGED FROM CUTTINGS: saturated, moderate light brown, well graded, coarse to fine SAND and medium GRAVEL *(Continued)*	SWG		-61.0 85.0								
	-60												
85		85.0 - 86.0 LOGGED FROM CUTTINGS: saturated, very dark brown and black, silty CLAY with pine needles and wood frags	CL		-62.0 86.0								
		Boring completed at 75.0 ft											
	-65												
90													
	-70												
95													
	-75												
100													

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-65 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 65-75 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 62-75.5 ft bgs
Type: #1 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 61-62 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-61 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAGW-04

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Review Avenue

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/10/03
DATE COMPLETED: 11/11/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,151.7 E: 1,001,990.2
GS ELEVATION: 25.9 ft
TOC ELEVATION: 25.5 ft
TEMPERATURE: 30-35 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

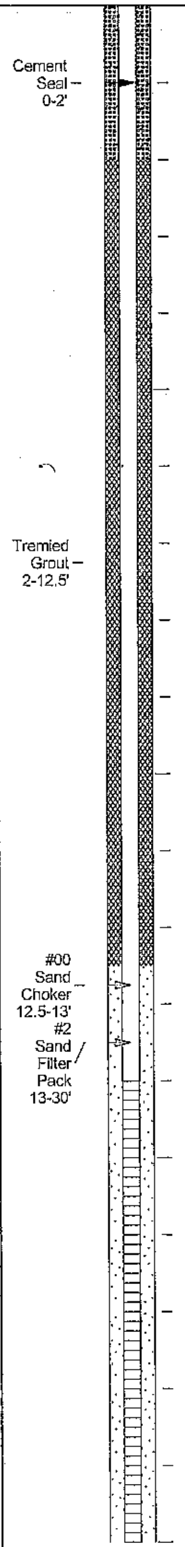
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 0.5 dry to damp, grayish blak, loose, angular, poorly sorted silty SAND (soil) AND medium GRAVEL with trace coarse angular gravel; no HC odor, some slag type material at 0.5	FILL	25.4 0.5
0.5 - 1.5 damp, brownish gray, moderately compact, very fine silty SAND and some fine gravel, no HC odor	SM	24.4 1.5
1.5 - 2.0 damp, moderate yellowish brown (rust colored), well sorted, very fine to silty SAND and trace coarse gravel; no HC odor	SM	23.9 2.0
2.0 - 6.0 damp, moderate yellowish brown, very well sorted, SILT and trace clay; increasing silt content to 6 ft; no HC odor	ML	19.9 6.0
6.0 - 10.0 damp to moist, moderate yellowish brown, very fine to silty SAND with trace to some coarse gravel from 7-8 ft; no HC odor	SM	15.9 10.0
10.0 - 12.0 moist to wet, moderate yellowish brown, well graded, fine to medium SAND AND medium GRAVEL with some coarse gravel; no HC odor	SWG	13.9 12.0
12.0 - 14.0 moist to wet, moderate yellowish brown and moderate brown, moderately sorted, medium to fine SAND and some coarse gravel; no HC odor	SW	11.9 14.0
14.0 - 18.0 moist, moderately compact, moderate yellowish brown to moderate brown, fine SAND AND very coarse GRAVEL (>3" dia); no HC odor	SWG	7.9 18.0
18.0 - 18.5 damp, moderate yellowish brown, fine to medium SAND and trace medium gravel; no HC odor	SP	7.4 18.5
18.5 - 20.0 damp, olive gray and brownish gray, very well sorted, fine to medium SAND; faint HC odor	SP	5.9

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	8 6 4 4	1.8 / 2.0	0.5 0.6 0.1	SBGAGW040102 11/10/2003 12:35:00 PM
SS	2 3 2 2	1.6 / 2.0	0.0 0.1 0.4	
SS	5 4 3 7	1.8 / 2.0	0.0 0.6 0.8	SBGAGW040206 11/10/2003 12:50:00 PM
SS	6 14 19 20	1.8 / 2.0	0.6 0.2 0.6	
SS	15 21 22 22	0.8 / 2.0	0.3	
SS	4 46 19 6	1.3 / 2.0	2.3 3.5	SBGAGW040312 11/10/2003 1:15:00 PM
SS	8 16 10 5	1.5 / 2.0	0.4 0.3	
SS	8 9 12 10	1.1 / 2.0	0.3 0.2	
SS	16 27 37 45	0.6 / 2.0	2.4	SBGAGW040418 11/10/2003 1:55:00 PM
SS	8 21 12 11	1.8 / 2.0	2.7 0.9 0.8	

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-14 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 14-29 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 13.5-30 ft bgs
Type: #2 Sand
Quantity: 4x50 lb

FILTER PACK SEAL
Interval: 12.5-13.5 ft bgs
Type: #00 Sand
Quanlity: 1x50 lb

ANNULUS SEAL
Interval: 0-12.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAGW-04

SHEET 2 of 2

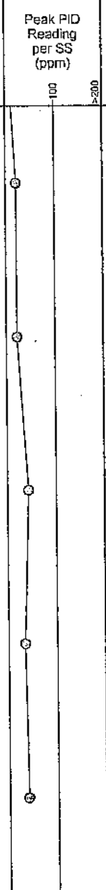
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Review Avenue

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/10/03
DATE COMPLETED: 11/11/03
WEATHER: Sunny

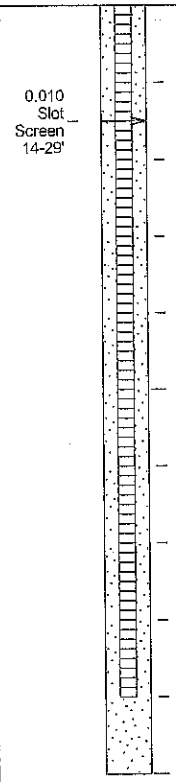
DATUM: Local
COORDS: N: 206,151.7 E: 1,001,990.2
GS ELEVATION: 25.9 ft
TOC ELEVATION: 25.5 ft
TEMPERATURE: 30-35 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20	5	20.0 - 22.0 (same as above) light to moderate HC odor	SP		20.0 3.9	SS	4 12 17 21	2.0/2.0	7.8 16.2 22.0	☒	SBGAGW040522 11/10/2003 2:15:00 PM	
		22.0 - 24.0 wet, saturated, olive gray, well sorted fine to medium SAND and trace fine gravel; moderate HC odor	SP		22.0 1.9	SS	8 12 22 20	2.0/2.0	12.2 22.1 22.3			
25	0	24.0 - 26.0 (same as above) moderate/strong HC odor	SP		24.0 -0.1	SS	12 12 12 15	2.0/2.0	24.7 43.4 23.9	☒	SBGAGW040626 11/10/2003 2:50:00 PM	
		26.0 - 30.0 wet to saturated, olive gray to brownish gray, well sorted, fine to medium SAND and trace fine to medium gravel; moderate/strong HC odor (increasing medium sand content to 30 ft)	SP		26.0	SS	8 13 17 23	2.0/2.0	23.6 34.2 29.7			
					-4.1	SS	13 18 19 22	2.0/2.0	20.9 32.2 39.7	☒	SBGAGW040730 11/11/2003 9:05:00 AM	
30	-5				30.0							
35	-10											
40		Boring completed at 40.0 ft										



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-14 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 14-29 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 13.5-30 ft bgs
Type: #2 Sand
Quantity: 4x50 lb

FILTER PACK SEAL
Interval: 12.5-13.5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-12.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-04D

SHEET 1 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 73.0 ft
AZIMUTH: N/A
LOCATION: Review Avenue

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 8/2/04
DATE COMPLETED: 8/3/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,146.3 E: 1,001,994.6
GS ELEVATION: 25.7 ft
TOC ELEVATION: 25.8 ft
TEMPERATURE: 85-88 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 0.5 dry to damp, compact, well graded, angular, CONCRETE FRAGS AND coarse SAND; some debris	Fill	25.2 0.5
0.5 - 2.0 damp, brownish gray, moderately compact, very fine silty SAND and some fine gravel, no HC odor	SM	23.7 2.0
2.0 - 6.0 damp, moderate yellowish brown, very well sorted, SILT and trace clay; increasing silt content to 6 ft; no HC odor	ML	19.7 6.0
6.0 - 10.0 damp to moist, moderate yellowish brown, very fine to silty SAND with trace to some coarse gravel from 7-8 ft; no HC odor	SM	15.7 10.0
10.0 - 12.0 wet, olive gray and light brownish gray, well sorted, fine to medium SAND and trace medium gravel; faint to very faint HC odor	SWG	13.7 12.0
12.0 - 14.0 moist to wet, moderate yellowish brown and moderate brown, moderately sorted, medium to fine SAND and some coarse gravel; no HC odor	SW	11.7 14.0
14.0 - 18.0 moist, moderately compact, moderate yellowish brown to moderate brown, fine SAND AND very coarse GRAVEL (>3" dia); no HC odor	SWG	7.7 18.0
18.0 - 18.5 damp, moderate yellowish brown, fine to medium SAND and trace medium gravel; no HC odor	SP	7.2 18.5
18.5 - 20.0 damp, olive gray and brownish gray, very well sorted, fine to medium SAND; faint HC odor	SP	5.7

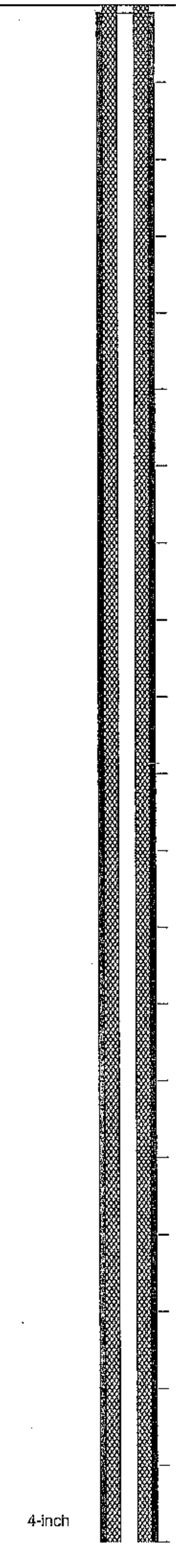
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)
SS	2 4 4 6	1.5 / 2.0	0.0 0.0 0.1
SS	6 15 18 20	1.0 / 2.0	0.1 0.0 0.2
SS	5 9 12 6	1.0 / 2.0	0.0 0.1 0.0
SS	5 9 9 7	1.2 / 2.0	0.0 0.0
SS	9 8 7 6	0.7 / 2.0	0.0 0.0
SS	14 6 8 8	0.8 / 2.0	0.0 0.0
SS	8 8 7 7	1.2 / 2.0	0.0 0.0
SS	1 2 7 8	1.3 / 2.0	0.0 0.0 0.0

Sample Interval | Laboratory Sample ID Date/Time Collected | Analyses | Peak PID Reading per SS (ppm) 100 >200

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-59 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 59-69 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 56-69 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 54-56 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-54 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAGW-04D

SHEET 2 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 73.0 ft
AZIMUTH: N/A
LOCATION: Review Avenue

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 8/2/04
DATE COMPLETED: 8/3/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,146.3 E: 1,001,994.6
GS ELEVATION: 25.7 ft
TOC ELEVATION: 25.8 ft
TEMPERATURE: 85-88 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

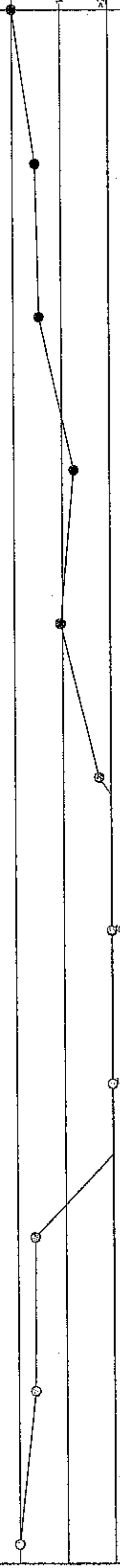
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
20.0 - 22.0 (same as above) light to moderate HC odor	SP	20.0
22.0 - 24.0 wet, saturated, olive gray, well sorted fine to medium SAND and trace fine gravel; moderate HC odor	SP	3.7 22.0
24.0 - 26.0 (same as above) moderate/strong HC odor	SP	1.7 24.0
26.0 - 30.0 wet to saturated, olive gray to brownish gray, well sorted, fine to medium SAND and trace fine to medium gravel; moderate/strong HC odor (increasing medium sand content to 30 ft)	SP	-0.3 26.0
30.0 - 36.0 Water saturated, gray brown compact MF SAND, trace fine rounded gravel (strong HC odor)	SP	-4.3 30.0
36.0 - 48.0 Water saturated, orange brown compact to dense MF SAND, trace gravel	SP	-10.3 36.0

Log continued on next page

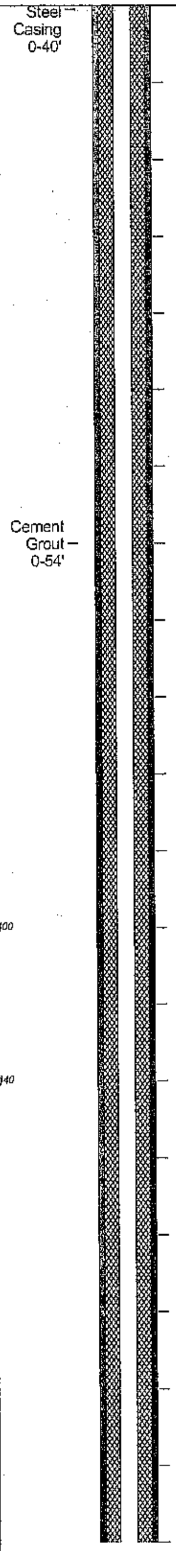
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	1 2 7 8	1.3/2.0	0.0 0.0 0.0			
SS	4 8 10 12	1.4/2.0	47 27 30			
SS	8 7 7 9	1.7/2.0	53 54 46			
SS	3 5 5 10	1.9/2.0	38 118 125			
SS	6 9 14 15	2.0/2.0	96 85 55			
SS	7 10 10 14	2.0/2.0	35 60 175			
SS	7 12 15 16	2.0/2.0	150 310 400			
SS	7 8 10 15	2.0/2.0	115 180 340			
SS	6 7 15 21	2.0/2.0	6.1 36 0.0			
SS	13 18 12 17	2.0/2.0	35 0.0 0.0			
SS	3 6 9 11	2.0/2.0	0.0 0.0			

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-59 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 59-69 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 56-69 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 54-56 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-54 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-04D

SHEET 3 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 73.0 ft
AZIMUTH: N/A
LOCATION: Review Avenue

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 8/2/04
DATE COMPLETED: 8/3/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,146.3 E: 1,001,994.6
GS ELEVATION: 25.7 ft
TOC ELEVATION: 25.8 ft
TEMPERATURE: 85-88 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)
40	
	-15
45	
	-20
50	
	-25
55	
	-30
60	

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
36.0 - 48.0 Water saturated, orange brown compact to dense MF SAND, trace gravel *(Continued)*	SP	-22.3 48.0
48.0 - 52.0 Water saturated, orange brown poorly sorted CM SAND, little fine rounded gravel	SP	-26.3 52.0
52.0 - 59.0 Water saturated, orangish brown dense to very dense CF SAND and CF rounded and subangular GRAVEL (no odor)	GP	-33.3 59.0
59.0 - 64.0 Water saturated, light brown dense silty CF SAND, little CF rounded gravel (no odor)	SP	

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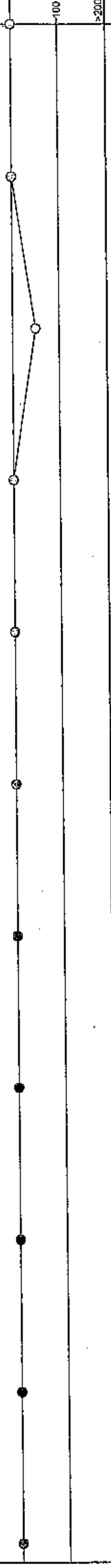
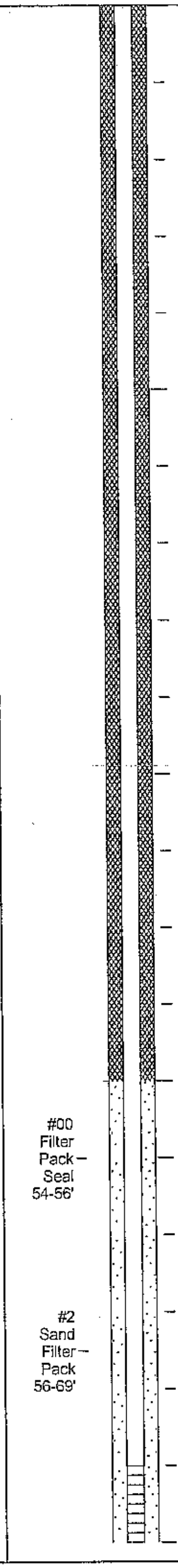
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	3 6 9 11	2.0 / 2.0	0.0 0.0			
SS	6 9 12 16	1.0 / 2.0	0.0 0.0			
SS	3 3 15 15	1.2 / 2.0	50 0.0 0.0			
SS	10 14 19 16	1.3 / 2.0	0.0 0.0			
SS	17 23 28 28	2.0 / 2.0	0.0 0.0 0.0			
SS	9 7 8 6	0.6 / 2.0	0.0 0.0			
SS	26 25 34 29	0.4 / 2.0	0.0			
SS	14 30 26 25	0.5 / 2.0	0.0 0.0			
SS	37 47 48 0.0	0.4 / 2.0	0.0			
SS	22 26 22 25	1.5 / 2.0	0.0 0.0			
SS	17 19 24 28	1.4 / 2.0	0.0 0.0 0.0			

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-59 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 59-69 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 56-69 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 54-56 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-54 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-04D

SHEET 4 of 4

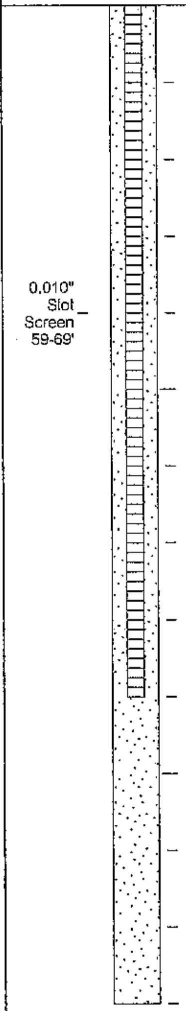
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 73.0 ft
AZIMUTH: N/A
LOCATION: Review Avenue

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 8/2/04
DATE COMPLETED: 8/3/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,146.3 E: 1,001,994.6
GS ELEVATION: 25.7 ft
TOC ELEVATION: 25.8 ft
TEMPERATURE: 85-88 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE				SAMPLES							
DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
59.0 - 64.0 Water saturated, light brown dense silty CF SAND, little CF rounded gravel (no odor) *(Continued)*	SP			SS	17 19 24 28	1.4 / 2.0	0.0 0.0 0.0				
				SS	14 15 19 24	1.2 / 2.0	0.0 0.0				
			-38.3 64.0	SS	16 20 22 22	1.0 / 2.0	0.0 0.0				
64.0 - 69.0 Water saturated, orange brown poorly sorted dense CF SAND, little rounded fine gravel (no odor)	SP			SS	20 26 20 27	1.2 / 2.0	0.0 0.0 0.0				
			-43.3 69.0	SS	17 22 34 38	1.3 / 2.0	0.0 0.0				
69.0 - 71.0 Water saturated, orange brown very dense F-VF SAND, tracew fine rounded gravel (no odor)	SP		-45.3 71.0	SS	14 26 37 38	1.5 / 2.0	0.0 0.0 0.0				
71.0 - 73.0 Water saturated, Dark Gray very hard CLAY, (traces fine to very fine sand (no odor)	CL		-47.3	SS	16 30 17 7	1.0 / 2.0	0.0 0.0				
Boring completed at 73.0 ft											



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-59 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 59-69 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 56-69 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 54-56 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-54 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-05

SHEET 1 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/19/03
DATE COMPLETED: 11/21/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,889.9 E: 1,001,650.0
GS ELEVATION: 16.3 ft
TOC ELEVATION: 18.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0		0.0 - 0.5 dry to damp, compact, well graded, angular, CONCRETE FRAGS AND coarse SAND; some debris	FILL	15.8							
	15	0.5 - 2.0 CONCRETE SLAB	CONCRETE	0.5 14.3							
		2.0 - 3.0 dry, moderately compact to loose, pinkish gray, well sorted, very fine SAND and some fine gravel (subgrade); Very light HC odor	FILL	2.0 13.3	SS	5 4 3 3	1.7 2.0	9.6 51.8 20.6	☒	SBGAL040104 10/22/2003 8:30:00 AM	
5		3.0 - 5.5 oil moist to wet, moderately compact, black to grayish black, silty SAND AND fine GRAVEL with some clay in matrix (plastic); Heavy HC odor	SPG	3.0 10.8							
	10	5.5 - 7.0 oil moist to damp, moderately compact, interleaving black and olive gray, well sorted, fine SAND and trace fine to med gravel; Strong HC odor	SP	5.5 9.3	SS	5 16 10 12	1.3 2.0	26.2 42.9 44.0	☒	SBGAL040207 10/22/2003 9:00:00 AM	
		7.0 - 8.0 (same as above) with increasing clay content to 8 ft.; Moderate HC odor	SP	7.0 8.3	SS	7 21 20 16	1.0 2.0	30 25.1			
		8.0 - 9.0 damp, compact to dense, moderate olive brown, interleaving silty CLAY AND fine SAND, with some to trace fine gravel; Moderate HC odor	CLS	8.0 7.3					☒	SBGAL040309 10/22/2003 9:20:00 AM	
10	5	9.0 - 11.5 (same as above) with interleaving damp, black (n1), fine SAND and trace angular rock frags (>3" dia.); Moderate HC odor	CLS	9.0 4.8	SS	3 8 12 17	0:8 2.0	40.8	☒	- SBGAL040411 10/22/2003 9:30:00 AM	
		11.5 - 13.0 oil saturated, black (n1), moderately loose, fine SAND AND coarse GRAVEL (with brick frag (?) at 12.5 to 13.0); Heavy HC odor	SWG	11.5 3.3	SS	66 25 21 18	1.3 2.0	51 50.0 40.0	☒	SBGAL040513 10/22/2003 12:46:00 PM	
		13.0 - 15.0 oil saturated, loose, olive gray to black, very fine to fine SAND with some oil stained very coarse gravel to cobble (>3" dia)-- little recovery	SW	13.0 1.3	SS	10 16 16 10	0.3 2.0	14.6	☒	SBGAL040615 10/22/2003 1:00:00 PM	
15	0	15.0 - 18.0 oil saturated, black (n1) loose to moderately compact, well graded, fine to coarse SAND AND medium to coarse GRAVEL; Heavy HC odor	SWG	15.0 -1.7	SS SS	11 27 60/1 8 13 14 14	0.2 2.0 2.0 2.0	29.4 43.1 41.2	☒ ☒	SBGAL040717 10/22/2003 1:20:00 PM SBGAL040818 10/22/2003 2:00:00 PM	
20		18.0 - 20.0 oil wet, black (n1), loose, well graded, coarse GRAVEL AND medium SAND; Heavy HC odor	GWS	18.0 -3.7	SS	10 32 37 36	2.0 2.0	5.9 3.9 7.0	☒	SBGAL040920 10/22/2003 2:10:00 PM	

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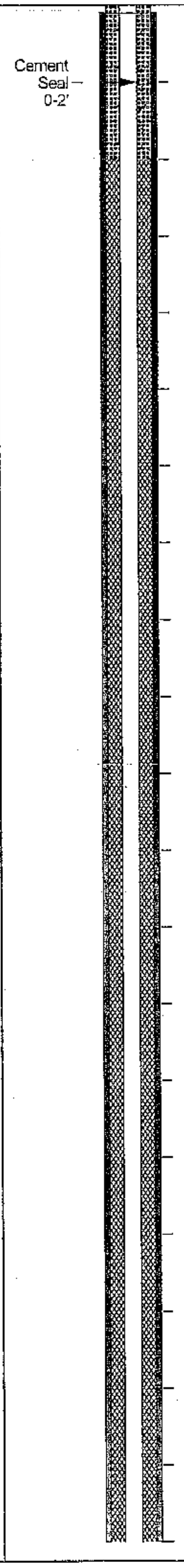
MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-73.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-05

SHEET 2 of 4

PROJECT: Quanta Resources Site	DRILL METHOD: HSA/Mud Rotary	DATUM: Local	INCLINATION: -90
PROJECT NUMBER: 023-6151	DRILL RIG: CME 75	COORDS: N: 205,889.9 E: 1,001,650.0	DEPTH W.L.:
DRILLED DEPTH: 75.0 ft	DATE STARTED: 11/19/03	GS ELEVATION: 16.3 ft	ELEVATION W.L.:
AZIMUTH: N/A	DATE COMPLETED: 11/21/03	TOC ELEVATION: 18.6 ft	DATE W.L.:
LOCATION: Quanta Property	WEATHER: Sunny	TEMPERATURE: 40-45 F	TIME W.L.:

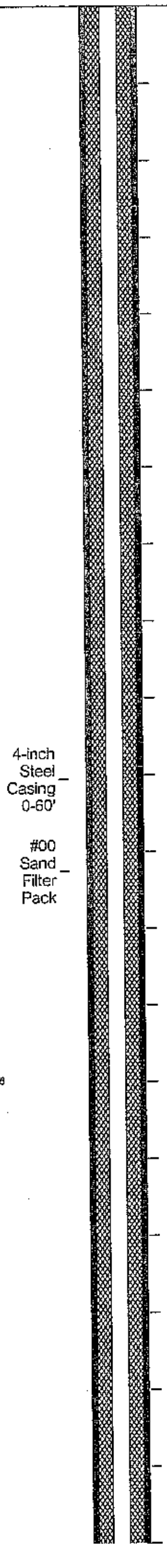
SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
20.0 - 21.5 oil wet, black (n1), loose, well graded, medium SAND AND medium GRAVEL; Heavy HC odor	SWG	20.0 -5.2
21.5 - 22.0 oil wet, black (n1), loose, well sorted, medium SAND and trace medium gravel; Heavy HC odor	SP	21.5 -5.7
22.0 - 28.0 saturated, black (n1) to grayish black, well sorted, medium SAND and trace medium gravel; Heavy HC odor	SP	22.0 -11.7
28.0 - 30.0 (same as above) with moderate to strong HC odor	SP	28.0 -13.7
30.0 - 33.0 saturated, olive gray to brownish gray, well sorted, medium SAND and little medium grave; Moderate HC odor	SP	30.0 -16.7
33.0 - 35.0 saturated, olive gray and brownish gray, well sorted fine to medium SAND and trace medium gravel; odor decreasing from moderate at 33 ft. bgs to faint (fuel?) at 35 ft. bgs	SP	33.0 -18.7
35.0 - 36.5 saturated, olive gray and brownish gray, well sorted, fine to medium SAND and trace fine gravel; Moderate HC odor	SP	35.0 -20.2
36.5 - 37.0 saturated, olive gray, very fine to silty SAND; Moderate to strong HC odor	SM	36.5 -20.7
37.0 - 39.0 saturated, olive gray, well sorted fine SAND with trace fine gravel and trace silt; Moderate HC odor; slight coarsing to medium sand from 37 to 39 ft. bgs	SP	37.0 -22.7
	SP	39.0

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	6 10 12 13	2.0 / 2.0	13.7 18.7 37.0	SBGAL041022 10/22/2003 2:40:00 PM
SS	2 2 3 8	1.5 / 2.0	88.1 98.1	SBGAL041124 10/22/2003 3:20:00 PM
SS	16 10 10 18	1.5 / 2.0	46.2 57.8 69	SBGAL041226 10/22/2003 3:40:00 PM
SS	4 4 7 11	2.0 / 2.0	175 76.3 49.2	SBGAL041328 10/23/2003 1:28:00 PM
SS	8 6 5 10	2.0 / 2.0	119 79.1	SBGAL041430 10/23/2003 2:30:00 PM
SS	2 10 18 24	0.0 / 2.0		
SS	50 60/5	0.3 / 2.0	63.3	SBGAGW050133 11/20/2003 8:40:00 AM
SS	21 14 20 33	0.0 / 2.0		SBGAGW050234 11/20/2003 9:30:00 AM
SS	1 4 15 32	2.0 / 2.0	296 145.0 19.6	SBGAGW050335 11/20/2003 9:35:00 AM
SS	9 26 36 36	2.0 / 2.0	10.4 135.0 146.0	SBGAGW050437 11/20/2003 9:50:00 AM
SS	6 10 30 45	1.8 / 2.0	80.2 4.6 8.4	SBGAGW050539 11/20/2003 10:25:00 AM
SS	3 11 16 22	1.3 / 2.0	15.9 4.2	



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-73.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-05

SHEET 3 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/19/03
DATE COMPLETED: 11/21/03
WEATHER: Sunny

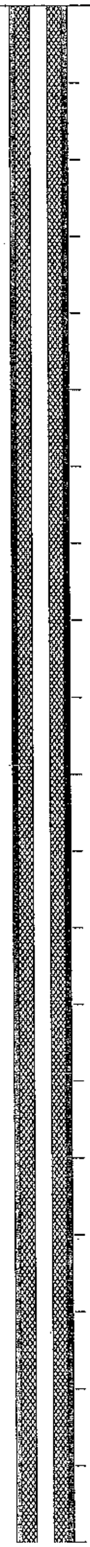
DATUM: Local
COORDS: N: 205,889.9 E: 1,001,650.0
GS ELEVATION: 16.3 ft
TOC ELEVATION: 18.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
40		39.0 - 41.0 saturated, moderate olive gray and brownish gray, well sorted fine SAND with trace fine gravel at 39 ft. bgs grading to well sorted medium to coarse sand at 41 ft. bgs; Moderate to faint HC odor *(Continued)*	SP		-24.7	SS	3 11 16 22	1.3/2.0	15.9 4.2	☒	SBGAGW050641 11/20/2003 10:45:00 AM		
	-25	41.0 - 43.0 saturated, olive gray to olive brown, well sorted, medium to coarse SAND and trace medium gravel; faint HC (fuel?) odor	SP		41.0 -26.7	SS	11 22 33 32	1.2/2.0	6.7 13.3	☒	SBGAGW050743 11/20/2003 11:10:00 AM		
45		43.0 - 46.0 saturated, olive gray and brownish gray, well graded, coarse SAND AND fine GRAVEL, Modrate to faint HC (fuel?) odor	SWG		43.0 -29.7	SS SS	6 16 24 26 4 10 15 27	0.0/2.0 1.6/2.0	18 28.7 30.1	☒	SBGAGW050846 11/20/2003 11:40:00 AM		
	-30	46.0 - 48.0 (same as above) with some medium and fine sand	SWG		46.0 -31.7	SS	7 10 15 20	1.5/2.0	4.8 3.3 12.8	☒	SBGAGW050948 11/20/2003 1:25:00 PM		
50		48.0 - 50.5 saturated, olive gray to brownish gray, well sorted, coarse SAND and trace to some medium gravel; Faint HC odor	SP		48.0 -34.2	SS	60/1	0.0/2.0		☒	SBGAGW051351 11/20/2003 1:50:00 PM		
	-35	50.5 - 52.0 saturated, moderate yellowish brown, well graded, coarse SAND AND medium to coarse GRAVEL; Very faint HC odor, if any	SWG		50.5 -35.7	SS	4 9 9 14	1.5/2.0	24.2 7.4 10.9	☒	SBGAGW051052 11/20/2003 1:55:00 PM		
		52.0 - 54.0 saturated, moderate yellowish brown, moderately sorted, very coarse SAND and some medium gravel; Very faint HC odor, ifany	SPG		52.0 -37.7	SS	4 10 10 13	2.0/2.0	2.7 5.2 5.4	☒	SBGAGW051154 11/20/2003 2:10:00 PM		
55		54.0 - 56.0 saturated, dark yellowish orange to moderate yellowish brown, well graded coarse GRAVEL AND coarse SAND with some fine sand; Very faint HC odor, if any	GWS		54.0 -39.7	SS	10 20 17 20	1.3/2.0	3.3 2.4	☒	SBGAGW051266 11/20/2003 2:40:00 PM		
60	-40	56.0 - 73.0 LOGGED FROM CUTTINGS: (same as above)	GWS		56.0								

Log continued on next page

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-73.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-05

SHEET 4 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

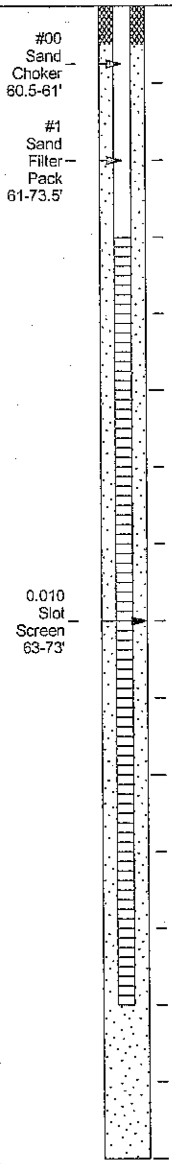
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: CME 75
DATE STARTED: 11/19/03
DATE COMPLETED: 11/21/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,889.9 E: 1,001,650.0
GS ELEVATION: 16.3 ft
TOC ELEVATION: 18.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
60		56.0 - 73.0 LOGGED FROM CUTTINGS: (same as above) *(Continued)*	GWS										
	-45												
65													
	-50												
70													
	-55				-56.7 73.0								
		73.0 - 74.5 LOGGED FROM CUTTINGS: white to very light gray, CLAY	CL		-58.2 74.5								
75		Boring completed at 75.0 ft											
	-60												
80													

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 61-73.5 ft bgs
Type: #1 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 60.5-61 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-60.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAGW-06I

SHEET 1 of 3

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 51.0 ft
AZIMUTH: N/A
LOCATION: Quant Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/28/04
DATE COMPLETED: 6/29/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,765.7 E: 1,001,723.9
GS ELEVATION: 19.0 ft
TOC ELEVATION: 21.9 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

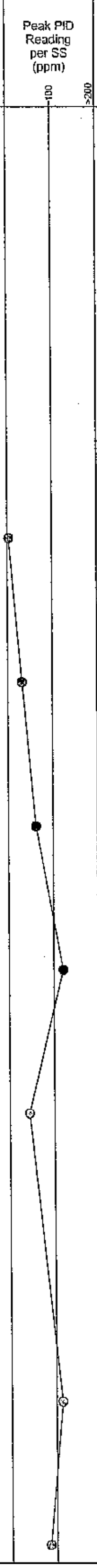
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0		0.0 - 5.0 Dry brown sand and gravel FILL, some brick and concrete fragments, wood and metal debris. Borehole advanced to 5 ft bgs via "soft dig" techniques.	FILL	14.0 5.0
5	15	5.0 - 8.0 Damp black stained medium-fine SAND, some silt, little to trace subangular coarse gravel and rounded gravel. Slight HC odor.	FILL	11.0 8.0
		8.0 - 9.0 Damp light brown medium-fine SAND, some to little coarse gravel. Slight HC odor.	SP	10.0 9.0
10	10	9.0 - 16.0 Moist gray to grayish brown black stained medium-fine SAND, little to trace silt and fine rounded gravel, trace coarse gravel. Slight to moderate HC odor.	SP	3.0 16.0
15	5	16.0 - 19.0 Moist black (intermittent streaking) well graded coarse-fine SAND, little coarse subangular gravel. Moderate to strong HC odor.	SW	-0.1 19.0
	0	19.0 - 19.5 Oil wet black medium-fine SAND, some to little silt, little fine rounded gravel and cobbles. Stong HC odor.	SP-SM	-0.6 19.5
20			SWG	

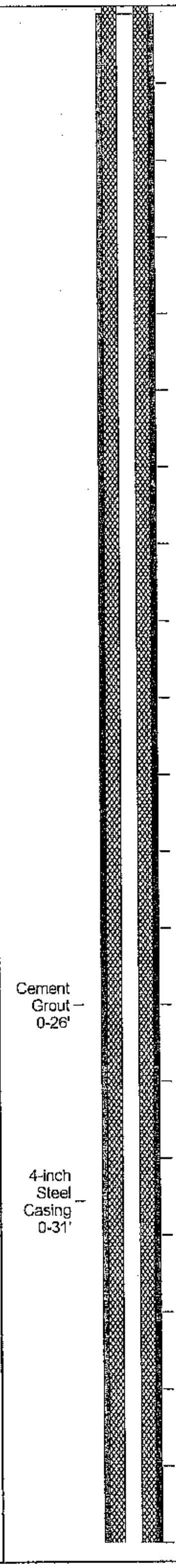
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	4 5 4 5	1.2 / 2.0	0.9 1.2 3.4	GAGW-06I0107 6/28/2004
SS	5 8 14 10	1.2 / 2.0	32 4 9	GAGW-06I0309 6/28/2004
SS	7 3 4 3	1.3 / 2.0	62 27 39	
SS	3 3 6 8	1.2 / 2.0	52 121 70	GAGW-06I0412 6/28/2004
SS	35 7 9 9	1.4 / 2.0	36 44 28	GAGW-06I0514 6/28/2004
SS	9 8 11 13	0.0 / 2.0	N/A N/A N/A	
SS	5 10 10 12	0.1 / 2.0	114	GAGW-06I0819 6/28/2004
SS	10 7 6 7	1.4 / 2.0	86 63 62	GAGW-06I0720 6/28/2004



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-31ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 31-41 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 28-51 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 26-28 ft bgs
Type: #00 Sand
Quantity 1x50 lb

ANNULUS SEAL
Interval: 0-26 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-06I

SHEET 2 of 3

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 51.0 ft
AZIMUTH: N/A
LOCATION: Quant Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/28/04
DATE COMPLETED: 6/29/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,765.7 E: 1,001,723.9
GS ELEVATION: 19.0 ft
TOC ELEVATION: 21.9 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

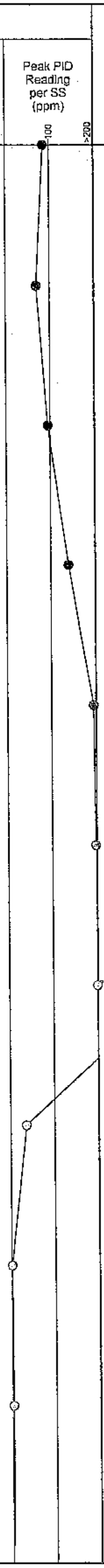
SOIL PROFILE

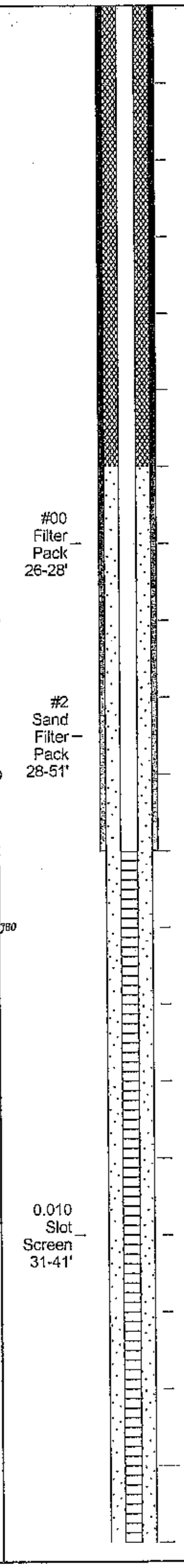
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
19.5 - 27.0 Oil saturated, grayish brown, well graded, coarse-fine SAND, some coarse rounded and subangular gravel, trace fine rounded gravel. Strong HC odor. *(Continued)*	SWG	-8.1 27.0
27.0 - 29.0 Oil saturated, grayish brown with black staining, sorted, medium-fine SAND, trace fine gravel. Strong HC odor	SP	-10.1 29.0
29.0 - 31.0 Oil saturated, dark grayish brown, grading coarse-fine SAND, some coarse-fine subangular gravel. Strong HC odor.	SWG	-12.1 31.0
31.0 - 32.0 Oil saturated, dark grayish brown, sorted medium-fine SAND, trace fine gravel. Strong HC odor.	SP	-13.1 32.0
32.0 - 33.0 H2O/Oil saturated, light grayish brown, sorted medium-fine SAND. Strong HC odor	SP	-14.1 33.0
33.0 - 33.5 H2O/Oil saturated, orange brown, well sorted coarse SAND, trace fine gravel.	SP	-14.6 33.5
33.5 - 43.0 Saturated, grayish brown, sorted, medium-fine SAND, tace mica (Muscovite) and trace fine subangular gravel. Very slight to no HC odor.	SP	

DEPTH (ft): 20, 25, 30, 35, 40
ELEVATION (ft): -5, -10, -15, -20

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	10 7 6 7	1.4/2.0	86 63 62			
SS	8 6 4 8	1.1/2.0	50 64 70	☒	GAGW-06I0823 6/28/2004	
SS	6 7 8 6	0.9/2.0	70 95			
SS	14 15 12 11	1.5/2.0	80 110 140	☒	GAGW-06I1027 6/28/2004	
SS	9 12 13 10	0.1/2.0	195 170			
SS	7 10 12 18	1.4/2.0	65 198 190	☒	GAGW-06I1231 6/28/2004	
SS	6 9 12 15	1.6/2.0	120 307 380	☒	GAGW-06I1333 6/28/2004	
SS	3 9 13 13	2.0/2.0	35 36 20	☒	GAGW-06I1434 6/28/2004	
SS	5 9 7 9	1.3/2.0	0.9 1.4			
SS	7 9 12 12	1.0/2.0	2.0 2.5	☒	GAGW-06I1539 6/30/2004	
SS	14 25 31 24	0.0/2.0	N/A N/A			





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-31ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 31-41 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 28-51 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 26-28 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-26 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-06I

SHEET 3 of 3

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 51.0 ft
AZIMUTH: N/A
LOCATION: Quant Property

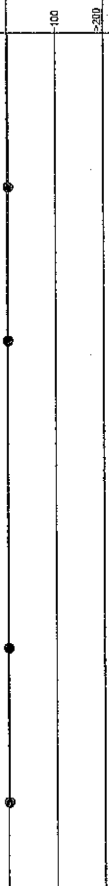
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/28/04
DATE COMPLETED: 6/29/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,765.7 E: 1,001,723.9
GS ELEVATION: 19.0 ft
TOC ELEVATION: 21.9 ft
TEMPERATURE: 80-85 F

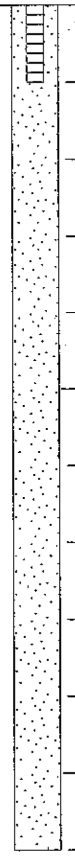
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES						
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
40		33.5 - 43.0 Saturated, grayish brown, sorted, medium-fine SAND, tace mica (Muscovite) and trace fine subangular gravel. Very slight to no HC odor. *(Continued)*	SP			SS	14 25 31 24	0.0/2.0	N/A N/A			
					-24.1	SS	27 18 24 22	0.6/2.0	3.2			
	-25	43.0 - 46.0 Saturated, grayish brown, well graded coarse-fine SAND, trace coarse-fine gravel and mica (Muscovite). No odor.	SW		43.0	SS	24 28 34 32	0.6/2.0	2.1			
45					-27.1	SS	48 50/.3 N/A N/A	0.0/2.0	N/A N/A			
		46.0 - 48.0 Saturated, grayish brown, sorted, medium-fine SAND, trace fine gravel. Very slight HC odor.	SP		46.0 -29.1	SS	15 22 12 20	1.4/2.0	1.8 0.9 0.7			
50	-30	48.0 - 51.0 Saturated, grayish brown, well graded coarse-fine SAND, little medium-fine gravel. Very slight HC odor.	SW		48.0 -32.1	SS	12 11 14 14	1.6/2.0	2.0 0.7 0.6			
		Boring completed at 51.0 ft										
55	-35											
60	-40											

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-31ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 31-41 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 28-51 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 26-28 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-26 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-07

SHEET 1 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/21/04
DATE COMPLETED: 6/27/04
WEATHER: Sun Lt. Breeze

DATUM: Local
COORDS: N: 206,130.0 E: 1,001,814.7
GS ELEVATION: 22.4 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

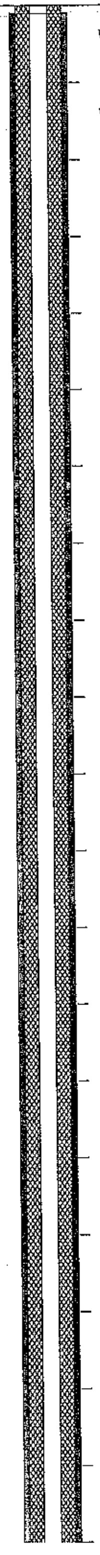
DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	DEPTH (ft)
0.0 - 0.5 Asphalt	ASPHA		21.9	0.5
0.5 - 9.5 Dry, dark brown to black, coarse to fine sand and gravel FILL, little to trace silt, brick fragments and wood debris. No odor.	FILL		12.9	9.5
9.5 - 11.7 Oil moist, dark reddish brown, loose, well graded, coarse-fine SAND, trace medium gravel. Strong LHC odor.	SW		10.7	
11.7 - 12.0 Moist, gray, soft to firm, SILT.	ML		10.4	12.0
12.0 - 15.0 Oil moist, dark reddish brown, loose, well graded, coarse-fine SAND, trace medium gravel. Strong LHC odor.	SW		7.4	15.0
15.0 - 17.0 Oil moist, grayish brown, sorted meduim-fine SAND, trace coarse sand and fine gravel. Strong LHC odor	SP		5.4	17.0
17.0 - 19.5 Oil wet/saturated, reddish gray brown, sorted, medium-fine SAND, trace fine subangular gravel. Coarsing with depth. Strong LHC odor.	SP		2.9	19.5
	SP-SM			

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
SS	3 4 4 7	1.5 / 2.0	35 66				
				☒	GAGW-070107 6/21/2004		
SS	8 8 5 7	0.6 / 2.0	4.1				
SS	6 5 5 8	1.4 / 2.0	770 900				900
				☒	GAGW-070211 6/21/2004		
SS	13 12 8 13	0.6 / 2.0	892				892
SS	3 6 6 10	1.0 / 2.0	720 1,020				1020
				☒	GAGW-070415 6/21/2004		
				☒	GAGW-070516 6/21/2004		
SS	2 6 7 12	1.0 / 2.0	2,300 1,700				300
SS	6 10 14 14	1.3 / 2.0	1,050 700				050
				☒	GAGW-070616 6/21/2004		
SS	2 6 9 9	1.5 / 2.0	650 500				650

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 60-73 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 58-60 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-58 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-07

SHEET 2 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/21/04
DATE COMPLETED: 6/27/04
WEATHER: Sun Lt. Breeze

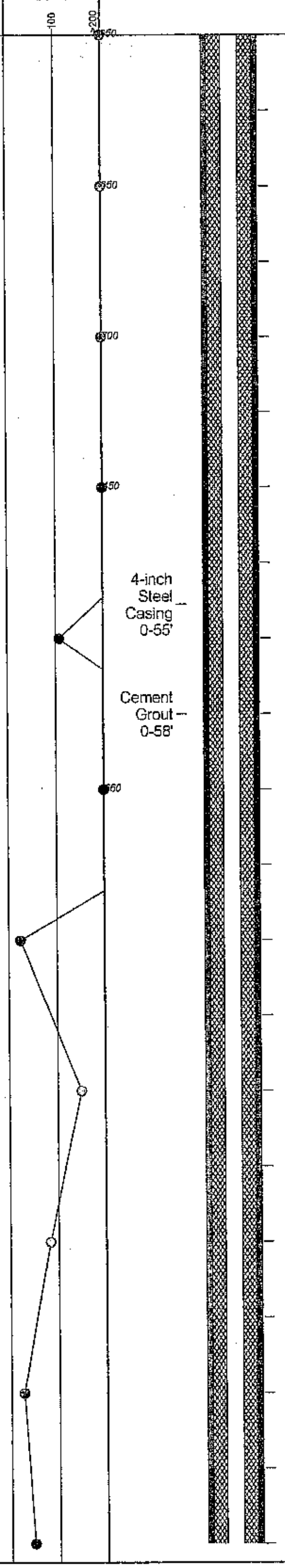
DATUM: Local
COORDS: N: 206,130.0 E: 1,001,814.7
GS ELEVATION: 22.4 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE			SAMPLES						
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		19.5 - 24.0 Oil moist, gray, soft to firm, SILT and very fine-fine SAND. Coarsens with depth. Moderate to slight odor. *(Continued)*	SP-SM		SS	2 6 9 9	1.5/2.0	650 500			
	0				SS	9 9 11 11	1.0/2.0	650 450	☒	GAGW-070721 6/21/2004	
		24.0 - 33.0 H2O saturated, grayish brown, compact, well graded, coarse to fine SAND, trace fine gravel. Slight odor.	SW	-1.6 24.0	SS	4 9 17 22	1.9/2.0	700 250 450	☒	GAGW-070823 6/21/2004	
25					SS	6 11 20 23	2.0/2.0	450 200 120	☒	GAGW-071026 6/21/2004	
	-5				SS	7 15 18 21	1.8/2.0	108 41 33			
30					SS	9 14 24 22	2.0/2.0	560 33 47			
	-10				SS	3 4 14 15	2.0/2.0	22 18 24	☒	GAGW-071231 6/21/2004	
		33.0 - 39.0 Saturated, grayish brown, well graded, coarse-fine SAND, some to little coarse rounded gravel, trace mica (Muscovite). Slight to no odor.	SWG	-10.6 33.0	SS	6 11 11 11	1.5/2.0	150 24 24	☒	GAGW-071333 6/21/2004	
35					SS	11 15 17 19	1.8/2.0	83 22 18			
	-15				SS	18 37 30 34	1.6/2.0	26 25 10			
40			SWG	-16.6 39.0	SS	21 29 29 34	2.0/2.0	48 10 8			

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 60-73 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 58-60 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-58 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-07

SHEET 3 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/21/04
DATE COMPLETED: 6/27/04
WEATHER: Sun Lt. Breeze

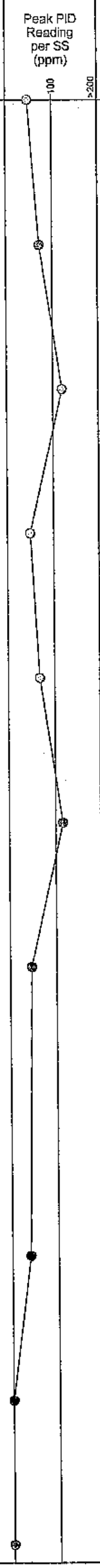
DATUM: Local
COORDS: N: 206,130.0 E: 1,001,814.7
GS ELEVATION: 22.4 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

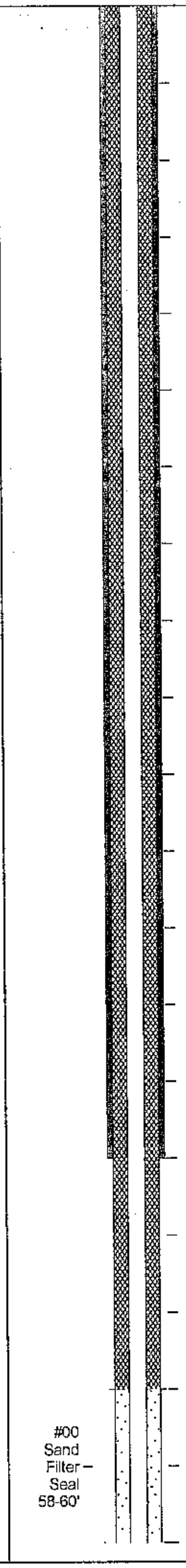
SOIL PROFILE / SAMPLES

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
40		39.0 - 57.0 Saturated, grayish brown, well graded, coarse-fine SAND and coarse rounded GRAVEL, little fine gravel. Slight to no odor. *(Continued)*	SWG	-34.6 57.0
45	-20			
50	-25			
55	-30			
	-35	57.0 - 59.0 Saturated, grayish yellow brown, well graded, coars to fine SAND, trace fine gravel. No odor.	SW	-36.6 59.0
60		59.0 - 63.0 Saturated, light brown, graded, coarse to fine SAND, some to little coarse-fine rounded gravel. No odor.	SWG	

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses
SS	21 29 29 34	2.0/2.0	48 10 8			
SS	23 32 22 27	2.0/2.0	73 12 13			
SS	16 16 18 21	1.8/2.0	120 15 19			
SS	15 25 27 32	1.4/2.0	50 25 22			
SS	10 15 22 28	2.0/2.0	69 7 21			
SS	10 19 30 34	1.5/2.0	116 13 2			
SS	9 13 13 14	0.5/2.0	47			
SS	7 11 18 22	0.0/2.0	N/A N/A N/A			
SS	5 10 14 18	1.3/2.0	40 10 6			
SS	13 7 10 9	0.8/2.0	0.7			
SS	10 10 12 17	1.0/2.0	0.4 0.0			



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 60-73 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 58-60 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-58 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAGW-07

SHEET 4 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 75.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

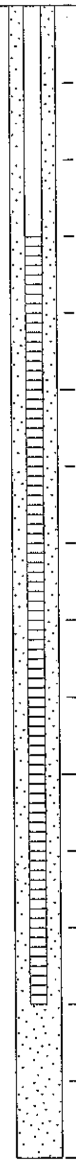
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/21/04
DATE COMPLETED: 6/27/04
WEATHER: Sun Lt. Breeze

DATUM: Local
COORDS: N: 206,130.0 E: 1,001,814.7
GS ELEVATION: 22.4 ft
TOC ELEVATION: 22.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES
60		59.0 - 63.0 Saturated, light brown, graded, coarse to fine SAND, some to little coarse-fine rounded gravel. No odor. *(Continued)*	SWG	-40.6 63.0	SS	10 10 12 17	1.0/2.0	0.4 0.0					#1 Sand Filter Pack 60-73'
	-40				SS	12 10 15 15	0.1/2.0	0.2 0.3					
		63.0 - 65.0 Saturated, light reddish brown, sorted medium-fine SAND, little to trace rounded fine gravel. No odor.	SP	-42.6 65.0	SS	13 21 19 22	1.2/2.0	0.4 0.3					
65		65.0 - 66.5 Saturated, light reddish brown, sorted coarse-medium SAND, little rounded fine gravel. No odor.	SP	-44.1 66.5	SS	34 35 25 16	0.1/2.0	0.3 0.3					
		66.5 - 67.0 Orange brown, medium-fine SAND, little subangular coarse-fine gravel.	SP	-44.6 67.0									
	-45	67.0 - 73.0 Saturated, light reddish brown, well graded coarse-fine SAND, some rounded coarse-fine gravel. No odor.	SWG	-50.6 73.0	SS	23 17 17 25	0.5/2.0	N/A N/A N/A					0.020 Slot Screen 63-73'
70					SS	18 45 48 42	1.0/2.0	0.0 0.3					
	-50				SS	28 28 40 30	1.4/2.0	0.0 0.1					
		73.0 - 75.0 Saturated, reddish yellow brown, well graded coarse-fine SAND, some to little coarse-fine gravel	SWG	-52.6	SS	21 24 20 18	1.2/2.0	0.0 0.0					
75		Boring completed at 75.0 ft											
	-55												
80													

Peak PID Reading scale: 100 >200



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-63 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 63-73 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 60-73 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 58-60 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-58 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-08

SHEET 1 of 4

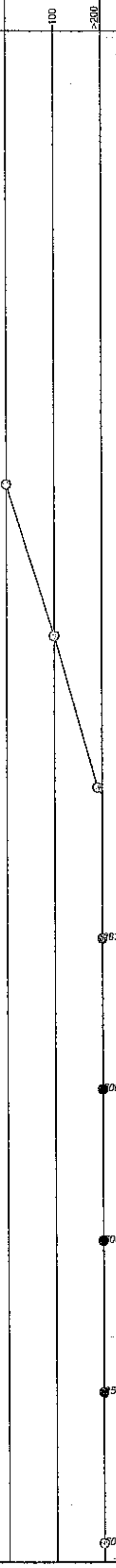
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 74.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/17/04
DATE COMPLETED: 6/23/04
WEATHER: M.Sun/Calm/Humid

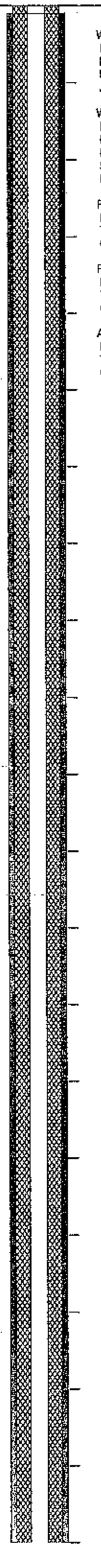
DATUM: Local
COORDS: N: 206,052.6 E: 1,001,738.5
GS ELEVATION: 19.2 ft
TOC ELEVATION: 19.2 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE			SAMPLES				
DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
0.0 - 0.5 Asphalt	ASPHA						
0.5 - 5.0 Moist, gray and orange brown, coarse-fine sand and gravel FILL, some cobble fragments and debris, trace silt. Borehole advanced to 5 ft bgs via "soft dig" techniques.	FILL	18.7 0.5					
5.0 - 7.0 Moist, brown, medium-fine sand and fine gravel FILL.	FILL	14.2 5.0	SS	8 50/3	0.6/2.0	0.0	GAGW-080107 6/17/2004
7.0 - 9.0 Moist, reddish brown, sorted, medium-fine SAND (intermittent black staining), trace fine gravel. Slight to moderate odor.	SP	12.2 7.0	SS	3 3 6 8	1.7/2.0	100 76 66	GAGW-080208 6/17/2004
9.0 - 13.0 Moist, olive gray to reddish gray brown, sorted, medium-fine SAND (intermittent black staining), trace fine gravel. Slight to moderate LHC odor.	SP	10.2 9.0	SS	3 3 9 12	1.6/2.0	150 140 190	GAGW-080311 6/17/2004
			SS	3 9 10 13	1.6/2.0	350 383 200	GAGW-080412 6/17/2004
13.0 - 17.0 Oil moist-wet, reddish brown, graded, medium-fine to coarse-fine, SAND (intermittent black staining). Coarsing with depth. Strong LHC odor.	SW	6.2 13.0	SS	4 8 12 13	1.7/2.0	470 650 700	GAGW-080515 6/17/2004
			SS	6 12 14 15	1.2/2.0	700 700	GAGW-080616 6/17/2004
17.0 - 23.0 Oil saturated, Gray to Gray brown poorly sorted compact to dense CF SAND, traces mf gravel (moderate to strong HC odor)	SW	2.2 17.0	SS	5 8 12 14	1.7/2.0	350 300 280	GAGW-080717 6/17/2004
			SS	6 14 24 26	2.0/2.0	390 350 500	



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-62 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 62-72 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 59-62 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 57-59 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-57 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAGW-08

SHEET 2 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 74.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/17/04
DATE COMPLETED: 6/23/04
WEATHER: M.Sun/Calm/Humid

DATUM: Local
COORDS: N: 206,052.6 E: 1,001,738.5
GS ELEVATION: 19.2 ft
TOC ELEVATION: 19.2 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)
20	
	-5
25	
	-10
30	
	-15
35	
	-20
40	

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
17.0 - 23.0 Oil saturated, Gray to Gray brown poorly sorted compact to dense CF SAND, traces mf gravel (moderate to strong HC odor) *(Continued)*	SW	-3.8 23.0
23.0 - 27.0 Water saturated, Gray brown poorly sorted compact CF SAND, trace fine to medium gravel	SP	-7.8 27.0
27.0 - 37.0 Water saturated, gray to reddish brown compact MF SAND, traces coarse to fine gravel (slight to no odor)	SP	-17.8 37.0
37.0 - 45.0 Water saturated, gray brown compact CF SAND and MC GRAVEL, some cobbles, (slight to no odor)	SW	

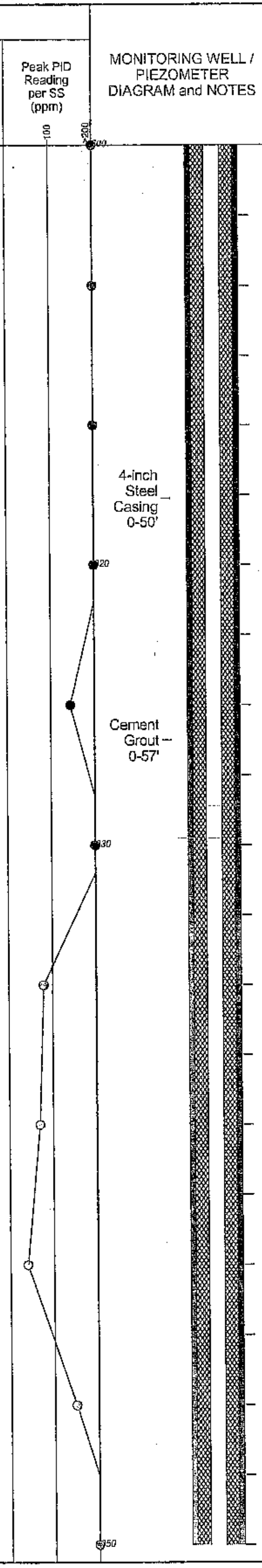
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
SS	6 14 24 26	2.0/2.0	390 350 500	GAGW-080821 6/17/2004	
SS	8 19 22 17	1.2/2.0	200 150	GAGW-080922 6/17/2004	
SS	8 12 17 21	1.7/2.0	170 200 190	GAGW-081024 6/17/2004	
SS	3 12 20 26	2.0/2.0	220 170 150	GAGW-081126 6/17/2004	
SS	N/A N/A N/A N/A	1.2/2.0	145	GAGW-081228 6/17/2004	
SS	7 12 16 22	1.4/2.0	190 230	GAGW-081331 6/17/2004	
SS	6 11 13 17	1.4/2.0	80 40		
SS	10 12 19 30	1.4/2.0	70 50	GAGW-081534 6/17/2004	
SS	32 15 19 15	1.0/2.0	40		
SS	13 22 30 35	1.1/2.0	150 20		
SS	13 8 12 11	1.0/2.0	250 25 10	GAGW-081840 6/17/2004	

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-62 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 62-72 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 59-62 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 57-59 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-57 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-08

SHEET 3 of 4

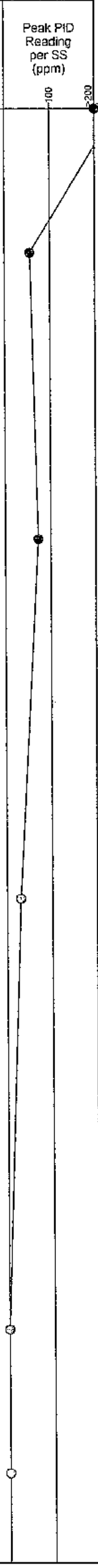
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 74.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

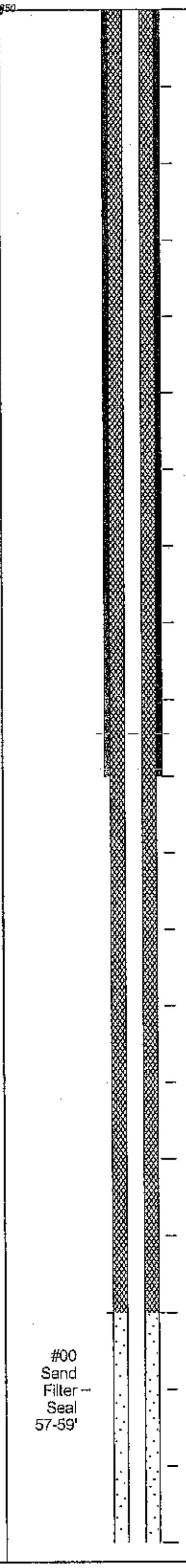
DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/17/04
DATE COMPLETED: 6/23/04
WEATHER: M.Sun/Calm/Humid

DATUM: Local
COORDS: N: 206,052.6 E: 1,001,738.5
GS ELEVATION: 19.2 ft
TOC ELEVATION: 19.2 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
40		37.0 - 45.0 Water saturated, gray brown compact CF SAND and MC GRAVEL, some cobbles, (slight to no odor) *(Continued)*	SW		SS	13 8 12 11	1.0 2.0	250 25 10			
					SS	11 11 12 12	0.8 2.0	49 56			
	-25			-25.8 45.0	SS	6 10 12 12	0.0 2.0	N/A N/A N/A			
45		45.0 - 52.0 Water saturated, gray brown compact to dense poorly sorted CF SAND, little fine to medium rounded gravel (no odor)	SP		SS	5 7 8 9	1.8 2.0	73 5 3	☒	GAGW-082046 6/17/2004	
					SS	10 10 11 15	0.1 1.0	N/A N/A N/A			
	-30				SS	N/A N/A N/A N/A	0.0 2.0	N/A N/A N/A			
50				-32.8 52.0	SS	5 9 17 23	1.2 2.0	30 28	☒	GAGW-082151 6/17/2004	
		52.0 - 74.0 Water saturated, Yellow brown to orange brown poorly sorted, compact to dense, CF SAND and CF GRAVEL, (no odor)	SP		SS	2 2 4 15	0.8 2.0	N/A N/A N/A			
55	-35				SS	16 20 20 22	1.5 2.0	N/A N/A N/A			
					SS	36 27 30 36	1.8 2.0	0.2 0.0 0.0			
	-40				SS	20 25 36 45	2.0 2.0	0.0 0.0 0.0			
60											





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-62 ft bgs
Material: Sch 40 PVC
Diameter: 2 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 62-72 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 59-62 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 57-59 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-57 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAGW-08

SHEET 4 of 4

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 74.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: HSA/Mud Rotary
DRILL RIG: Mobile B-58
DATE STARTED: 6/17/04
DATE COMPLETED: 6/23/04
WEATHER: M.Sun/Calm/Humid

DATUM: Local
COORDS: N: 206,052.6 E: 1,001,738.5
GS ELEVATION: 19.2 ft
TOC ELEVATION: 19.2 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

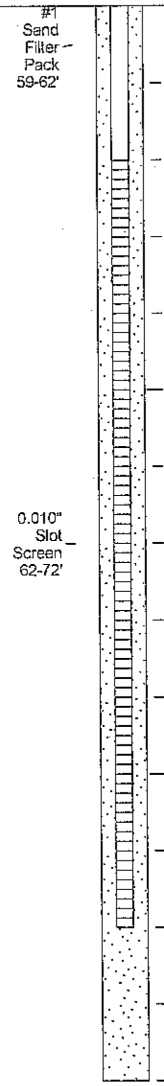
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. DEPTH (ft)
60		52.0 - 74.0 Water saturated, Yellow brown to orange brown poorly sorted, compact to dense, CF SAND and CF GRAVEL, (no odor) *(Continued)*	SP	
	-45			
65				
	-50			
70				
		Boring completed at 74.0 ft		-54.8
	-55			
75				
	-60			
80				

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
SS	13 21 18 16	2.0 / 2.0	N/A N/A N/A				
SS	4 10 8 8	1.0 / 2.0	N/A N/A N/A				
SS	3 4 8 9	0.1 / 2.0	N/A N/A N/A				
SS	6 11 27 25	1.5 / 2.0	N/A N/A N/A				
SS	5 11 19 32	1.6 / 2.0	N/A N/A N/A				
SS	12 16 19 21	2.0 / 2.0	N/A N/A N/A				
SS	26 50/0.3	1.0 / 2.0	N/A N/A N/A				

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-62 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 62-72 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 59-62 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 57-59 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-57 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-01

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/21/03
DATE COMPLETED: 10/21/03
WEATHER: P. Cloudy Lt. Breeze

DATUM: Local
COORDS: N: 205,974.1 E: 1,001,718.0
GS ELEVATION: 20.3 ft
TOC ELEVATION: 23.1 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

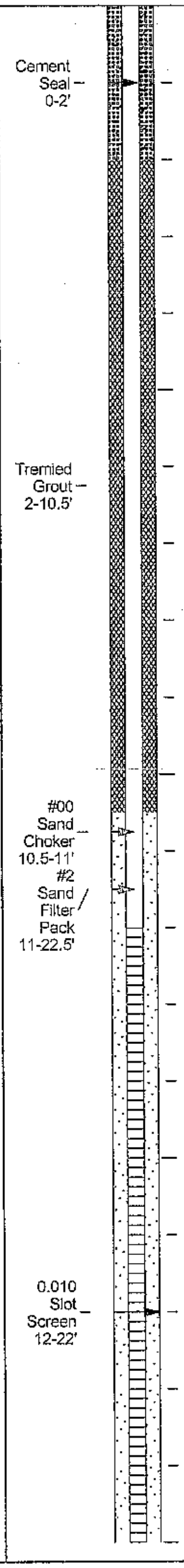
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
1.5 - 2.0 dry, compact, olive gray CONCRETE AND DEBRIS frags (>3" size) with olive gray to black fine to very fine sand; No HC odor	FILL	18.3
2.5 - 3.0 wet, black (n1) to olive black, fine to very fine silty SAND AND medium GRAVEL, trace wood debris and plastic debris; Moderate HC odor	FILL	17.3
3.5 - 5.0 wet, black (n1), well graded, angular, medium to coarse SAND AND GRAVEL; strong HC odor	FILL	15.3 5.0
5.0 - 6.0 moist to wet, black(n1), poorly sorted, silty sand to coarse sand layered in ~3" intervals with poorly sorted, angular, coarse SAND AND trace gravel; Strong HC odor	FILL	14.3 6.0
6.0 - 7.0 dry, compact, poorly sorted, highly angular, brownish gray to olive gray, fine SAND AND coarse GRAVEL and crushed concrete debris; Moderate HC odor	FILL	13.3 7.0
7.0 - 10.0 oil wet to moist, black (n1), poorly sorted, highly angular, fine SAND AND coarse GRAVEL, and crushed concrete debris; Moderate to heavy HC odor	FILL	10.3 10.0
10.0 - 13.0 damp to moist, loose to moderately compact, well graded, olive gray to olive black, medium SAND and trace medium gravel; Moderate HC odor	SW	7.3 13.0
13.0 - 14.0 damp to moist, well graded, dark gray to grayish black, fine SAND to medium sand; Strong to moderate HC odor	SW	6.3 14.0
14.0 - 15.0 damp to moist, loose to moderately compact, well graded, olive gray to olive black medium SAND and trace medium gravel; Moderate to strong HC odor	SW	5.3 15.0
15.0 - 18.0 oil wet, subangular, well graded, black (n1), medium to coarse SAND AND fine GRAVEL with some coarse gravel; Moderate HC odor	SWG	2.3 18.0
18.0 - 20.0 oil wet, well graded, black (n1) to grayish black, medium SAND with some coarse gravel; Moderate HC odor	SW	0.3

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
GRAB		0.5	0	
GRAB		0.5	4.1	
GRAB		0.5	86.2	SBGAL010204 10/14/2003 12:40:00 PM
GRAB		0.5	89.4	
SS	15 6 6 10	1.8/2.0	121 48 27	SBGAL010306 10/17/2003 2:30:00 PM
SS	5 3 2 6	0.8/2.0	12	SBGAL010408 10/20/2003 8:30:00 AM
SS	2 4 15 16	0.8/2.0	69.1	SBGAL012010 10/17/2003 8:35:00 AM
SS	13 34 26 24	1.5/2.0	59.8 154 142	SBGAL010512 10/21/2003 8:45:00 AM
SS	17 30 47 55	0.9/2.0	143 104	SBGAL012114 10/17/2003 9:00:00 AM
SS	24 87 80 75	0.0/1.0		
SS	57 48 46 46	1.7/2.0	29 78.4 82.2	SBGAL010618 10/21/2003 9:45:00 AM
SS	36 24 32 28	1.8/2.0	85.4 107.0 92.1	SBGAL012220 10/17/2003 10:10:00 AM

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-12 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 12-22 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 11-22 ft bgs
Type: #2 Sand
Quantity: 4x50 lb

FILTER PACK SEAL
Interval: 10.5-11 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-10.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

QUANTA SOIL BOR QUANTA18NOV04.GPJ QUANTA.GDT 1/20/05

RECORD OF BOREHOLE GAL-01

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

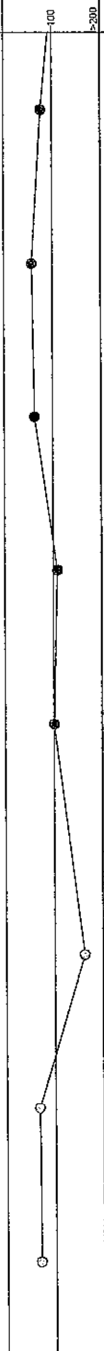
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/21/03
DATE COMPLETED: 10/21/03
WEATHER: P. Cloudy Lt. Breeze

DATUM: Local
COORDS: N: 205,974.1 E: 1,001,718.0
GS ELEVATION: 20.3 ft
TOC ELEVATION: 23.1 ft
TEMPERATURE: 50-55 F

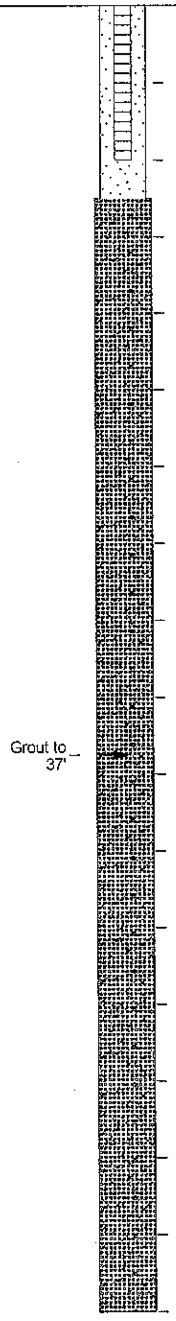
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20	0	20.0 - 22.0 oil wet, well sorted, black (n1) to grayish black, medium SAND with some coarse gravel (>3"); Moderate HC odor	SP		20.0 -1.7	SS	46 69 60 42	0.8/2.0	77.3		SBGAL012322 10/17/2003 10:45:00 AM	
		22.0 - 24.0 saturated to oil wet, well sorted, black (n1), medium SAND and trace medium gravel; Strong HC odor	SP		22.0 -3.7	SS	8 16 23 28	1.5/2.0	58 51.6 38.1		SBGAL010723 10/21/2003 11:05:00 AM	
25	-5	24.0 - 33.0 (same as above) Strong burnt HC odor			24.0	SS	18 16 16 19	2.0/2.0	38 57.9 63.4		SBGAL012425 10/17/2003 11:30:00 AM	
						SS	22 30 30 64	2.0/2.0	28 48.6 109		SBGAL010828 10/21/2003 11:50:00 AM	
			SP			SS	5 17 30 35	1.8/2.0	101 70.2 29.9		SBGAL012530 10/17/2003 12:55:00 PM	
30	-10											
					-12.7	SS	14 29 25 31	2.0/2.0	121 94.9 162		SBGAL010933 10/21/2003 1:55:00 PM	
		33.0 - 37.0 (same as above), olive black to olive gray			33.0	SS	2 8 15 16	1.2/2.0	62 68.0			
35	-15		SP		-16.7	SS	10 8 14 24	2.0/2.0	60.3 60.1 69.8		SBGAL011037 10/21/2003 3:00:00 PM	
40		Boring completed at 40.0 ft			37.0							

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-12 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 12-22 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 11-22 ft bgs
Type: #2 Sand
Quantity: 4x50 lb

FILTER PACK SEAL
Interval: 10.5-11 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-10.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-01R

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 28.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 7/13/04
DATE COMPLETED: 7/13/04
WEATHER: Rain

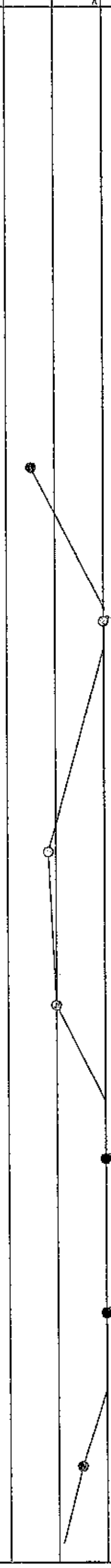
DATUM: Local
COORDS: N: 205,978.8 E: 1,001,723.3
GS ELEVATION: 20.4 ft
TOC ELEVATION: 23.4 ft
TEMPERATURE: 70-75 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

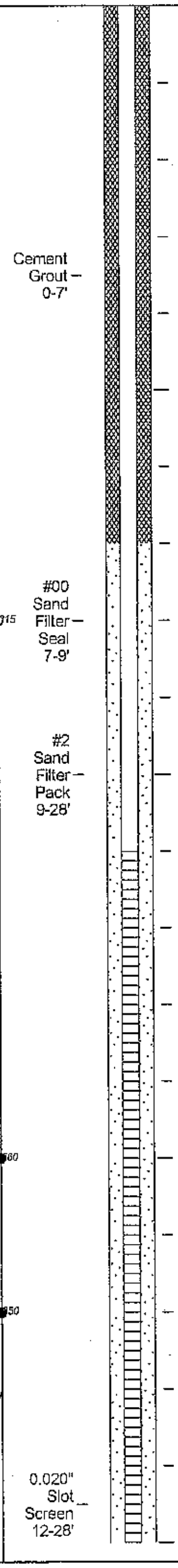
DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
0	20	0.0 - 5.0 Dry, compact, olive gray CONCRETE AND DEBRIS frags (>3" size) with olive gray to black fine to very fine sand; No HC odor	FILL	15.4 5.0					
5	15	5.0 - 7.0 Moist to wet, black, compact, poorly sorted, silty medium-fine SAND, little subangular coarse gravel (strong HC odor)	SP-SM	13.4 7.0	SS	8 13 15 12	0.4 / 2.0	52.1	GAL-01R0106 7/13/2004
		7.0 - 10.0 Oil wet loose black silty medium-fine SAND and fine to coarse subangular Gravel (strong-heavy HC odor)	GW-GM	10.4 10.0	SS	6 3 3 4	1.3 / 2.0	178 215	GAL-01R0209 7/13/2004
10	10	10.0 - 12.0 Damp to moist red brown compact medium-fine SAND, trace rounded fine gravel with some very coarse (>3" dia) cobbles. Intermittent black staining (strong HC odor)	SP	8.4 12.0	SS	8 9 11 11	1.3 / 2.0	75 85	GAL-01R0311 7/13/2004
		12.0 - 14.0 Damp to moist, well graded, dark gray to grayish black, fine SAND to medium sand. Strong to moderate HC odor	SW	6.4 14.0	SS	9 12 13 14	1.5 / 2.0	100 98	
15	5	14.0 - 16.0 Damp to moist, loose to moderately compact, well graded, olive gray to olive black medium SAND, trace medium gravel. Moderate to strong HC odor	SP	4.4 16.0	SS	12 16 15 12	1.4 / 2.0	185 260	GAL-01R0414 7/13/2004 GAL-01R0516 7/13/2004
		16.0 - 18.0 Oil wet, grayish brown, compact, sorted, medium-fine SAND, trace rounded fine gravel (Strong HC odor)	SP	2.4 18.0	SS	5 7 15 15	1.7 / 2.0	180 250	GAL-01R0618 7/13/2004
20		18.0 - 22.0 Oil wet, well graded, black (n1) to grayish black, medium SAND with some coarse gravel, trace fine rounded gravel; Moderate HC odor	SPG		SS	8 10 17 18	1.4 / 2.0	110 150	

Log continued on next page

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-28 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-01R

SHEET 2 of 2

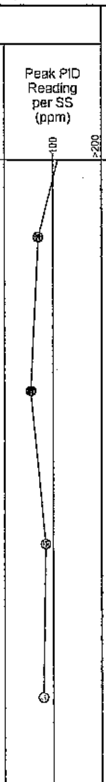
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 28.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 7/13/04
DATE COMPLETED: 7/13/04
WEATHER: Rain

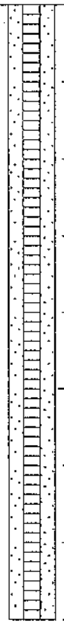
DATUM: Local
COORDS: N: 205,978.8 E: 1,001,723.3
GS ELEVATION: 20.4 ft
TOC ELEVATION: 23.4 ft
TEMPERATURE: 70-75 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
20	0	18.0 - 22.0 Oil wet, well graded, black (n1) to grayish black, medium SAND with some coarse gravel, trace fine rounded gravel; Moderate HC odor *(Continued)*	SPG	-1.6 22.0	SS	8 13 14 16	1.5/2.0	60 70	GAL-01R0720 7/13/2004	
		22.0 - 26.0 Oil stained, saturated, well sorted, compact, medium-fine SAND, little coarse to fine rounded gravel (slight to moderate HC odor)	SP		SS	9 8 8 15.	2.0/2.0	55 53	GAL-01R0822 7/13/2004	
25	-5			-5.6 26.0	SS	7 11 16 20	2.0/2.0	71 75 85	GAL-01R0924 7/13/2004 GAL-01R1026 7/13/2004	
		26.0 - 28.0 Oil stained, well graded, dense medium-fine SAND, little rounded fine to coarse gravel (slight to moderate HC odor)	SW	-7.6	SS	10 15 20 26	2.0/2.0	65 80	GAL-01R1128 7/13/2004	
		Boring completed at 28.0 ft								
30	-10									
35	-15									
40										



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-28 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-02

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quant Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/28/03
DATE COMPLETED: 10/28/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,800.3 E: 1,001,698.5
GS ELEVATION: 18.2 ft
TOC ELEVATION: 20.2 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DESCRIPTION	USCS	DEPTH (ft)	ELEV.
0.0 - 2.0 damp, olive gray to brownish gray, loose, well graded, medium SAND AND GRAVEL with concrete frags (>3" dia); No HC odor	FILL		16.2
2.0 - 3.0 CONCRETE SLAB with wire mesh	CONCRETE	2.0	15.2
3.0 - 6.5 saturated, olive gray to grayish black, angular, well graded, fine to silty SAND AND medium GRAVEL with plastic, wire, brick debris; Moderate HC odor	FILL	3.0	11.7
6.5 - 7.0 damp, olive gray to olive black, moderately compact, well graded, angular, fine SAND AND medium GRAVEL, some brick frags (≤1" dia); Moderate HC odor	FILL	6.5	11.2
7.0 - 8.0 moist to oil wet, grayish black and brownish gray, moderately compact, well graded fine SAND and some fine gravel; Faint HC odor	SW	7.0	10.2
8.0 - 9.0 moist to wet, brownish gray and (brick colored) reddish brown and light olive gray, angular, well graded coarse GRAVEL AND medium SAND; Faint HC odor	GWS	8.0	9.2
9.0 - 10.0 moist, poorly sorted, highly angular light olive brown to olive gray with some olive black, fine SAND AND coarse GRAVEL FRAGS (>3" dia) with trace silty clay; Moderate to Faint HC odor (see note **)	SWG	9.0	8.2
10.0 - 11.0 wet, well sorted, olive black to olive gray, fine SAND and trace medium gravel; Moderate to Heavy HC odor (see note **)	SP	10.0	7.2
11.0 - 13.0 wet, black to olive gray, fine sand to silty fine SAND AND medium to coarse subrounded GRAVEL (>3" dia)	SPG	11.0	5.2
13.0 - 15.0 moist to wet, olive gray, loose to moderately compact, fine to medium SAND AND fine to coarse (>3") GRAVEL; Moderate HC odor	SPG	13.0	3.2
15.0 - 17.0 wet, olive gray, well sorted, medium SAND and some fine gravel with trace coarse sand; Moderate sweet HC odor	SP	15.0	1.2
17.0 - 18.0 wet, saturated, olive gray and moderate olive brown grains, well graded fine to coarse SAND AND fine to coarse GRAVEL; Moderate HC odor, Fining to 19 ft	SWG	17.0	0.2
18.0 - 19.0 wet, saturated, olive gray, well sorted medium SAND and trace to some fine to medium gravel; Moderate HC odor	SP	18.0	-0.8
	SP	19.0	

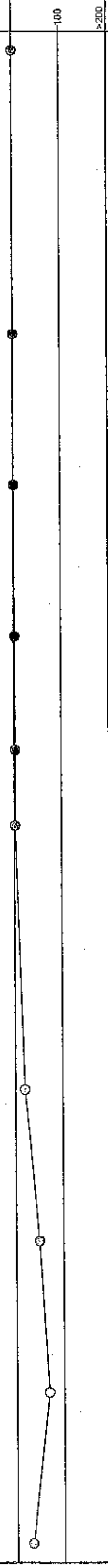
Log continued on next page

SAMPLES

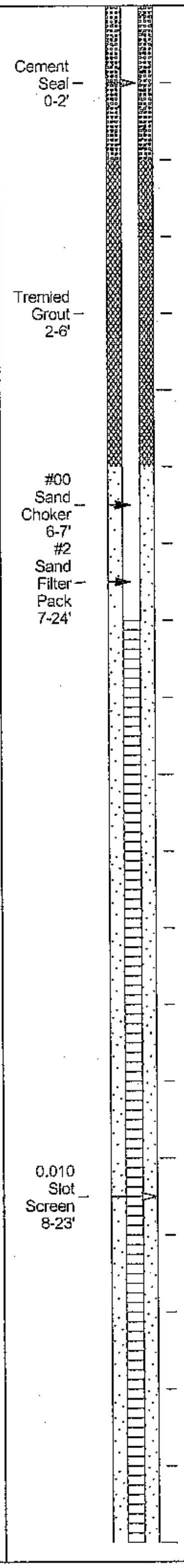
TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
GRAB		0.5	0.7	
SS	1 1 3 16	1.0 / 2.0	1.3 1.4	SBGAL020305 10/29/2003 8:30:00 AM
SS	2 2 8 15	1.0 / 2.0	1.4 1.1	SBGAL020407 10/29/2003 8:40:00 AM
SS	8 10 10 11	1.2 / 2.0	2.4 0.8	SBGAL020509 10/29/2003 9:00:00 AM
SS	30 17 17 16	0.3 / 1.0	2.8	SBGAL020611 10/29/2003 9:15:00 AM
SS	7 8 7 20	0.3 / 1.0	1.8	
SS	60/6	0.3 / 2.0		
SS	30 15 15 17	0.3 / 2.0	19.9	SBGAL020715 10/29/2003 10:10:00 AM
SS	12 12 13 13	0.8 / 2.0	46.6 46.8 49.5	SBGAL020817 10/29/2003 10:20:00 AM
SS	21 26 27 23	2.0 / 2.0	27.2 47 69.1	SBGAL020919 10/29/2003 11:00:00 AM
SS	10 11 15 20	2.0 / 2.0	30.6 33.2 30.8	

Analyses

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-6 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 8-23 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 7-24 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 6-7 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-02

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quant Property

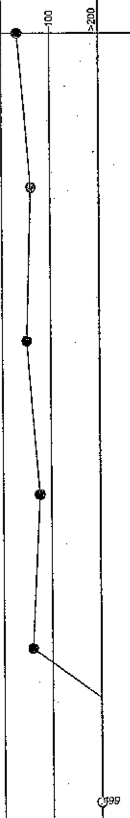
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/28/03
DATE COMPLETED: 10/28/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,800.3 E: 1,001,698.5
GS ELEVATION: 18.2 ft
TOC ELEVATION: 20.2 ft
TEMPERATURE: 40-45 F

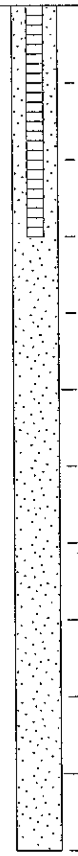
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
20		19.0 - 21.0 wet, saturated, well sorted, olive gray, medium SAND and coarse sand with trace fine gravel; 1 large (>2" dia) rock frag at 20.5 ft.; some black staining; Strong to Moderate HC odor *(Continued)*	SP	-2.8 21.0	SS	10 11 15 20	2.0/2.0	30.6 33.2 30.8	SBGAL021021 10/29/2003 11:15:00 AM	
		21.0 - 23.0 wet, loose, olive gray and olive black and brownish black, well sorted, medium SAND and some fine gravel; Moderate HC odor	SP	-4.8 23.0	SS	17 18 21 27	2.0/2.0	40.1 60.8 41.4	SBGAL021123 10/29/2003 12:20:00 PM	
	-5	23.0 - 23.5 wet, loose, olive gray, well graded, medium SAND AND medium GRAVEL; Moderate HC odor, Fining to 25 ft	SWG	-5.3 23.5	SS	31 22 20 19	2.0/2.0	19.4 20.6 50.9	SBGAL021325 10/29/2003 12:30:00 PM	
		23.5 - 25.0 wet, loose, olive gray, well sorted, medium SAND to coarse sand and some trace fine gravel; Moderate HC odor	SP	-6.8 25.0						
25		25.0 - 27.0 wet, olive gray, moderately compact, well sorted medium to coarse SAND and some to trace medium gravel; Moderate HC odor	SP	-8.8 27.0	SS	66 20 17 27	2.0/2.0	56.4 76.9	SBGAL021225 10/29/2003 12:30:00 PM SBGAL021427 10/29/2003 1:00:00 PM	
		27.0 - 27.5 wet, olive gray, well sorted, medium SAND and some coarse gravel; Moderate HC odor	SP	-9.3 27.5	SS	16 23 22 33	2.0/2.0	23.1 52.0 60.5	SBGAL021529 10/29/2003 1:25:00 PM	
	-10	27.5 - 28.0 wet, black, well sorted, fine SAND with trace fine gravel; Heavy HC odor	SP	-9.8 28.0						
		28.0 - 29.0 wet, olive gray, well sorted very fine SAND; Moderate to Light HC odor	SP	-10.8 29.0						
30		29.0 - 31.0 wet, olive gray, well sorted, medium SAND and trace medium gravel; Very Heavy HC odor	SP	-12.8 31.0	SS	16 22 27 40	2.0/2.0	129 499.0 456.0	SBGAL021631 10/29/2003 1:40:00 PM	
									(? Added from S. Mitchell Spreadsheet)	
	-15								(? Added from S. Mitchell Spreadsheet)	
35										
	-20									
40		Boring completed at 40.0 ft								

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-8 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 8-23 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 7-24 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 6-7 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-02R

SHEET 1 of 1

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 13.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/29/03
DATE COMPLETED: 10/29/03
WEATHER: Rain

DATUM: Local
COORDS: N: 205,800.3 E: 1,001,699.5
GS ELEVATION: 18.2 ft
TOC ELEVATION:
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES									
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0		0.0 - 9.0 (see GAL-02 log)													**WELL CASING** Interval: Material: Diameter: Joint Type: **WELL SCREEN** Interval: Material: Diameter: Slot Size: End Cap: **FILTER PACK** Interval: Type: Quantity: **FILTER PACK SEAL** Interval: Type: Quantity: **ANNULUS SEAL** Interval: Type: Quantity:
	15														
5															
	10														
10		9.0 - 11.0 moist, poorly sorted, highly angular light olive brown to olive gray with some olive black, fine SAND AND coarse GRAVEL FRAGS (>3" dia) with trace silty clay; Moderate to Faint HC odor (see note **)	SWG		9.2 9.0 7.2	SS	18 5 4 6	$\frac{1.8}{2.0}$	1.7 22.7 21.3						
		11.0 - 13.0 wet, black to olive gray, fine sand to silty fine SAND AND medium to coarse subrounded GRAVEL (>3" dia)	SWG		11.0 5.2	SS	8 18 18 20	$\frac{1.0}{2.0}$	3.2 14.9 16.1						
	5	Boring completed at 13.0 ft													
15															
	0														
20															

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-03

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/14/03
DATE COMPLETED: 10/15/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 205,879.1 E: 1,001,830.0
GS ELEVATION: 24.0 ft
TOC ELEVATION: 26.2 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE			SAMPLES				
DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
0.0 - 0.5 ASPHALT	ASPHA	23.5					
0.5 - 1.0 black (n1), dry, compact, angular,well graded, fine to medium SAND AND and medium GRAVEL; Light HC odor	FILL	0.5 23.0	GRAB		0.5	0.9	
1.0 - 2.0 olive gray, damp to moist, BRICKS AND fine to medium SAND; Very faint HC odor	FILL	1.0 22.0	GRAB		0.5	0	
2.0 - 3.0 (same as above); No HC odor	FILL	2.0 21.0	GRAB		0.5	0	
3.0 - 4.5 (cuttings to 5 ft.) moist to damp, angular, poorly sorted, light olive brown to moderate olive brown, silty SAND AND coarse angular GRAVEL, debris, wire, cloth, coloring black (n1) in shoe; No HC odor	FILL	3.0 19.5	SS	1 1 1 3	0.3/2.0	1.2	
4.5 - 5.0 wet, black, very coarse SAND AND (very coarse sand-sized) SLAG fragments; Well sorted below 4.5; No HC odor	FILL	4.5 19.0					
5.0 - 6.5 wet to oil wet, black (n1), poorly sorted, angular, SLAG AND silty to medium SAND, BRICK FRAGS, DEBRIS; Faint HC odor	FILL	5.0 17.5	SS	1 5 2 3	1.4/2.0	3.8 11.1	SBGAL030307 10/31/2003 12:20:00 PM
6.5 - 7.0 wet to oil wet, olive gray to olive black, well graded, silty SAND, DEBRIS, CLOTH, trace fine gravel; Moderate HC odor	FILL	6.5 17.0					
7.0 - 9.0 wet to oil wet, grayish black to olive black, angular to subangular, silty SAND and some very coarse sand with trace medium gravel, large brick frag (>3" dia) at 8.5 ft; Moderate HC odor	FILL	7.0 15.0	SS	3 1 3 10	1.2/2.0	36.3 54.1	SBGAL030409 10/31/2003 12:35:00 PM
9.0 - 9.5 (little recovery) black (n1) wet to oil wet, very fine silty SAND and some angular gravel; Moderate HC odor	FILL	9.0 14.5					
9.5 - 10.0 3 ROCK FRAGS, each approx 3" Dia, oil wet, some brick frags	FILL	9.5 14.0	SS	10 50/1	0.6/2.0	43.3	
10.0 - 12.0 oil wet to saturated, black (n1) to olive gray and brick colored, well sorted fine SAND, with some very coarse (>3" dia) cobbles and brick frags; Heavy HC (gasoline odor?)	FILL	10.0 12.0	SS	3 13 20 20	1.5/2.0	22 25.0 29.5	SBGAL030512 10/31/2003 12:55:00 PM
12.0 - 13.0 oil wet to saturated, black to grayish black, angular, poorly sorted, fine SAND AND very coarse GRAVEL, crushed brick frag (>3"dia) @ 13 ft; Moderate burnt HC odor	FILL	12.0 11.0	SS	31 30 16 16	2.0/2.0	10.5 12.0 28.0	
13.0 - 14.5 moist, olive gray to light olive gray, well graded, medium to coarse SAND AND coarse GRAVEL; Moderate burnt HC odor	SWG	13.0 9.5					SBGAL030614 11/3/2003 8:55:00 AM
14.5 - 15.0 damp to moist, olive gray to light olive gray, well sorted, medium SAND; Moderate burnt HC odor	SP	14.5 9.0	SS	37 27 12 12	2.0/2.0	4.8 13.5 32.2	SBGAL030716 11/3/2003 9:10:00 AM
15.0 - 18.0 damp to slightly moist, olive gray to light olive gray, well sorted, fine to medium SAND and trace fine to medium gravel, slight to moderate HC odor	SP	15.0 6.0	SS	15 16 10 11	2.0/2.0	13.6 7.4 10.4	SBGAL030818 11/3/2003 9:20:00 AM
18.0 - 20.0 (same as above); 1 large cobble (2-3" dia) at 19.5; Moderate burnt (sweet?) HC odor	SP	18.0 4.0	SS	15 12 27 20	1.9/2.0	20.4 25.3 20.5	SBGAL030920 11/3/2003 9:30:00 AM

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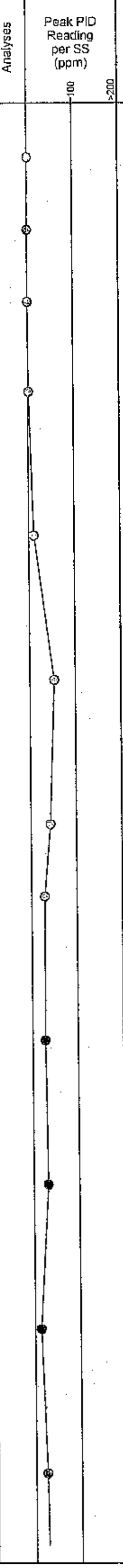
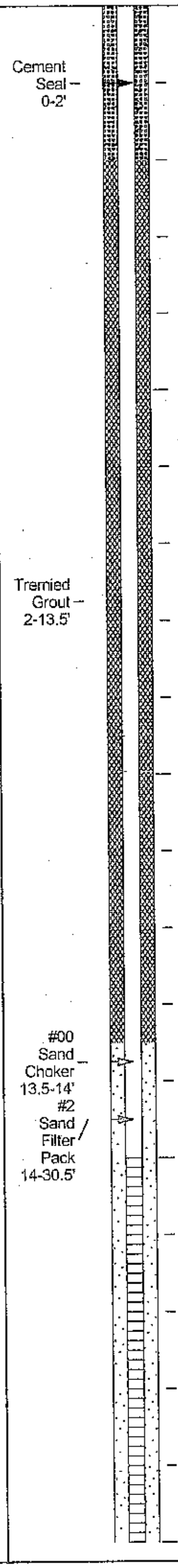


MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 14-30.5 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 13.5-14 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-13.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-03

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

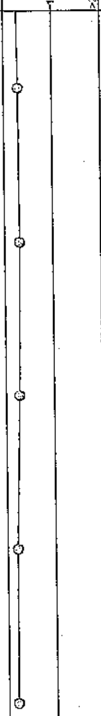
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/14/03
DATE COMPLETED: 10/15/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 205,879.1 E: 1,001,830.0
GS ELEVATION: 24.0 ft
TOC ELEVATION: 26.2 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

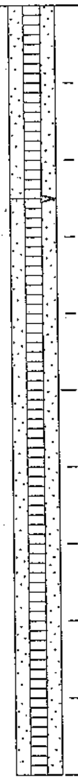
DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		20.0 - 22.0 saturated, olive gray, well sorted, medium SAND and trace medium gravel; Moderate (sweet?) HC odor, faint burnt HC odor	SP	20.0 2.0	SS	5 8 10 12	1.2/2.0	27.1 30.3	☒	SBGAL031022 11/3/2003 9:37:00 AM	
		22.0 - 26.0 saturated, olive gray to black (n1), well sorted, fine to medium SAND; Moderate (sweet?) HC odor, faint burnt HC odor	SP	22.0	SS	5 6 8 12	1.9/2.0	27.2 23.7 31.3	☒	SBGAL031124 11/3/2003 10:18:00 AM	
25	0			-2.0	SS	6 6 8 10	2.0/2.0	19 28.2 16.5	☒	SBGAL031226 11/3/2003 10:26:00 AM	
		26.0 - 28.0 saturated, light olive gray, poorly sorted, fine to coarse SAND AND fine GRAVEL, Light HC odor, very faint (sweet?) HC odor	SWG	26.0 -4.0	SS	6 12 24 20	2.0/2.0	20.8 21.4 17.3	☒	SBGAL031327 11/3/2003 10:45:00 AM	
30	-5	28.0 - 30.0 saturated, dark olive gray to olive black, well sorted fine to medium SAND, little to some fine to medium gravel; Strong burnt HC odor	SP	28.0 -6.0 30.0	SS	6 26 16 16	2.0/2.0	10.9 12.5 19.9	☒	SBGAL031430 11/3/2003 10:55:00 AM	
35	-10										
40	-15	Boring completed at 40.0 ft									

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

0.010 Slot Screen 15-30'



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 14-30.5 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 13.5-14 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-13.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-04

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/21/03
DATE COMPLETED: 10/22/03
WEATHER: M. Sunny

DATUM: Local
COORDS: N: 205,892.3 E: 1,001,643.8
GS ELEVATION: 16.0 ft
TOC ELEVATION: 18.7 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

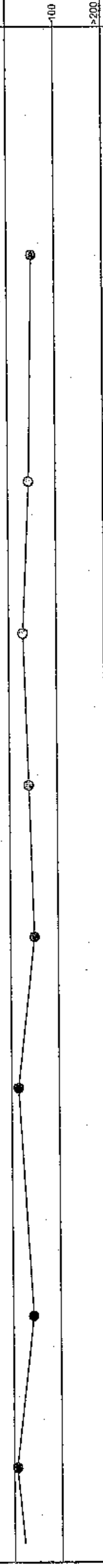
DESCRIPTION	USCS	ELEV.	DEPTH (ft)
0.0 - 0.5 dry to damp, compact, well graded, angular, CONCRETE FRAGS AND coarse SAND; some debris	FILL	15.5	
0.5 - 2.0 CONCRETE SLAB	CONCRETE	14.0	0.5
2.0 - 3.0 dry, moderately compact to loose, pinkish gray, well sorted, very fine SAND and some fine gravel (subgrade); Very light HC odor	FILL	13.0	2.0
3.0 - 5.5 oil moist to wet, moderately compact, black to grayish black, silty SAND AND fine GRAVEL with some clay in matrix (plastic); Heavy HC odor	SPG	10.5	3.0
5.5 - 7.0 oil moist to damp, moderately compact, interleaving black and olive gray, well sorted, fine SAND and trace fine to med gravel; Strong HC odor	SP	9.0	5.5
7.0 - 8.0 (same as above) with increasing clay content to 8 ft.; Moderate HC odor	SP	8.0	7.0
8.0 - 9.0 damp, compact to dense, moderate olive brown, interleaving silty CLAY AND fine SAND, with some to trace fine gravel; Moderate HC odor	CLS	7.0	8.0
9.0 - 11.5 (same as above) with interleaving damp, black (n1), fine SAND and trace angular rock frags (>3" dia.); Moderate HC odor	CLS	4.5	9.0
11.5 - 13.0 oil saturated, black (n1), moderately loose, fine SAND AND coarse GRAVEL (with brick frag (?) at 12.5 to 13.0); Heavy HC odor	SWG	3.0	11.5
13.0 - 15.0 oil saturated, loose, olive gray to black, very fine to fine SAND with some oil stained very coarse gravel to cobble (>3" dia)-- little recovery	SW	1.0	13.0
15.0 - 18.0 oil saturated, black (n1) loose to moderately compact, well graded, fine to coarse SAND AND medium to coarse GRAVEL; Heavy HC odor	SWG	-2.0	15.0
18.0 - 20.0 oil wet, black (n1), loose, well graded, coarse GRAVEL AND medium SAND; Heavy HC odor	GWS	-4.0	18.0

Log continued on next page

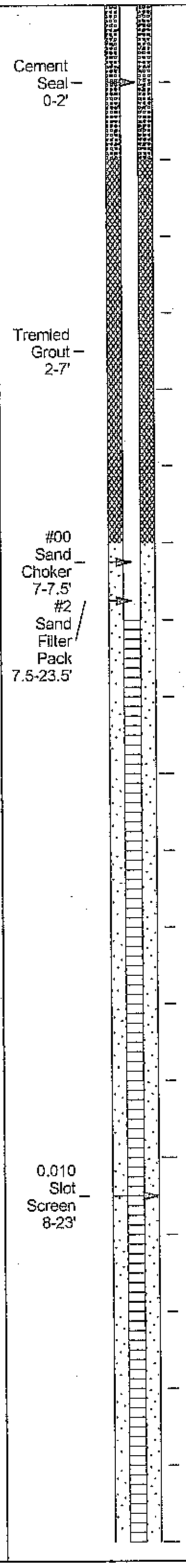
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
SS	5 4 3 3	1.7 / 2.0	9.6 51.8 20.6	SBGAL040104 10/22/2003 8:30:00 AM	
SS	5 16 10 12	1.3 / 2.0	26.2 42.9 44.0	SBGAL040207 10/22/2003 9:00:00 AM	
SS	7 21 20 16	1.0 / 2.0	30 25.1	SBGAL040309 10/22/2003 9:20:00 AM	
SS	3 8 12 17	0.8 / 2.0	40.8	SBGAL040411 10/22/2003 9:30:00 AM	
SS	66 25 21 18	1.3 / 2.0	51 50.0 40.0	SBGAL040513 10/22/2003 12:45:00 PM	
SS	10 16 16 10	0.3 / 2.0	14.6	SBGAL040615 10/22/2003 1:00:00 PM	
SS	11 27 60/1	0.2 / 2.0		SBGAL040717 10/22/2003 1:20:00 PM	
SS	8 13 14 14	2.0 / 2.0	29.4 43.1 41.2	SBGAL040818 10/22/2003 2:00:00 PM	
SS	10 32 37 36	2.0 / 2.0	5.9 3.9 7	SBGAL040920 10/22/2003 2:10:00 PM	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-8 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 8-23 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 7.5-23.5 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 7-7.5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-04

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/21/03
DATE COMPLETED: 10/22/03
WEATHER: M. Sunny

DATUM: Local
COORDS: N: 205,892.3 E: 1,001,643.8
GS ELEVATION: 16.0 ft
TOC ELEVATION: 18.7 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

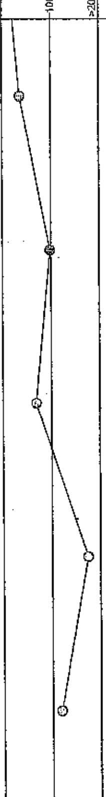
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. DEPTH (ft)
20		20.0 - 21.5 oil wet, black (n1), loose, well graded, medium SAND AND medium GRAVEL; Heavy HC odor	SWG	20.0 -5.5
	-5	21.5 - 22.0 oil wet, black (n1), loose, well sorted, medium SAND and trace medium gravel; Heavy HC odor	SP	21.5 -6.0
25	-10	22.0 - 28.0 saturated, black (n1) to grayish black, well sorted, medium SAND and trace medium gravel; Heavy HC odor	SP	22.0 -12.0
30		28.0 - 30.0 (same as above) with moderate to strong HC odor	SP	28.0 -14.0 30.0
35	-15 -20			
40		Boring completed at 40.0 ft		

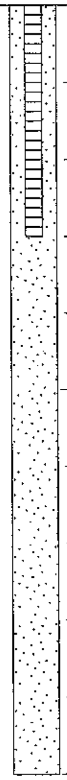
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
SS	6 10 12 13	2.0 / 2.0	13.7 18.7 37	SBGAL041022 10/22/2003 2:40:00 PM	
SS	2 2 3 8	1.5 / 2.0	88.1 98.1	SBGAL041124 10/22/2003 3:20:00 PM	
SS	16 10 10 18	1.5 / 2.0	46.2 57.8 69	SBGAL041226 10/22/2003 3:40:00 PM	
SS	4 4 7 11	2.0 / 2.0	175 76.3 49.2	SBGAL041328 10/23/2003 1:28:00 PM	
SS	8 6 5 10	2.0 / 2.0	119 79.1	SBGAL041430 10/23/2003 2:30:00 PM	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-8 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 8-23 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 7.5-23.5 ft bgs
Type: #2 Sand
Quanlily: 6x50 lb

FILTER PACK SEAL
Interval: 7-7.5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-05

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/13/03
DATE COMPLETED: 10/14/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 205,958.3 E: 1,001,809.8
GS ELEVATION: 28.3 ft
TOC ELEVATION: 26.7 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

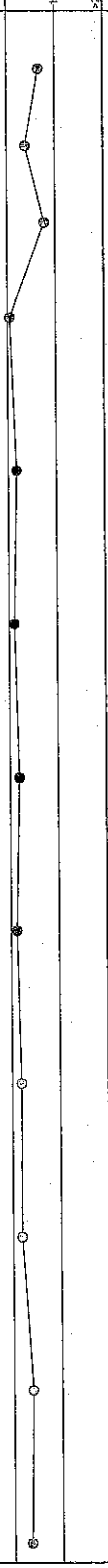
DESCRIPTION	USCS	ELEV.	DEPTH (ft)
0.0 - 0.5 ASPHALT	ASPHA	27.8	0.5
0.5 - 4.5 Moist, olive gray to light olive gray, poorly sorted, silty SAND AND medium GRAVEL; Very faint HC odor	FILL	23.8	4.5
4.5 - 5.0 ASPHALT AND BRICK interlayered; Asphalt in shoe	ASPHA	23.3	5.0
5.0 - 5.5 ASPHALT	ASPHA	22.8	5.5
5.5 - 7.0 Moist, light olive gray with black (n1) interleaving coloring, well sorted, moderately compact, silty SAND and trace medium gravel; Moderate HC odor	FILL	21.3	7.0
7.0 - 7.5 Moist, soft, pinkish gray, (wax?), WAX-like substance; Strong "animal-fat" odor	75	20.8	7.5
7.5 - 9.0 Damp to dry, moderately compact, brownish gray and light brownish gray, poorly sorted, silty to clayey SAND and some fine to medium gravel; Moderate HC odor	FILL	19.3	9.0
9.0 - 9.5 Oil wet to water saturated, black (n1) angular, poorly sorted, fine to coarse SAND AND medium GRAVEL; Moderate burnt HC odor	FILL	18.8	9.5
9.5 - 10.5 Damp, pinkish gray to white, plastic, soft, WAX-like material ("fatty"?); similar to 7-7.5 interval; Strong "animal-fat" odor; Brick frags (>3"dia) at 10.5	75	17.8	10.5
10.5 - 11.0 Damp, olive gray, well sorted fine SAND and some medium gravel; Moderate to light burnt HC odor	FILL	17.3	11.0
11.0 - 11.5 Oil wet to water saturated, black (n1) angular, poorly sorted, fine to coarse SAND AND medium GRAVEL; Moderate burnt HC odor	FILL	16.8	11.5
11.5 - 12.0 Damp, pinkish gray to white, plastic, soft, WAX-like material ("fatty"?); similar to 7-7.5 interval; Strong "animal-fat" odor	75	16.3	12.0
12.0 - 13.0 Damp, olive gray, well sorted fine SAND and some medium gravel; Moderate to light burnt HC odor	SP	15.3	13.0
13.0 - 15.0 Dry, loose to moderately compact, light brownish gray, very well sorted, fine SAND; moderate HC odor; Fining from 10.5 to 14.5	SP	13.3	15.0
15.0 - 17.0 (same as above) with increasing medium gravel content to 17 ft (Gravel = 0% at 15; 30% at 17); Moderate HC odor	SP	11.3	17.0
17.0 - 19.0 Moist, loose to moderately compact, light brownish gray to light olive gray, very well sorted, fine SAND and trace medium gravel; Light to moderate HC odor	SP	9.3	19.0
19.0 - 20.0 Moist to damp, olive gray to light olive gray, well sorted, fine to medium SAND; Moderate HC odor; Coarsing to 21	SP	8.3	

Log continued on next page

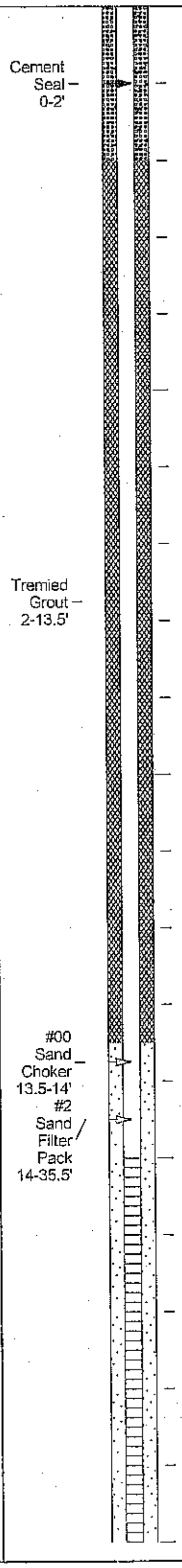
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
GRAB		/0.5	67		
GRAB		/0.5	39		
GRAB		/0.5	78	SBGAL050103 10/13/2003 2:50:00 PM	
SS	3 4 4 8	1.0/2.0	4.4	SBGAL050204 10/13/2003 2:55:00 PM	
SS	8 8 10 8	1.1/2.0	8.4 17.7	SBGAL050307 11/4/2003 10:00:00 AM SBGAL050408 11/4/2003 10:18:00 AM	
SS	4 8 10 12	1.3/2.0	11.4 7.8	SBGAL050509 11/4/2003 10:20:00 AM SBGAL050610 11/4/2003 10:25:00 AM	
SS	4 2 9 15	1.8/2.0	20 3.8 5.6	SBGAL050711 11/4/2003 10:28:00 AM SBGAL050811 11/4/2003 10:30:00 AM	
SS	5 12 12 9	1.3/2.0	12.8 11.6	SBGAL050913 11/4/2003 10:55:00 AM	
SS	6 6 8 10	1.7/2.0	20 8.6 5.0	SBGAL051015 11/4/2003 11:05:00 AM	
SS	4 6 10 13	1.8/2.0	19.3 8.4 4.9	SBGAL051117 11/4/2003 11:15:00 AM	
SS	4 8 10 16	2.0/2.0	39.8 26.3 30.0	SBGAL051219 11/4/2003 11:20:00 AM	
SS	10 13 13 17	2.0/2.0	23.8 34.8 36.0		

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-35 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 14-35.5 ft bgs
Type: #2 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 13.5-14 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-13.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-05

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/13/03
DATE COMPLETED: 10/14/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 205,958.3 E: 1,001,809.8
GS ELEVATION: 28.3 ft
TOC ELEVATION: 26.7 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

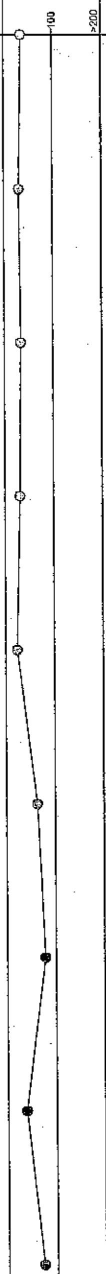
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
20		20.0 - 21.0 Wet, olive gray to dark olive gray, well sorted, medium to coarse SAND; Moderate to strong HC odor	SP		20.0 7.3
		21.0 - 22.0 Moist to wet, olive gray to dark olive gray, well sorted, fine SAND and trace coarse sand; Moderate to strong HC odor; Color gradation from olive gray to black (n1) from 21 to 23	SP		21.0 6.3
	5	22.0 - 25.0 Oil wet to saturated, black (n1), well sorted, fine SAND and some coarse sand; Strong HC odor	SP		22.0 3.3
25		25.0 - 27.0 Oil wet to saturated, black (n1); well sorted, fine to medium SAND and some coarse gravel; Moderate to heavy burnt HC odor	SP		25.0 1.3
30	0	27.0 - 33.0 Oil wet to water saturated, black (n1) to grayish black, well sorted, fine SAND and trace medium gravel; Moderate HC odor	SP		27.0 -4.7
	-5	33.0 - 35.0 wet to saturated, olive black, well sorted, fine SAND to medium sand and trace medium gravel; Moderate to strong HC odor	SP		33.0 -6.7
35		35.0 - 37.0 (same as above); Moderate HC odor; Color gradation from olive black (at 35) to olive gray (at 37)	SP		35.0 -8.7
	-10				37.0
40		Boring completed at 40.0 ft			

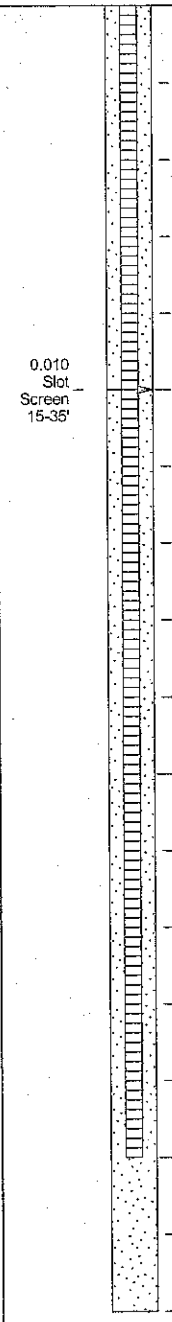
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	10 13 13 17	2.0 / 2.0	23.8 34.8 36.0	☒	SBGAL051321 11/4/2003 12:40:00 PM	
SS	5 5 8 12	2.0 / 2.0	21.7 29.1 31.2	☒	SBGAL051423 11/4/2003 12:50:00 PM	
SS	7 7 9 7	1.8 / 2.0	31.2 34.1 33.4	☒	SBGAL051525 11/4/2003 12:55:00 PM	
SS	3 5 6 8	2.0 / 2.0	21.2 29.2 31.2	☒	SBGAL051627 11/4/2003 1:15:00 PM	
SS	4 8 8 11	1.5 / 2.0	22.8 23.9	☒	SBGAL051729 11/4/2003 1:30:00 PM	
SS	4 8 8 10	1.3 / 2.0	18.3 63.1	☒	SBGAL051831 11/4/2003 1:35:00 PM	
SS	4 8 50/1	1.4 / 2.0	53 78.2	☒	SBGAL051933 11/4/2003 2:00:00 PM	
SS	15 16 20 27	2.0 / 2.0	36.8 28.4 38.8	☒	SBGAL052035 11/6/2003 8:00:00 AM	
SS	4 4 10 11	1.5 / 2.0	70.8 73.4	☒	SBGAL052137 11/6/2003 8:15:00 AM	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-35 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 14-35.5 ft bgs
Type: #2 Sand
Quantity: 8x50 lb

FILTER PACK SEAL
Interval: 13.5-14 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-13.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-06

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

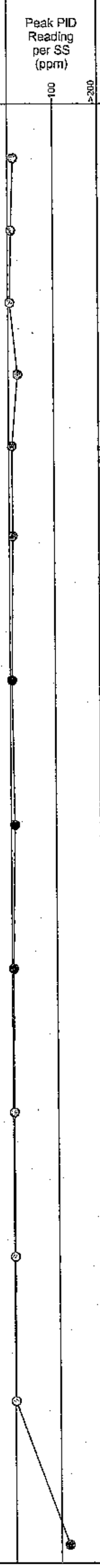
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/13/04
DATE COMPLETED: 10/17/03
WEATHER: Overcast

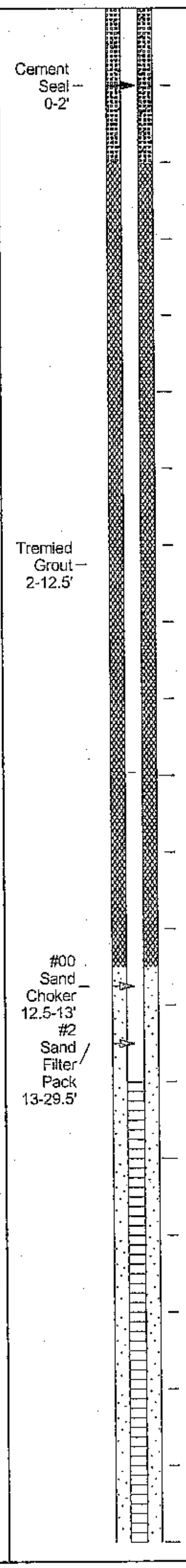
DATUM: Local
COORDS: N: 206,144.6 E: 1,001,887.5
GS ELEVATION: 26.4 ft
TOC ELEVATION: 28.8 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE				SAMPLES					
DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected
0.0 - 0.5 ASPHALT	ASPHA		25.9						
0.5 - 1.0 dry, loose to compact/dense, black (n1), well graded medium SAND AND medium GRAVEL; Heavy HC odor (asphalt related?)	FILL		0.5 25.4	GRAB		0.5	12.9		
1.0 - 3.0 dry, compact, angular, black (n1), well graded medium SAND AND medium GRAVEL with some concrete frags; Moderate HC odor	FILL		1.0 23.4	GRAB		0.5	7.1		
				GRAB		0.5	4.1	☒	SBGAL060103 10/13/2003 12:45:00 PM
3.0 - 5.0 wet, loose, black (n1) to olive gray, well graded medium SAND with some gravel; Moderate HC odor (motor oil?)	FILL		3.0 21.4	GRAB		0.5	20.6	☒	SBGAL060204 10/13/2003 1:00:00 PM
				GRAB		0.5	7.1		
5.0 - 6.5 moist to wet, moderately loose, olive black to olive brown, well graded, fine SAND to silty sand with some medium gravel; Moderate HC odor	FILL		5.0 19.9	SS	3 4 5 40	1.8 2.0	2.1 2.6 7.9		
6.5 - 7.0 damp to dry, dense to compact, olive brown, fine to medium SAND with some medium gravel and trace brick frags; Moderate to heavy HC odor	FILL		6.5 19.4					☒	SBGAL060307 10/17/2003 11:25:00 AM
7.0 - 8.5 wet, dense to compact, angular, olive black to black (n1), well graded, fine SAND AND medium GRAVEL with some medium angular gravel frags; Moderate HC odor	FILL		7.0 17.9	SS	4 60 66 20	1.3 2.0	4.2 2.5	☒	SBGAL062008 10/16/2003 12:10:00 PM
8.5 - 11.0 wet to moist, loose, brownish gray, well sorted, medium to coarse SAND with trace to some medium gravel; Faint HC odor	FILL		8.5 15.4	SS	20 31 40 38	0.7 2.0	8.6		
11.0 - 13.0 damp to moist, loose, brownish gray, well graded, coarse SAND AND coarse GRAVEL (>1" dia.); Moderate sweet HC odor	SWG		11.0 13.4	SS	49 36 27 24	1.7 2.0	3.4 2.1 1.2	☒	SBGAL060412 10/17/2003 1:25:00 PM
13.0 - 15.0 moist, loose, brownish gray to black and light brownish gray, well graded coarse SAND AND coarse GRAVEL with trace brick frags; Moderate sweet HC odor	SWG		13.0 11.4	SS	5 20 100 66/1	1.5 2.0	2.9 1.4 1.8	☒	SBGAL062115 10/16/2003 1:45:00 PM
15.0 - 19.0 moist, loose, light olive gray to brownish gray, well graded, coarse SAND AND coarse GRAVEL to cobble size (>3" dia.) and trace brick frags; Very faint sweet HC odor	SWG		15.0 7.4	SS	60 47 36 46	1.4 2.0	1.3 2.4	☒	SBGAL062217 10/16/2003 2:00:00 PM
				SS	30 29 28 22	0.9 2.0	1.5 1.1	☒	SBGAL060519 10/17/2003 2:40:00 PM
19.0 - 21.0 moist to damp, loose, light brownish gray to brownish gray, clean, well sorted, medium to coarse SAND; Heavy sweet HC odor	SP		19.0	SS	7 14 19 26	1.7 2.0	8.1 29.1 119		

Log continued on next page




MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-14 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 14-29 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 13-29 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 12.5-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-12.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-06

SHEET 2 of 2

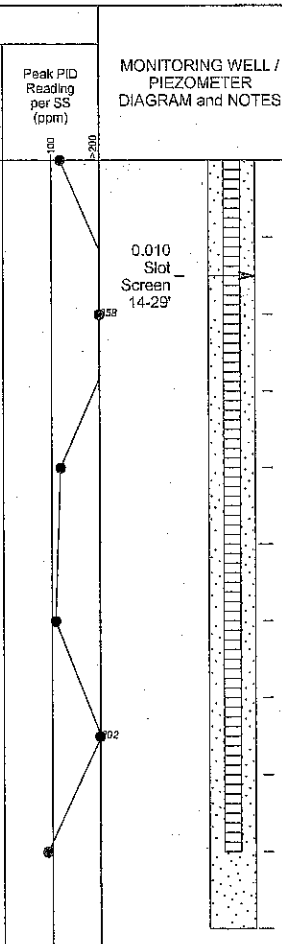
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/13/04
DATE COMPLETED: 10/17/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 206,144.6 E: 1,001,887.5
GS ELEVATION: 26.4 ft
TOC ELEVATION: 28.8 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
20		19.0 - 21.0 moist to damp, loose, light brownish gray to brownish gray, clean, well sorted, medium to coarse SAND; Heavy sweet HC odor *(Continued)*	SP	5.4 21.0	SS	7 14 19 26	1.7/2.0	8.1 29.1 119	SBGAL062321 10/16/2003 2:50:00 PM	
	5	21.0 - 23.0 moist to wet, loose, light brownish gray to brownish gray, clean, well sorted, medium SAND to coarse sand; Heavy sweet HC odor	SP	3.4 23.0	SS	20 18 22 27	2.0/2.0	9.9 258 225	SBGAL062423 10/16/2003 3:40:00 PM	
25		23.0 - 30.0 saturated, (same as above)	SP		SS	15 32 39 46	0.5/2.0	119	SBGAL062525 10/16/2003 3:50:00 PM SBGAL060625 10/17/2003 3:50:00 PM	
	0				SS	3 7 13 19	1.5/2.0	102 106.0 108.0		
					SS	7 12	1.0/1.0	202	SBGAL062628 10/16/2003 5:00:00 PM	
30				-3.6 30.0	SS	15 25 41 60/1	2.0/2.0	68.6 90.6 74.1	SBGAL060730 10/17/2003 9:00:00 AM	
	-5									
35	-10									
40		Boring completed at 40.0 ft								



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-14 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 14-29 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 13-29 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 12.5-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-12.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-07

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/30/03
DATE COMPLETED: 10/31/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,875.7 E: 1,001,730.2
GS ELEVATION: 19.1 ft
TOC ELEVATION: 21.5 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

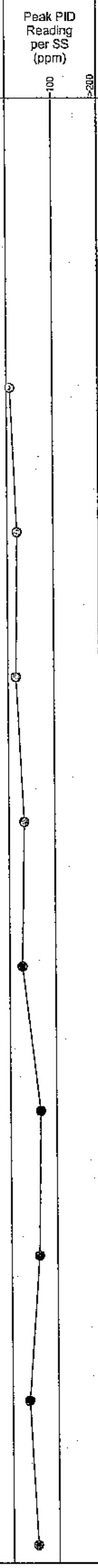
SOIL PROFILE

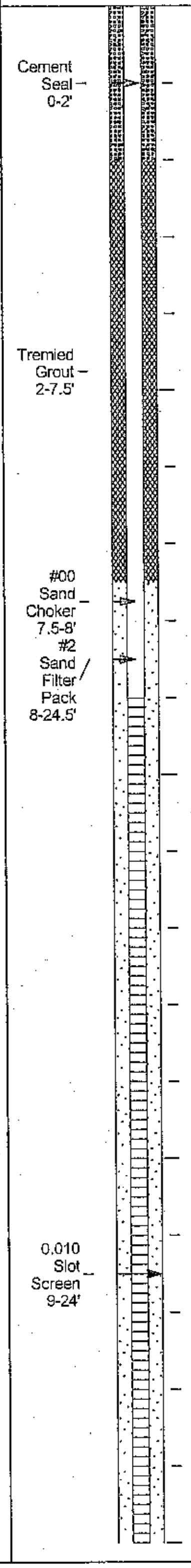
DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
0.0 - 2.0 CONCRETE SLAB		CONCRETE	17.1 2.0
2.0 - 5.0 dry to damp, brownish gray to olive gray, silty SAND and trace clay with some fine to medium gravel; Light to moderate Pesticide type odor	FILL		14.1 5.0
5.0 - 6.5 moist to wet, oil wet, olive black to grayish black, moderately sorted, subangular, very fine to silty SAND AND fine GRAVEL with trace angular medium gravel; Moderate HC odor	FILL		12.6 6.5
6.5 - 7.0 damp, brownish gray, loose, well sorted medium SAND AND trace fine GRAVEL, trace black (n1) wood frags; Moderate HC odor	FILL		12.1 7.0
7.0 - 7.5 (sluff?) oil wet, black to grayish black, well graded silty SAND AND angular medium GRAVEL; Moderate HC odor	FILL		11.6 7.5
7.5 - 9.5 damp to moist brownish gray to olive gray, well sorted, fine to medium SAND and trace to little fine gravel; Moderate HC odor	FILL		9.6 9.5
9.5 - 11.0 dry to moist, loose, light brownish gray, brownish gray, brownish black, moderate olive brown, and yellowish gray, angular, vesicular, (medium to coarse grained sand sized to gravel sized), SLAG or metallic like material or cutting torch slag-like material, indications of burnt or excessively heated matrix, biotite-like surfaces (visual correlation only); Moderate HC odor	FILL		8.1 11.0
11.0 - 11.5 (sluff?) wet, black to grayish black, fine SAND and trace very coarse gravel (>3" dia.), trace very fine brick frags; Heavy HC odor	FILL		7.6 11.5
11.5 - 12.0 wet to moist, olive black, well sorted, fine SAND and little fine gravel, subangular to subrounded; Moderate HC odor	SP		7.1 12.0
12.0 - 13.0 moist, olive gray, well sorted, loose, fine to medium SAND and trace fine gravel; Moderate HC odor	SP		6.1 13.0
13.0 - 15.0 moist to wet, interleaving olive gray and olive black coloring, well sorted, fine to medium SAND and trace fine gravel; Heavy HC odor	SP		4.1 15.0
15.0 - 17.0 oil wet to saturated, grayish black to black (n1), well sorted, fine to medium SAND and trace coarse gravel (@ 16 ft. >2" dia), and some fine to medium subrounded gravel; Very strong HC odor (solvent?)	SP		2.1 17.0
17.0 - 19.0 oil saturated, black (n1), loose, well sorted, fine to medium SAND; Very strong HC odor	SP		0.1 19.0
	SP		

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	2 WOR WOR WOR	1.1 / 2.0	3 7.2	SBGAL070104 10/31/2003 8:10:00 AM
SS	WOR WOR 13 9	1.7 / 2.0	12.9 21.0 21.3	SBGAL070207 10/31/2003 8:20:00 AM
SS	3 3 5 9	2.0 / 2.0	3.3 15.9 17.3	SBGAL070309 10/31/2003 8:30:00 AM
SS	3 5 3 9	2.0 / 2.0	26.8 32.3 33.4	SBGAL070411 10/31/2003 8:45:00 AM
SS	5 6 8 7	1.8 / 2.0	17.4 27.6 21.4	SBGAL070513 10/31/2003 9:20:00 AM
SS	3 4 4 4	1.8 / 2.0	65.4 35.6 45.4	SBGAL070615 10/31/2003 9:30:00 AM
SS	2 2 3 4	1.3 / 2.0	60.8 39.0	SBGAL070717 10/31/2003 9:40:00 AM
SS	2 2 3 6	1.7 / 2.0	33.4 34.2 36.4	SBGAL070819 10/31/2003 9:50:00 AM
SS	2 3 4 5	1.9 / 2.0	39.2 52.2 53.7	





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-9 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 9-24 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 8-24.5 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 7.5-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-07

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 10/30/03
DATE COMPLETED: 10/31/03
WEATHER: Sunny

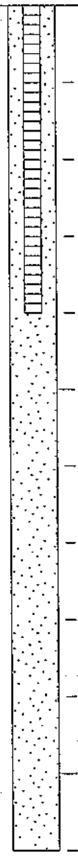
DATUM: Local
COORDS: N: 205,875.7 E: 1,001,730.2
GS ELEVATION: 19.1 ft
TOC ELEVATION: 21.5 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
20		19.0 - 21.0 saturated to oil saturated, loose, olive gray and olive black interleaving coloring, well sorted medium SAND; Moderate HC odor; coarsing to 21 *(Continued)*	SP	-1.9 21.0	SS	2 3 4 5	1.9/2.0	39.2 52.2 53.7	SBGAL070921 10/31/2003 10:00:00 AM	
		21.0 - 23.0 (same as above); no interleaving coloring; Moderate HC odor (visual impacts diminishing?)	SP	-3.9 23.0	SS	3 3 4 5	2.0/2.0	28 28.0 16.0	SBGAL071023 10/31/2003 10:10:00 AM	
	-5	23.0 - 25.0 wet to saturated, olive gray and olive black, well sorted, medium SAND, loose, Moderate to strong HC odor	SP	-5.9 25.0	SS	3 3 4 5	1.9/2.0	99.4 65.2 89.4	SBGAL071126 10/31/2003 10:20:00 AM	
25		25.0 - 27.0 wet to saturated, olive gray to olive black, well sorted, fine to medium SAND; Moderate to strong HC odor	SP	-7.9 27.0	SS	10 6 5 6	2.0/2.0	75.2 50.4 39.6	SBGAL071227 10/31/2003 10:30:00 AM	
		27.0 - 28.0 (same as above); coarsing to 29	SP	-8.9 28.0	SS	6 10 15 14	2.0/2.0	71.6 68.7 60.7	SBGAL071329 10/31/2003 11:45:00 AM	
		28.0 - 29.0 wet to saturated, olive gray, well graded, medium to coarse SAND AND fine GRAVEL with trace medium gravel; Moderate to strong HC odor	SWG	-9.9 29.0						
	-10	29.0 - 30.0 (same as above); Strong HC odor	SWG	-10.9 30.0	SS	12 12 20 20	2.0/2.0	130 117.0 129.0	SBGAL071431 10/31/2003 12:00:00 PM	
30		30.0 - 31.0 wet, olive gray, moderately compact, well sorted medium SAND to coarse sand with trace fine gravel; Strong HC odor	SP	-11.9 31.0						
	-15									
35										
	-20									
40		Boring completed at 40.0 ft								

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-9 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 9-24 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 8-24.5 ft bgs
Type: #2 Sand
Quantity: 6x50 lb

FILTER PACK SEAL
Interval: 7.5-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7.5 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-08

SHEET 1 of 2

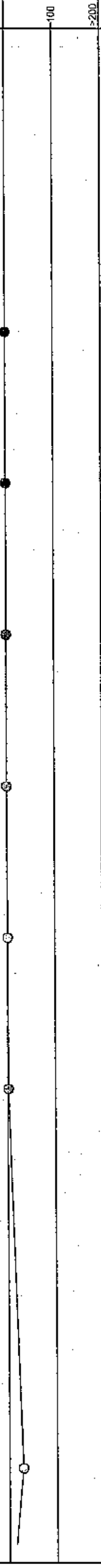
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

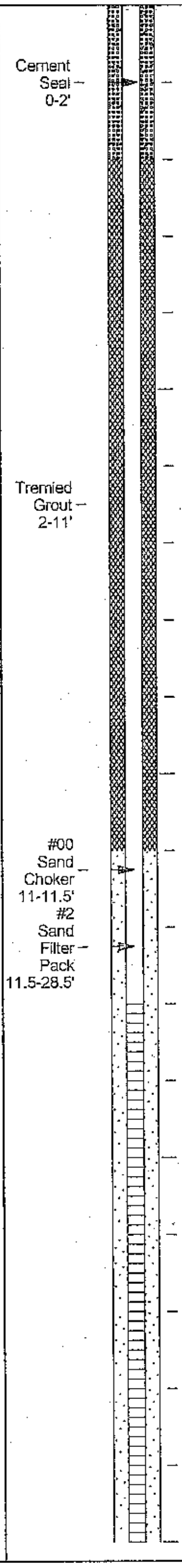
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/6/03
DATE COMPLETED: 11/7/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,968.6 E: 1,001,965.6
GS ELEVATION: 25.2 ft
TOC ELEVATION: 27.7 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses
0	25	0.0 - 0.5 ASPHALT	ASPHA		24.7							
		0.5 - 3.0 BRICK with some damp olive gray to olive black silty sand between bricks; No HC odor	FILL		0.5 22.2							
		3.0 - 5.0 dry to damp, loose, brownish black and light brownish gray and grayish yellow, poorly sorted, angular, silty SAND, angular GRAVEL, BRICK FRAGS, AND ROCK FRAGS, No HC odor	FILL		3.0 20.2	SS	6 5 6 4	2.0/2.0	0.1 0.1 0.2	☒	SBGAL080105 11/7/2003 8:20:00 AM	
5	20	5.0 - 7.0 (same as above); large BRICK PIECES (>3") at 5.5, 6.0, 7.0 ft. bgs; AND angular, rust colored, SLAG layer at 5.3 to 5.5 ft. bgs; No HC odor	FILL		5.0 18.2	SS	10 11 16 19	1.9/2.0	0.1 0.2 0.6			
		7.0 - 8.0 dry to damp, loose, BRICK and some olive gray to olive black silty sand between bricks; No HC odor	FILL		7.0 17.2	SS	16 16 6 4	1.5/2.0	0.6 0.4			
		8.0 - 8.8 damp to moist, pale yellowish brown, well sorted, fine to medium SAND and some coarse gravel; No HC odor	SP		8.0 16.4							
		8.8 - 9.0 wet, dark yellowish brown, well sorted, soft, SILT; No HC odor	ML		16.2					☒	SBGAL080209 11/7/2003 8:40:00 AM	
10	15	9.0 - 11.0 saturated, soft, light olive gray, SILT; saturation decreasing from saturated at 9 ft. bgs to damp at 11 ft. bgs (possibly due to hammering spoon?); No HC odor	ML		9.0 14.2	SS	6 3 2 2	1.1/2.0	0.2 0.1	☒	SBGAL080310 11/7/2003 8:50:00 AM	
		11.0 - 11.5 wet, soft, light olive gray, SILT; No HC odor	ML		11.0 13.7							
		11.5 - 12.0 wet, moderate olive brown, well sorted, very fine to silty SAND, firm to soft; Faint (burnt) HC odor	SP-SM		11.5 13.2	SS	30 6 50/3	1.3/2.0	1.3 1.2			
		12.0 - 13.0 damp, olive gray, well graded, angular, fine SAND AND coarse GRAVEL; Moderate (burnt) HC odor	SWG		12.0 12.2					☒	SBGAL080413 11/7/2003 9:05:00 AM	
		13.0 - 15.0 (little recovery) moist, brownish gray to olive gray, well graded, fine to medium SAND AND very coarse compact GRAVEL; Moderate to light (burnt) HC odor	SWG		13.0 10.2	SS	27 50/1	0.5/2.0	1.6	☒	SBGAL080515 11/7/2003 9:10:00 AM	
15	10	15.0 - 16.3 (same as above), Moderate burnt HC odor	SWG		15.0 8.9	SS	26 60/5	0.0/1.0				
		16.3 - 17.8 damp, moderately compact, moderate yellowish brown, silty CLAY; Very faint HC odor	CL-ML		16.3 7.4	SS	6 5 10 15	1.7/2.0		☒	SBGAL080618 11/7/2003 9:50:00 AM	
		17.8 - 18.5 moist, moderately compact, moderate olive brown, SILT; Moderate HC (solvent?) odor	ML		17.8 6.7							
		18.5 - 20.0 saturated, olive gray (at 18.5 ft) grading to moderate olive brown (at 19.5 ft), well sorted, very fine to silty SAND; Moderate (burnt) HC odor	SM		18.5 5.2	SS	WOR 5 36 6	2.0/2.0	0.6 21.9 29.6	☒	SBGAL080720 11/7/2003 10:10:00 AM	
20		Log continued on next page										





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-13 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 13-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 11.5-28.5 ft bgs
Type: #2 Sand
Quantity: 5x50 lb

FILTER PACK SEAL
Interval: 11-11.5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-08

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/6/03
DATE COMPLETED: 11/7/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,968.6 E: 1,001,965.6
GS ELEVATION: 25.2 ft
TOC ELEVATION: 27.7 ft
TEMPERATURE: 50-55 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)
20	5
25	0
30	-5
35	-10
40	

DESCRIPTION

20.0 - 20.5
wet, saturated, olive gray to brownish gray, very fine SAND and trace medium gravel; Moderate HC odor

20.5 - 21.5
wet, saturated, light olive brown and moderate olive brown, interleaving, very fine SAND AND SILT (varve-like features, approx. 4 per inch), Moderate HC odor

21.5 - 23.0
wet, saturated, moderate olive brown, well sorted, fine to very fine SAND, moderately compact; Very faint HC odor

23.0 - 23.5
damp to moist, moderate olive brown, CLAY AND SILT interleaving (varve-like features, approx 4 per inch); Very faint HC odor

23.5 - 24.0
damp to moist, light olive brown to moderate olive brown, clayey SILT; No HC odor

24.0 - 25.0
wet, moderate olive brown, clayey SILT grading to very fine sand to silt at 25 ft bgs; very faint HC odor

25.0 - 25.3
damp, moderate yellowish brown, moderately compact, silty CLAY; Very faing HC odor

25.3 - 25.5
damp to moist, moderately compact, moderate olive brown, SILT; Faint to moderate HC odor

25.5 - 25.5
(varve-like feature); black (n1), very fine SILT; strong HC odor

25.5 - 26.0
damp to moist, moderate olive brown to moderate yellowish brown, SILT AND very fine SAND

26.0 - 27.3
wet to moist, interleaving brownish gray and olive gray, interleaving SILT and clayey silt; Moderate HC odor;

27.3 - 27.3
(varve-like feature); black (n1), very fine SILT; strong HC odor

27.3 - 28.0
wet to moist, interleaving brownish gray and olive gray, interleaving SILT and clayey silt; Moderate HC odor;

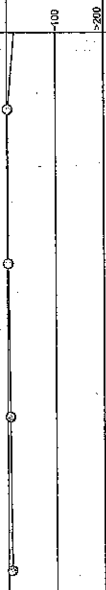
Boring completed at 40.0 ft

USCS	ELEV. / DEPTH (ft)
SP	20.0 4.7
SP-SM	20.5 3.7
SP	21.5 2.2
CL-ML	23.0 1.7
ML	23.5 1.2
ML	24.0 0.2
CL	-0.1
ML	-0.3
ML MLS	25.5 -0.8
ML	26.0 -2.1
ML ML	27.3 -2.8
	28.0

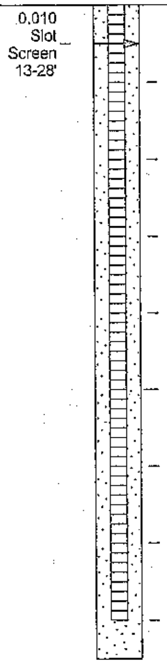
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	6 12 11 13	1.4 / 2.0	1.6 1.4	☒	SBGAL080822 11/7/2003 10:20:00 AM	
SS	2 5 5 5	1.9 / 2.0	2 1.2 1.9	☒	SBGAL080924 11/7/2003 10:40:00 AM	
SS	12 3 6 8	2.0 / 2.0	3.9 2.2 5.3	☒	SBGAL081026 11/7/2003 11:00:00 AM	
SS	4 6 15 12	1.3 / 2.0	0.8 8			

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: AGS-13 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 13-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.010
End Cap: Threaded

FILTER PACK
Interval: 11.5-26.5 ft bgs
Type: #2 Sand
Quantity: 5x50 lb

FILTER PACK SEAL
Interval: 11-11.5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-09

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

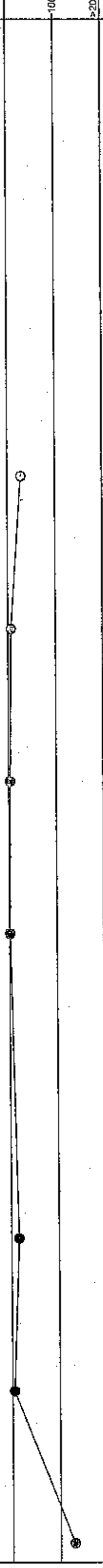
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/3/04
DATE COMPLETED: 3/3/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,079.1 E: 1,001,933.3
GS ELEVATION: 26.0 ft
TOC ELEVATION: 29.0 ft
TEMPERATURE: 40-50 F

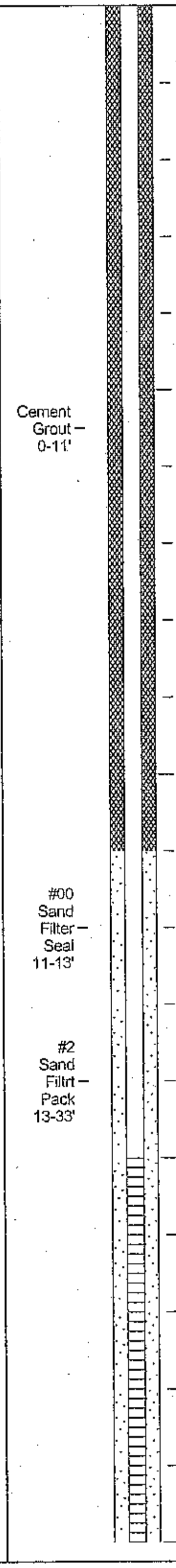
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0		0.0 - 0.5 Asphalt	Aspha	■	25.5 0.5							
	25	0.5 - 2.5 Fill-gray black sand and gravel with brick fragments	Fill	▨	23.5 2.5							
		2.5 - 5.0 Fill-black sub-angular gravel & cobbles with some sand and fine gravel	FILL	▨	21.0 5.0							
5	20	5.0 - 9.0 Brownish black loose to compact MF SAND, little silt (no odor)	FILL	▨		SS	3 2 3 5	$\frac{1.0}{2.0}$	29	☒	GAL-090105 3/3/2004	
					17.0 9.0	SS	4 5 5 4	$\frac{1.2}{2.0}$	4.5 6.5			
10		9.0 - 11.0 Moist, Olive gray firm clayey SILT, trace MF sand and gravel (no odor)	FILL	▨	15.0 11.0	SS	2 2 4 5	$\frac{1.2}{2.0}$	3.1	☒	GAL-090210 3/3/2004	
	15	11.0 - 15.0 Moist brown to olive brown loose well graded MF SAND, little to trace fine gravel (slight odor)	SP	⁘		SS	5 5 8 14	$\frac{1.0}{2.0}$	1.3	☒	GAL-090312 3/3/2004	
					11.0 15.0	SS	NA	$\frac{0.0}{2.0}$	NA			
15	10	15.0 - 19.0 Moist Grayish brown loose well sorted MF SAND, trace F gravel, (slight-no odor)	SP	⁘		SS	3 4 5 7	$\frac{1.5}{2.0}$	14 16	☒	GAL-090416 3/3/2004	
					7.0 19.0	SS	7 7 8 9	$\frac{1.4}{2.0}$	2.2 4.5			
20		19.0 - 21.0 Oil/wet Grayish brown loose CF SAND trace F gravel (slight-moderate HC odor)	SP	⁘		SS	5 6 8 9	$\frac{1.5}{2.0}$	84 131			

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-33 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-09

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/3/04
DATE COMPLETED: 3/3/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,079.1 E: 1,001,933.3
GS ELEVATION: 26.0 ft
TOC ELEVATION: 29.0 ft
TEMPERATURE: 40-50 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft): 20, 25, 30, 35, 40
ELEVATION (ft): 5, 0, -5, -10

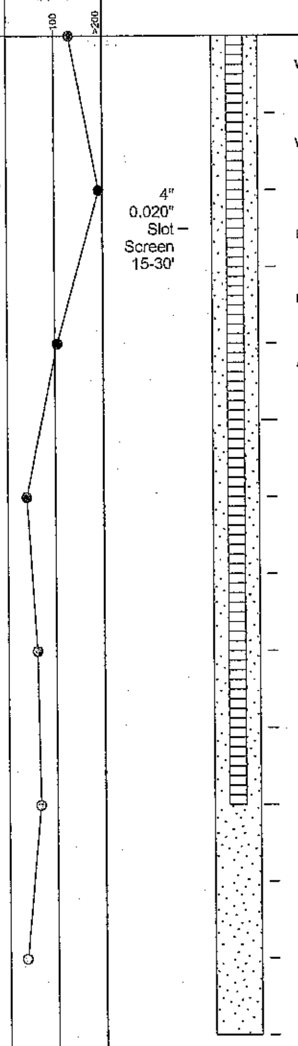
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
19.0 - 21.0 Oil/wet Grayish brown loose CF SAND trace F gravel (slight-moderate HC odor) *(Continued)*	SP	5.0
21.0 - 25.0 Oil/wet Grayish brown loose MF SAND, trace F gravel (moderate-strong HC odor)	SP	21.0 1.0
25.0 - 29.0 Oil/water saturated, grayish brown loose MF SAND, trace fine gravel, black staining (strong HC odor)	SP	25.0 -3.0
29.0 - 33.0 Saturated H2O, grayish black loose CF SAND, poorly sorted, trace CF gravel (moderate HC odor)	SP	29.0 -7.0
Boring completed at 33.0 ft		

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	5 6 8 9	1.5/2.0	84 131	☒	GAL-090520 3/3/2004	
SS	11 8 7 7	1.2/2.0	192 145	☒	GAL-090622 3/3/2004	
SS	3 3 4 5	1.3/2.0	95 105			
SS	2 4 6 7	1.6/2.0	40 36	☒	GAL-090725 3/3/2004	
SS	3 4 5 8	1.5/2.0	61 30	☒	GAL-090927 3/3/2004	
SS	2 3 7 8	1.4/2.0	66 45	☒	GAL-091030 3/3/2004	
SS	4 6 8 8	2.0/2.0	33 33 36			
				☒	GAL-091133 3/3/2004	

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-33 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-10

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 32.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/15/04
DATE COMPLETED: 6/15/04
WEATHER: M.Sun/Breeze

DATUM: Local
COORDS: N: 206,214.0 E: 1,001,814.0
GS ELEVATION: 23.7 ft
TOC ELEVATION: 23.7 ft
TEMPERATURE: 75-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

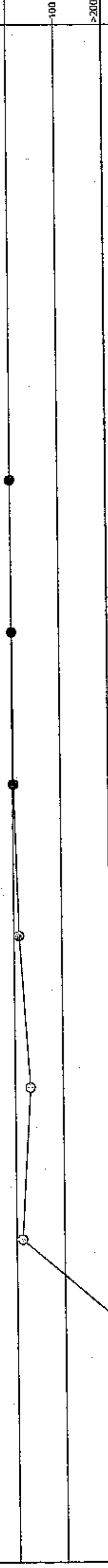
SOIL PROFILE

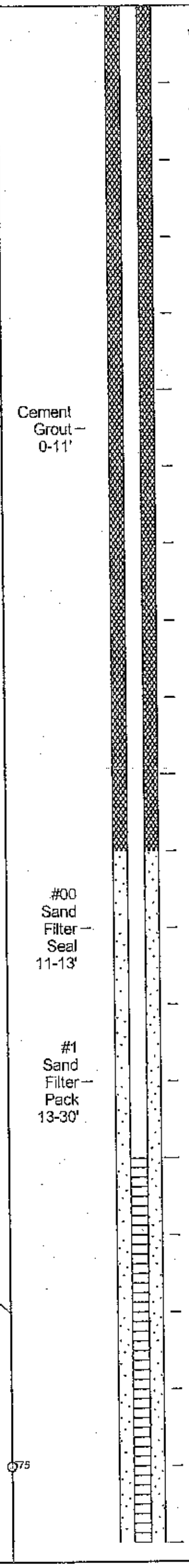
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 5.0 Fill material, sand cobbles, concrete and brick fragments	FILL	18.7 5.0
5.0 - 9.0 Dark gray MF GRAVEL	FILL	14.7 9.0
9.0 - 11.0 Dry gray brown very dense MF SAND, trace fine gravel	SP	12.7 11.0
11.0 - 15.0 Dry gray brown to reddish gray brown sorted compact MF SAND, little coarse GRAVEL (slight odor)	SW	8.7 15.0
15.0 - 19.0 Dry gray brown sorted compact MF SAND, trace coarse gravel (slight HC odor?)	SP	4.7 19.0
19.0 - 24.0 Oil wet gray brown poorly sorted CF SAND, tace to little CF gravel (strong HC odor)	SP	

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	3 4 6 9	0.8/2.0	0.3	
SS	10 9 8 5	0.6/2.0	1.1	GAL-1001-09 6/15/2004
SS	30 38 40 46	0.7/2.0	2.0	
SS	32 17 14 14	1.2/2.0	11.2 6.9	GAL-1002-A12 6/15/2004
SS	9 6 10 12	1.4/2.0	24 32.1	
SS	7 13 12 11	1.4/2.0	10.8 12.4	GAL-1003-15 6/15/2004
SS	35 50/4	0.0/1.0		GAL-1004-17 6/15/2004
SS	4 7 13 18	1.0/2.0	375 575	





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-30 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-10

SHEET 2 of 2

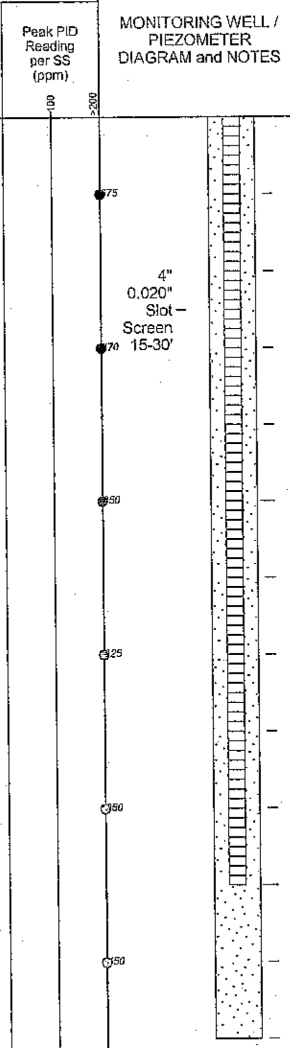
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 32.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/15/04
DATE COMPLETED: 6/15/04
WEATHER: M.Sun/Breeze

DATUM: Local
COORDS: N: 206,214.0 E: 1,001,814.0
GS ELEVATION: 23.7 ft
TOC ELEVATION: 23.7 ft
TEMPERATURE: 75-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		19.0 - 24.0 Oil wet gray brown poorly sorted CF SAND, tace to little CF gravel (strong HC odor) *(Continued)*	SP			SS	3 9 15 16	1.4 / 2.0	675 515	☒ ☒	GAL-1005-20 6/15/2004 GAL-1006-21 6/15/2004	
	0				-0.3 24.0	SS	8 12 11 11	2.0 / 2.0	770 530 650	☒	GAL-1007-23 6/15/2004	
25		24.0 - 28.0 Water saturated gray to reddish brown firm F SAND, trace silt, intermittent black streaking (slight odor)	SP			SS	6 8 10 20	2.0 / 2.0	350 125 40	☒	GAL-1008-25 6/15/2004	
					-4.3 28.0	SS	14 20 24 24	2.0 / 2.0	300 325 40	☒	GAL-1009-27 6/15/2004	
	-5	28.0 - 32.0 Water saturated gray brown to reddish brown poorly sorted compact CF SAND, trace mica (slight to no odor)	SP			SS	6 8 10 16	2.0 / 2.0	250 125 8.0			
30					-8.3	SS	3 10 24 26	2.0 / 2.0	450 28 15	☒	GAL-1011-30 6/15/2004	
		Boring completed at 32.0 ft								☒	GAL-1012-32 6/15/2004	
35	-10											
40	-15											



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-30 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoilie

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-11

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 27.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/18/04
DATE COMPLETED: 6/18/04
WEATHER: Overcast

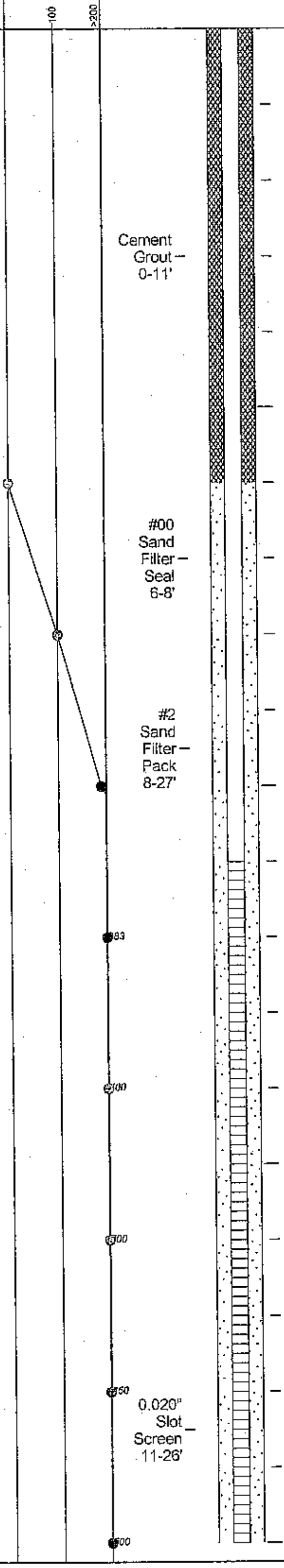
DATUM: Local
COORDS: N: 206,048.8 E: 1,001,733.7
GS ELEVATION: 18.8 ft
TOC ELEVATION: 18.9 ft
TEMPERATURE: 70-75 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES						
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0		0.0 - 0.5 Asphalt	ASPHA		18.3 0.5							
	15	0.5 - 5.0 Moist, gray and orange brown, coarse-fine sand and gravel FILL, some cobble fragments and debris, trace silt. Borehole advanced to 5 ft bgs via "soft dig" techniques	FILL		13.8 5.0							
5		5.0 - 7.0 Moist, brown, medium-fine sand and fine gravel FILL.	FILL		11.8 7.0	SS	8 50/.3	0.6/2.0	0.0			
	10	7.0 - 9.0 Moist, reddish brown, sorted, medium-fine SAND (intermittent black staining), trace fine gravel. Slight to moderate odor.	SP		9.8 9.0	SS	3 3 6 8	1.7/2.0	100 76 66			
10		9.0 - 13.0 Moist, olive gray to reddish gray brown, sorted, medium-fine SAND (intermittent black staining), trace fine gravel. Slight to moderate LHC odor	SP			SS	3 8 9 12	1.6/2.0	150 140 190			
					5.8 13.0	SS	3 9 10 13	1.6/2.0	350 383 200			
	5	13.0 - 17.0 Oil moist-wet, reddish brown, graded, medium-fine to coarse-fine, SAND (intermittent black staining). Coarsing with depth. Strong LHC odor	SW			SS	4 8 12 13	1.7/2.0	470 650 700			
15					1.8 17.0	SS	6 12 14 15	1.2/2.0	700 700			
		17.0 - 23.0 Water saturated, Gray brown poorly sorted compact CF SAND, trace fine to medium gravel	SW			SS	5 8 12 14	1.7/2.0	350 300 280			
	0					SS	6 14 24 26	2.0/2.0	390 350 500			
20		Log continued on next page										

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval. 11-26 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-26 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-11

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 27.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

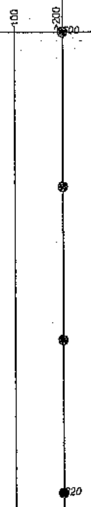
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/18/04
DATE COMPLETED: 6/18/04
WEATHER: Overcast

DATUM: Local
COORDS: N: 206,048.8 E: 1,001,733.7
GS ELEVATION: 18.8 ft
TOC ELEVATION: 18.9 ft
TEMPERATURE: 70-75 F

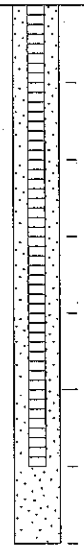
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		17.0 - 23.0 Water saturated, Gray brown poorly sorted compact CF SAND, trace fine to medium gravel *(Continued)*	SW		SS	6 14 24 26	2.0/2.0	390 350 500			
				-4.2	SS	8 19 22 17	1.2/2.0	200 150			
	-5	23.0 - 27.0 Water saturated, Gray brown poorly sorted compact CF SAND, trace fine to medium gravel	SP	23.0	SS	8 12 17 21	1.7/2.0	170 200 190			
25				-8.2	SS	3 12 20 26	2.0/2.0	220 170 150			
		Boring completed at 27.0 ft									
30	-10										
35	-15										
40	-20										

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-26 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-26 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-12

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

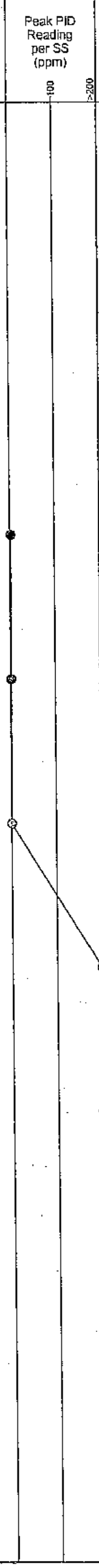
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/24/04
DATE COMPLETED: 6/24/04
WEATHER: Sun/Humid/Lt. Breeze

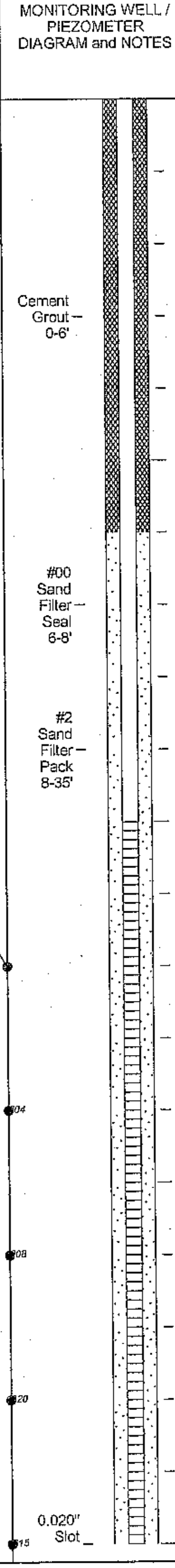
DATUM: Local
COORDS: N: 206,004.2 E: 1,001,596.2
GS ELEVATION: 17.3 ft
TOC ELEVATION: 17.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
0		0.0 - 5.0 Concrete slab/ asphalt, concrete fragments and fill debris	FILL	12.3 5.0					
5		5.0 - 11.0 Moist, Orange brown loose to compact silty MF SAND, trace cobbles and fill debris (slight to no odor)	SP		SS	2 5 6 6	1.6/2.0	0.7 0.9 2.6	
	10				SS	8 8 9 11	1.7/2.0	0.7 1.7 0.8	GAL-120208 6/24/2004
10				6.3 11.0	SS	8 9 13 20	0.6/2.0	1.0	
	5	11.0 - 19.0 Oil wet, grayish brown poorly sorted CF SAND, some rounded CF GRAVEL (moderate HC odor)	SW		SS	4 13 13 15	1.4/2.0	9 130 200	GAL-120313 6/24/2004
					SS	4 18 13 17	1.1/2.0	130 200 204	GAL-120415 6/24/2004
15					SS	17-32 50/0.4	1.0/2.0	130 208	GAL-120517 6/24/2004
	0			-1.7 19.0	SS	10 19 14 17	1.2/2.0	250 320	GAL-120619 6/24/2004
20		19.0 - 23.0 Oil wet, blackish to grayish brown pooly sorted compact CF SAND, little CF GRAVEL	SP		SS	19 18 14 14	2.0/2.0	423 615	GAL-121519 6/24/2004

Log continued on next page





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap. Threaded

FILTER PACK
Interval: 8-33 ft bgs
Type: #2 Sand
Quantity:

FILTER PACK SEAL
Interval: 0-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAL-12

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/24/04
DATE COMPLETED: 6/24/04
WEATHER: Sun/Humid/Lt. Breeze

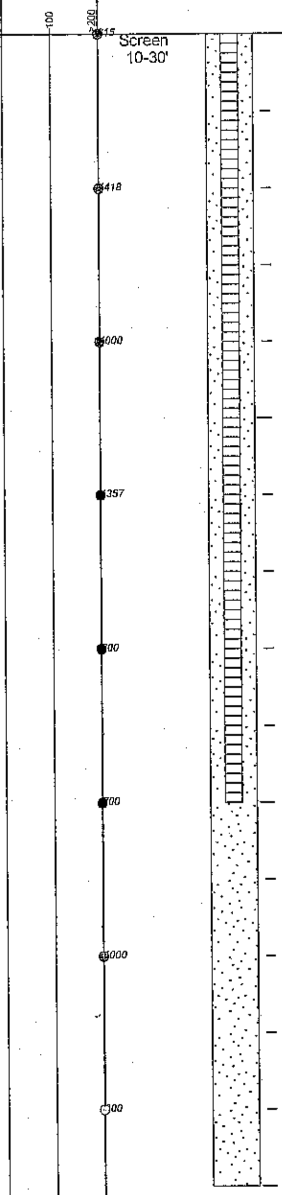
DATUM: Local
COORDS: N: 206,004.2 E: 1,001,596.2
GS ELEVATION: 17.3 ft
TOC ELEVATION: 17.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		19.0 - 23.0 Oil wet, blackish to grayish brown pooly sorted compact CF SAND, little CF GRAVEL *(Continued)*	SP		SS	19 18 14 14	2.0/2.0	423 615			
	-5			-5.7	SS	10 18 16 14	1.6/2.0	214 1,041 1,418	☒	GAL-120721 6/24/2004	
		23.0 - 27.0 Oil wet, Grayish black well graded compact CF SAND, trace fine gracvel (strong HC odor)	SW	23.0	SS	4 11 11 15	1.6/2.0	1,000 790	☒	GAL-120823 6/24/2004	
25				-9.7	SS	4 11 13 14	2.0/2.0	1,357 1,260 560	☒	GAL-121026 6/24/2004	
	-10	27.0 - 29.0 Water saturated Reddish gray brown poorly sorted CF SAND, trace MF gravel 9 (moderate to slight odor)	SP	27.0 -11.7	SS	10 15 18 18	1.4/2.0	110 300 250			
30		29.0 - 35.0 Water saturated gray brown well graded CF SAND, trace silt and fine gravel (moderate HC odor)	SW	29.0	SS	4 10 12 20	1.8/2.0	700 500 240	☒	GAL-121230 6/24/2004	
	-15				SS	6 9 15 19	2.0/2.0	600 800 1,000			
				-17.7	SS	7 11 14 18	2.0/2.0	900 560 350	☒	GAL-121333 6/24/2004	
35		Boring completed at 35.0 ft									
	-20										
40											

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-33 ft bgs
Type: #2 Sand
Quantity:

FILTER PACK SEAL
Interval: 0-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-13

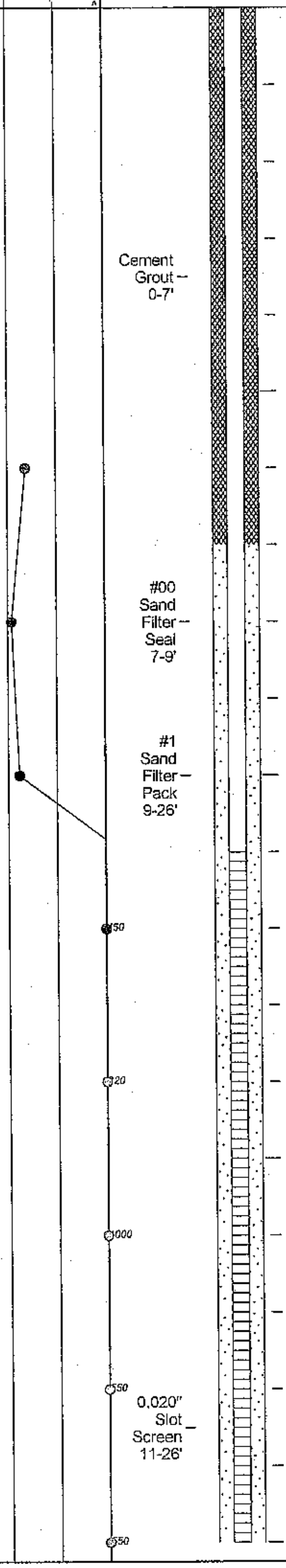
SHEET 1 of 2

PROJECT: Quanta Resources Site	DRILL METHOD: Hollow-stem auger	DATUM: Local	INCLINATION: -90
PROJECT NUMBER: 023-6151	DRILL RIG: Mobile B-58	COORDS: N: 206,218.1 E: 1,001,590.3	DEPTH W.L.:
DRILLED DEPTH: 31.0 ft	DATE STARTED: 6/16/04	GS ELEVATION: 18.1 ft	ELEVATION W.L.:
AZIMUTH: N/A	DATE COMPLETED: 6/16/04	TOC ELEVATION: 18.1 ft	DATE W.L.:
LOCATION: North Capasso Property	WEATHER: Sun/Lt. Breeze	TEMPERATURE: 75-85 F	TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0	15	0.0 - 5.0 Fill material, sand, gravel, cobbles, concrete, brick fragments	FILL								
5		5.0 - 11.0 Dry gray brown to olive brown compact MF SAND and medium GRAVEL (slight HC odor)	SP	13.1 5.0	SS	8 14 12 9	1.4/2.0	4.0 38			
	10				SS	14 12 18 18	1.0/2.0	8.0	☒	GAL-1301-07 6/16/2004	
10					SS	19 27 25 24	1.5/2.0	12.8 23.5	☒	GAL-1302-11 6/16/2004	
		11.0 - 15.0 Oil moist, gray brown to reddish brown loose to compact MF SAND, little CF rounded GRAVEL	SW	7.1 11.0	SS	10 17 12 11	1.3/2.0	9 24 450	☒	GAL-1303-13 6/16/2004	
	5				SS	7 15 19 22	1.0/2.0	820			
15		15.0 - 23.0 Oil wet, dark olive gray brown MF SAND, trace CF gravel, (strong HC odor)	SW	3.1 15.0	SS	3 6 6 7	1.2/2.0	1,000 650	☒	GAL-1305-16 6/16/2004	
	0				SS	6 7 9 13	2.0/2.0	540 550 520	☒	GAL-1306-18 6/16/2004	
20		Log continued on next page			SS	10 12 12 17	2.0/2.0	550 350 120			

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-26 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-26 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

QUANTA SOIL BOR JANTA18NOV04.GPJ QUANTA.GDT 1/20/05

RECORD OF BOREHOLE GAL-13

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/16/04
DATE COMPLETED: 6/16/04
WEATHER: Sun/Lt. Breeze

DATUM: Local
COORDS: N: 206,218.1 E: 1,001,590.3
GS ELEVATION: 18.1 ft
TOC ELEVATION: 18.1 ft
TEMPERATURE: 75-85 F

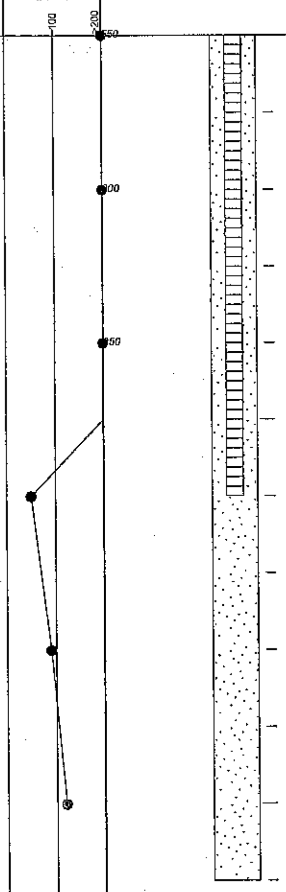
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
20		15.0 - 23.0 Oil wet, dark olive gray brown MF SAND , trace CF gravel, (strong HC odor) *(Continued)*	SW	-4.9 23.0
	-5	23.0 - 27.0 Water saturated reddish brown poorly sorted CF SAND, trace fine gravel (moderate gravel)	SP	-8.9 27.0
25				
	-10	27.0 - 31.0 Water saturated Dark gray brown well sorted MF SAND, trace fine gravel (moderate HC odor)	SW	-12.9
30		Boring completed at 31.0 ft		
35	-15			
40	-20			

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
SS	10 12 12 17	2.0 / 2.0	550 350 120	GAL-1307-21 6/16/2004	
SS	4 2 5 18	2.0 / 2.0	650 900 250	GAL-1308-22 6/16/2004	
SS	10 12 16 27	2.0 / 2.0	350 115 120	GAL-1309-25 6/16/2004	
SS	5 11 15 21	1.5 / 2.0	45 50		
SS	5 12 13 22	1.0 / 2.0	80 90	GAL-1310-27 6/16/2004	
SS	6 12 16 24	1.3 / 2.0	115 120	GAL-1312-31 6/16/2004	



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-26 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-26 ft bgs
Type: #1 Sand
Quantity:

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-14

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/27/04
DATE COMPLETED: 6/27/04
WEATHER: Sun/Lt. Breeze

DATUM: Local
COORDS: N: 205,800.4 E: 1,001,812.5
GS ELEVATION: 16.3 ft
TOC ELEVATION: 16.3 ft
TEMPERATURE: 75-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

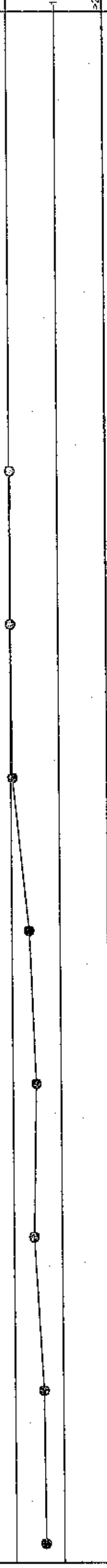
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 5.0 Fill material, sand, cobbles, concrete, brick fragments, timber	FILL	
5.0 - 9.0 Moist, red brown to Dark graysih brown MF SAND, little fine rounded GRAVEL, trace cobble	SP	11.3 5.0
9.0 - 11.0 Black streak stained Dark grayish brown compact CF SAND , trace fine rounded gravel (slight HC odor)	SP	7.3 9.0
11.0 - 19.0 Oil wet, Dark grayish brown compact-dense CF SAND, trace to little fine rounded gravel (Moderate to strong HC odor)	SP	5.3 11.0
19.0 - 23.0 Oil wet, Grayish brown well graded compact CF SAND, little rounded fine GRAVEL (moderate HC odor)	SW	-2.7 19.0

Log continued on next page

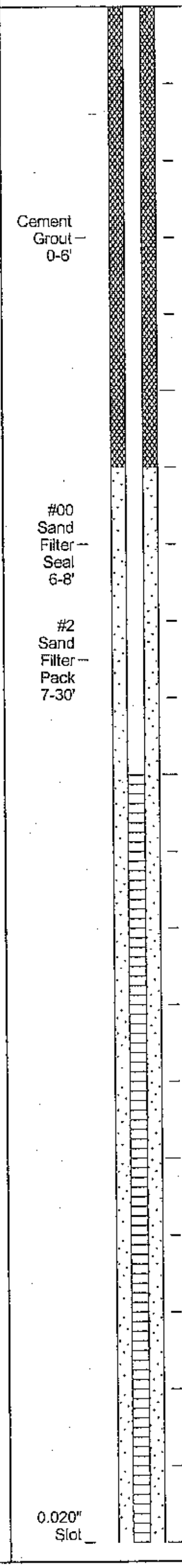
SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	5 5 5 9	1.5/2.0	1.3 1.9 0.9	GAL140106 6/27/2004
SS	6 6 13 14	1.4/2.0	0.7 1.0 0.6	
SS	4 9 13 25	0.6/2.0	0.7 3.6	
SS	3 8 15 13	1.0/2.0	33 36	GAL140311 6/27/2004
SS	5 11 13 14	1.5/2.0	32 49 30	GAL140413 6/27/2004
SS	9 14 16 13	1.4/2.0	39 42	GAL140515 6/27/2004 GAL140617 6/27/2004
SS	5 7 11 15	2.0/2.0	55 60 45	GAL140718 6/27/2004
SS	4 11 13 15	1.5/2.0	34 62 25	GAL140820 6/27/2004

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 7-30 ft bgs
Type: #2 Sand
Quantity:

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-14

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage Property

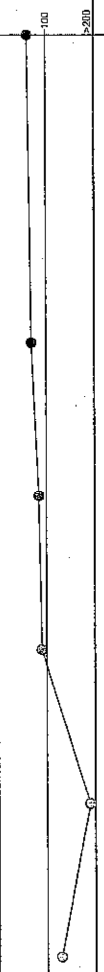
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/27/04
DATE COMPLETED: 6/27/04
WEATHER: Sun/Lt. Breeze

DATUM: Local
COORDS: N: 205,800.4 E: 1,001,812.5
GS ELEVATION: 16.3 ft
TOC ELEVATION: 16.3 ft
TEMPERATURE: 75-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

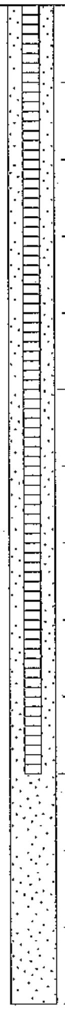
DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses
20		19.0 - 23.0 Oil wet; Grayish brown well graded compact CF SAND, little rounded fine GRAVEL (moderate HC odor) *(Continued)*	SW		SS	4 11 13 15	1.5/2.0	34 62 25			
	-5				SS	7 9 14 27	0.5/2.0	N/A N/A N/A			
		23.0 - 29.0 Water saturated, grayish brown poorly sorted CF SAND and CF GRAVEL, trace cobbles	SP	-6.7 23.0	SS	4 8 23 25	2.0/2.0	60 60 70	☒	GAL140925 6/27/2004	
25	-10				SS	8 9 11 22	1.6/2.0	85 75	☒	GAL141026 6/27/2004	
					SS	16 28 30 25	1.0/2.0	45 90	☒	GAL141129 6/27/2004	
30		29.0 - 33.0 Water Saturated Dark Grayish brown well-graded compact CF SAND, some sub/rounded GRAVEL	SW	-12.7 29.0	SS	4 8 14 30	2.0/2.0	100 80 190	☒	GAL141231 6/27/2004	
	-15				SS	13 21 18 21	2.0/2.0	110 130			
				-16.7 33.0							
35	-20	Boring completed at 35.0 ft									
40											

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

Screen
10-30'



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 7-30 ft bgs
Type: #2 Sand
Quantity:

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-15

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/26/04
DATE COMPLETED: 6/26/04
WEATHER: M. Cloudy/Calm

DATUM: Local
COORDS: N: 205,949.1 E: 1,001,983.7
GS ELEVATION: 21.8 ft
TOC ELEVATION: 22.0 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 5.0 Fill material, sand,gravel,cobbles, concrete, brick fragments, timber	FILL	16.8 5.0
5.0 - 13.0 Oil wet to black stained compact silty MF SAND, trace clay (moderate to strong HC odor)	SM	8.8 13.0
13.0 - 17.0 Oil stained compact to dense MF SAND, trace silt and fine rounded gravel (moderate HC odor)	SWG	4.8 17.0
17.0 - 25.0 Intermittent black stained, olive brown soft to firm VF SAND and SILT, varve like features (Strong HC odor)	SP-SM	

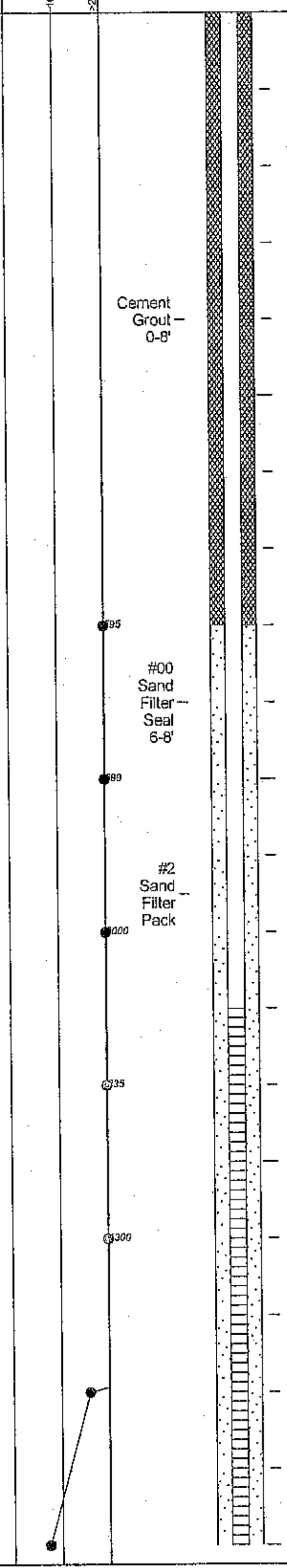
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	1 7 12 10	0.0 / 2.0	N/A N/A N/A	
SS	3 4 9 13	1.8 / 2.0	595 36 45	GAL150107 6/26/2004
SS	12/50/0.5	1.0 / 2.0	80 220 589	
SS	15 23 24 49	1.3 / 2.0	850 8,000	GAL150211 6/26/2004 GAL150313 6/26/2004
SS	32 38 50/0.5	2.0 / 2.0	235 133 12	GAL150414 6/26/2004
SS	14 19 22 27	1.7 / 2.0	206 965 1,300	GAL150517 6/26/2004
SS	15 26 50/0.3	2.0 / 2.0	75 29 160	GAL150619 6/26/2004
SS	16 17 26 26	2.0 / 2.0	3.8 25 74	

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-13 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 13-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 10-31 ft bgs
Type: #2 Sand
Quantity: 9x50 lb

FILTER PACK SEAL
Interval: 8-10 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-8 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-15

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage Property

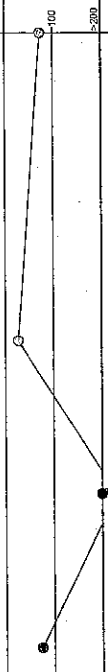
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/26/04
DATE COMPLETED: 6/26/04
WEATHER: M. Cloudy/Calm

DATUM: Local
COORDS: N: 205,949.1 E: 1,001,983.7
GS ELEVATION: 21.8 ft
TOC ELEVATION: 22.0 ft
TEMPERATURE: 70-80 F

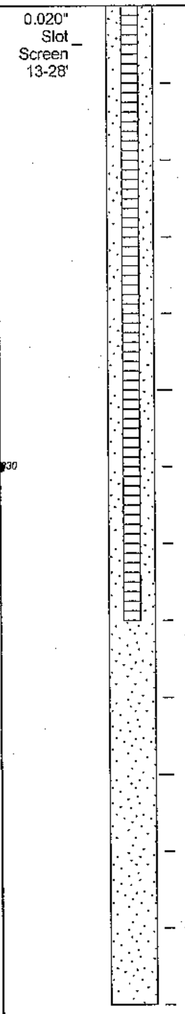
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE			SAMPLES					
DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected	Analyses
17.0 - 25.0 Intermittent black stained, olive brown soft to firm VF SAND and SILT, varve like features (Strong HC odor) *(Continued)*	SP-SM		SS	16 17 26 26	2.0/2.0	3.8 25 74	GAL150721 6/26/2004	
			SS	5 3 10	0.5/2.0	N/A N/A N/A		
		-3.2 25.0	SS	5 7 8	0.5/2.0	27		
25.0 - 31.0 Olive yellow soft silty Clay (slight to moderate odor)	ML		SS	3 4 6	1.8/2.0	230 34 64	GAL150827 6/26/2004	
			SS	5 6 14	0.1/2.0	75 50 29	GAL150928 6/26/2004	
		-9.2 31.0	SS	50/0.3	1.0/2.0	N/A N/A N/A		
31.0 - 33.0 Olive brown to red brown soft silty MF SAND (slight HC odor)	ML	-11.2	SS	5 7 10	0.0/2.0	N/A N/A N/A		
Boring completed at 33.0 ft								

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-13 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 13-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 10-31 ft bgs
Type: #2 Sand
Quantity: 9x50 lb

FILTER PACK SEAL
Interval: 8-10 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-8 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-16

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 29.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 7/1/04
DATE COMPLETED: 7/1/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,763.3 E: 1,001,717.3
GS ELEVATION: 18.7 ft
TOC ELEVATION: 21.5 ft
TEMPERATURE: 80-85 F

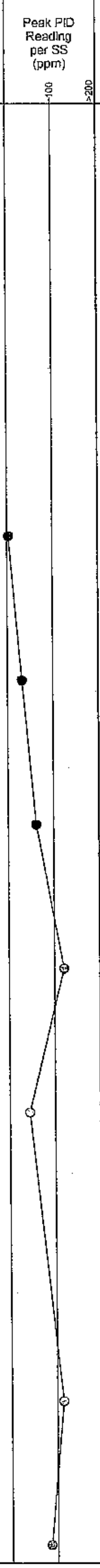
INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

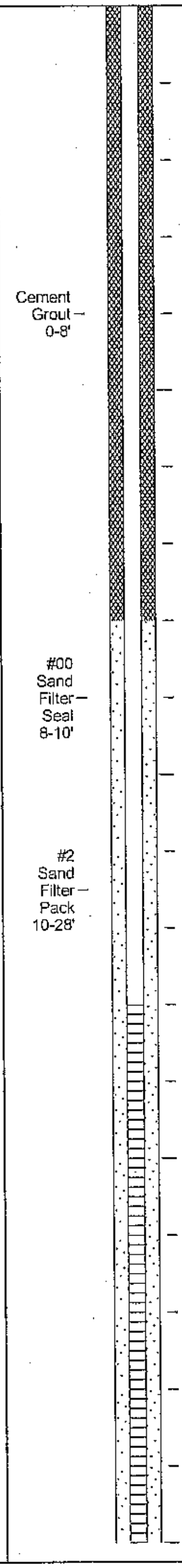
SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 5.0 Dry brown sand and gravel FILL, some brick and concrete fragments, wood and metal debris. Borehole advanced to 5 ft bgs via "soft dig" techniques.	FILL	
5.0 - 8.0 Damp black stained medium-fine SAND, some silt, little to trace subangular coarse gravel and rounded gravel. Slight HC odor.	FILL	13.7 5.0
8.0 - 9.0 Damp light brown medium-fine SAND, some to little coarse gravel. Slight HC odor.	SP	10.7 8.0
9.0 - 16.0 Moist gray to grayish brown black stained medium-fine SAND, little to trace silt and fine rounded gravel, trace coarse gravel. Slight to moderate HC odor.	SP	9.7 9.0
16.0 - 19.0 Moist black (intermittent streaking) well graded coarse-fine SAND, little coarse subangular gravel. Moderate to strong HC odor.	SW	2.7 16.0
19.0 - 19.5 Oil wet black medium-fine SAND, some to little silt, little fine rounded gravel and cobbles. Stong HC odor.	SP-SM	-0.3 19.0
	SWG	-0.8 19.5

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	4 5 4 5	1.2 / 2.0	0.9 1.2 3.4			
SS	5 8 14 10	1.2 / 2.0	32 4 9			
SS	7 3 4 3	1.3 / 2.0	62 27 39			
SS	3 3 6 8	1.2 / 2.0	52 121 70			
SS	35 7 9 9	1.4 / 2.0	36 44 28			
SS	9 8 11 13	0.0 / 2.0	N/A N/A N/A			
SS	5 10 10 12	0.1 / 2.0	114			
SS	10 7 6 7	1.4 / 2.0	86 63 62			





WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-13 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 13-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 10-28 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 8-10 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-8 ft bgs
Type: Cement Grout
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-16

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 29.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

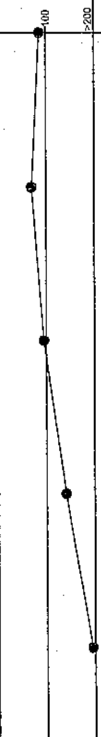
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 7/1/04
DATE COMPLETED: 7/1/04
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,763.3 E: 1,001,717.3
GS ELEVATION: 18.7 ft
TOC ELEVATION: 21.5 ft
TEMPERATURE: 80-85 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

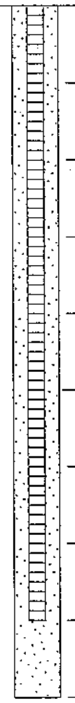
DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		19.5 - 27.0 Oil saturated, grayish brown, well graded, coarse-fine SAND, some coarse rounded and subangular gravel, trace fine rounded gravel. Strong HC odor. *(Continued)*	SWG		SS	10 7 6 7	1.4/2.0	86 63 62			
					SS	8 6 4 8	1.1/2.0	50 64 70			
	-5				SS	6 7 8 6	0.9/2.0	70 95			
25				-8.3 27.0	SS	14 15 12 11	1.5/2.0	80 110 140			
	-10	27.0 - 29.0 Oil saturated, grayish brown with black staining, sorted, medium-fine SAND, trace fine gravel. Strong HC odor	SP	-10.3	SS	9 12 13 10	0.1/2.0	195 170			
		Boring completed at 29.0 ft									
30	-15										
35	-20										
40											

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

0.020" Slot Screen 13-28'



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-13 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 13-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 10-28 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 8-10 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-8 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-17

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/26/04
DATE COMPLETED: 6/26/04
WEATHER: M. Cloudy/Calm

DATUM: Local
COORDS: N: 205,897.6 E: 1,001,933.6
GS ELEVATION: 16.3 ft
TOC ELEVATION: 16.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

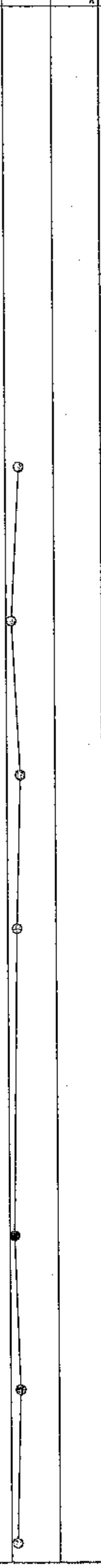
SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 7.0 Fill material, sand, gravel, cobbles, brick fragments (sheen observed in borehole during "Soft Dig"	FILL	
7.0 - 11.0 Dark Gray firm silt and rock and brick fragments	FILL	9.3 7.0
11.0 - 17.0 Dry, dark reddish brown dense coarse SAND and C GRAVEL (slight HC odor)	SP	5.3 11.0
17.0 - 21.0 Oil wet, dark gray brown loose to dense CF SAND, little rounded MF gravel (slight HC odor)	SP	-0.7 17.0

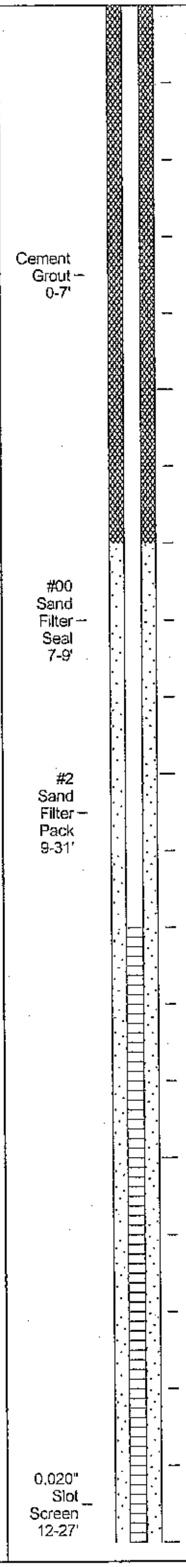
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID / Date/Time Collected
SS	2 8 25 20	1.5/2.0	24 28 22.7	GAL170106 6/26/2004
SS	7 8 15 27	1.4/2.0	7.0 11.2	
SS	15 21 35 21	1.5/2.0	15.0 28.0	
SS	39 23 31 30	1.3/2.0	19.4 10.1	GAL170312 6/26/2004
SS	41 50/0.4	0.0/2.0		GAL170415 6/26/2004
SS	15 37 27 24	1.0/2.0	10.2	
SS	2 11 14 18	1.6/2.0	10.4 20.6	GAL170518 6/26/2004
SS	8 16 15 16	2.0/2.0	4.3 12.5 10.1	



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-12 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 12-27 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-29 ft bgs
Type: #2 Sand
Quantity:

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-17

SHEET 2 of 2

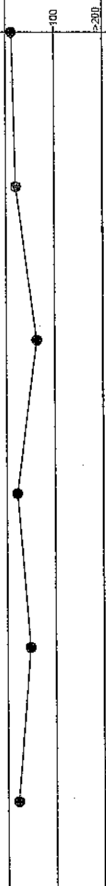
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/26/04
DATE COMPLETED: 6/26/04
WEATHER: M. Cloudy/Calm

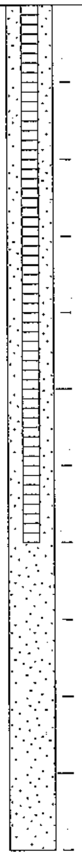
DATUM: Local
COORDS: N: 205,897.6 E: 1,001,933.6
GS ELEVATION: 16.3 ft
TOC ELEVATION: 16.3 ft
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
20		17.0 - 21.0 Oil wet, dark gray brown loose to dense CF SAND, little rounded MF gravel (slight HC odor) *(Continued)*	SP		-4.7 21.0	SS	8 16 15 16	2.0 / 2.0	4.3 12.5 10.1	☒	GAL170621 6/26/2004		
	-5	21.0 - 25.0 Oil wet, dark gray brown dense CF SAND, trace fine gravel (slight HC odor)	SP			SS	13 14 19 32	2.0 / 2.0	5.7 20.7 20.9	☒	GAL170723 6/26/2004		
					-8.7 25.0	SS	4 8 10 15	2.0 / 2.0	63 33 20				
25	-10	25.0 - 27.0 Water saturated, dark gray brown compact silty MF SAND, little rounded fine gravel (slight HC odor)	SM		-10.7 27.0	SS	4 8 12 15	2.0 / 2.0	22 19.1 7.6	☒	GAL170926 6/26/2004		
		27.0 - 31.0 Water saturated, dark gray brown compact CM SAND, little MF rounded gravel (slight HC odor)	SP			SS	6 8 12 15	2.0 / 2.0	9.0 20 48	☒	GAL171029 6/26/2004		
30					-14.7	SS	7 9 11 14	2.0 / 2.0	20 20 22	☒	GAL171131 6/26/2004		
	-15	Boring completed at 31.0 ft											
35	-20												
40													



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-12 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type. Threaded

WELL SCREEN
Interval: 12-27 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-29 ft bgs
Type: #2 Sand
Quantity:

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-18

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 30.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 7/14/04
DATE COMPLETED: 7/14/04
WEATHER: Partly Cloudy

DATUM: Local
COORDS: N: 206,136.4 E: 1,001,823.4
GS ELEVATION: 22.7 ft
TOC ELEVATION: 22.6 ft
TEMPERATURE: 70-75 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

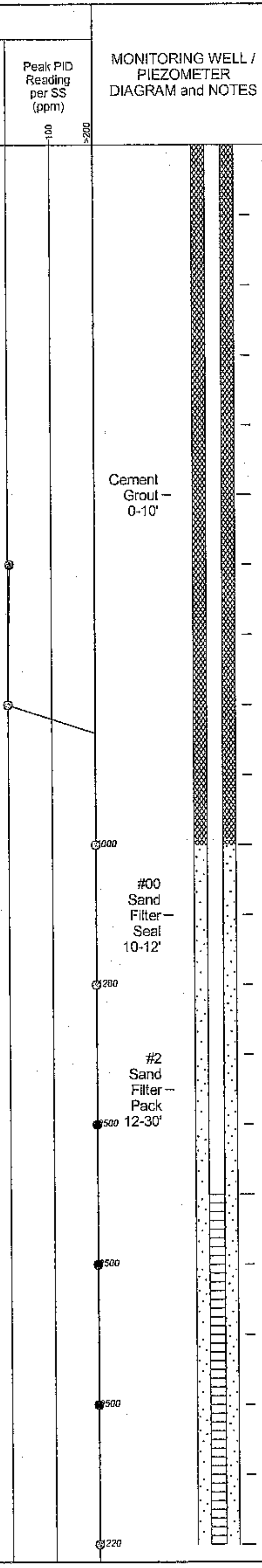
SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 0.5 Asphalt	ASPHA	22.2 0.5
0.5 - 9.5 Dry, dark brown to black, coarse to fine sand and gravel FILL, little to trace silt, brick fragments and wood debris. No odor.	FILL	13.2 9.5
9.5 - 11.7 Oil moist, dark reddish brown, loose, well graded, coarse-fine SAND, trace medium gravel. Strong LHC odor.	SW	11.0
11.7 - 12.0 Moist, gray, soft to firm, SILT.	ML	10.7 12.0
12.0 - 15.0 Oil moist, dark reddish brown, loose, well graded, coarse-fine SAND, trace medium gravel. Strong LHC odor.	SW	7.7 15.0
15.0 - 17.0 Oil moist, grayish brown, sorted meduim-fine SAND, trace coarse sand and fine gravel. Strong LHC odor	SP	5.7 17.0
17.0 - 19.5 Oil wet/saturated, reddish gray brown, sorted, medium-fine SAND, trace fine subangular gravel. Coarsing with depth. Strong LHC odor.	SP	3.2 19.5
	SP-SM	

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	1 3 1 2	0.5 / 2.0	2.1 4.1			
SS	2 1 1 1	0.3 / 2.0	0.0			
SS	7 8 9 10	1.5 / 2.0	600 970 1000			
SS	7 8 9 10	2.0 / 2.0	700 1200 1280			
SS	3 6 9 12	1.5 / 2.0	1500 1440 2500			
SS	3 6 7 13	2.0 / 2.0	1500 1440 2500			
SS	9 10 12 15	1.7 / 2.0	1500 1800 2500			
SS	9 21 17 16	1.0 / 2.0	1220 720			



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 12-30 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 10-12 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-10 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

RECORD OF BOREHOLE GAL-18

SHEET 2 of 2

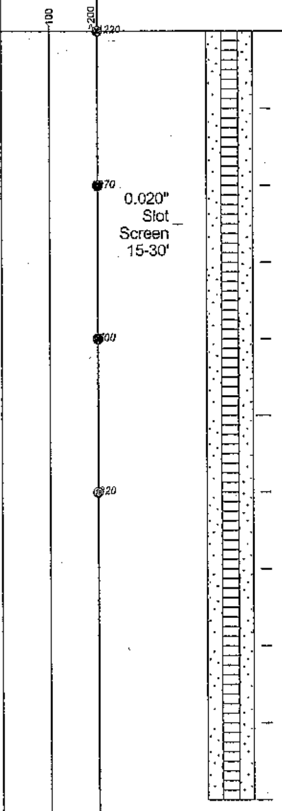
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 30.0 ft
AZIMUTH:: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 7/14/04
DATE COMPLETED: 7/14/04
WEATHER: Partly Cloudy

DATUM: Local
COORDS: N: 206,136.4 E: 1,001,823.4
GS ELEVATION: 22.7 ft
TOC ELEVATION: 22.6 ft
TEMPERATURE: 70-75 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		19.5 - 24.0 Oil moist, gray, soft to firm, SILT and very fine-fine SAND. Coarsens with depth. Moderate to slight odor. *(Continued)*	SP-SM			SS	9 21 17 16	1.0/2.0	1220 720			
	0					SS	6 9 14 18	2.0/2.0	840 970 600			
					-1.3 24.0	SS	11 25 21 28	2.0/2.0	700 550 230			
25		24.0 - 30.0 H2O saturated, grayish brown, compact, well graded, coarse to fine SAND, trace fine gravel. Slight odor.	SW			SS	8 22 30 32	2.0/2.0	320 179			
	-5											
						SS	15 18 20 25	0.5/2.0	N/A N/A			
30		Boring completed at 30.0 ft			-7.3							
35	-10											
40	-15											



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 12-30 ft bgs
Type: #2 Sand
Quantity: 12x50 lb

FILTER PACK SEAL
Interval: 10-12 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-10 ft bgs
Type: Cement Grout
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE GAL-19

SHEET 1 of 2

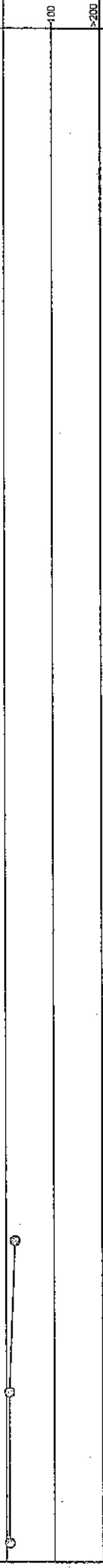
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: Quanta

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 2/23/05
DATE COMPLETED: 2/24/05
WEATHER: P. Sunny

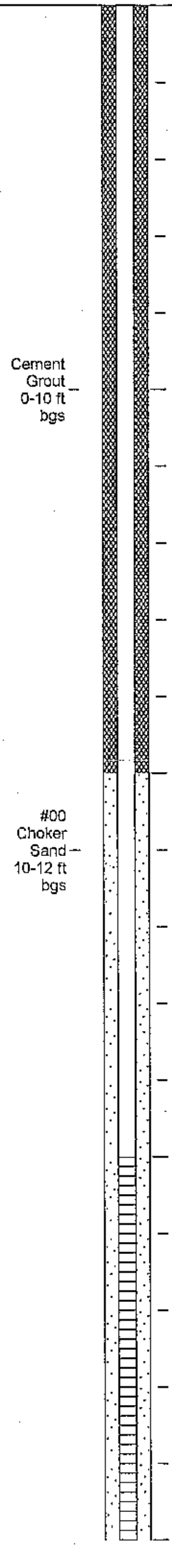
DATUM: Local
COORDS: N: 206,025.9 E: 1,001,783.9
GS ELEVATION: 22.9 ft
TOC ELEVATION: 25.2 ft
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES							
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
0		0.0 - 0.5 CONCRETE AND ASPHALT	CONC		22.4 0.5								
5 10	20 15 10	0.5 - 15.0 Fragmented brick and rock FILL.	FILL		7.9 15.0								
15		15.0 - 17.0 Black (oil stained), compact medium to fine SAND, trace fines and fine to coarse gravel, strong hydrocarbon odor.	SW		5.9 17.0	SS	10 15 11 11	1.3/2.0	54.6 93.8				
	5	17.0 - 21.0 Oil wet, black compact fine to very fine SAND, little fine to coarse rounded gravel, slight to moderate hydrocarbon odor.	SP			SS	7 12 13 14	1.2/2.0	34 32				
20						SS	25 50/.5	0.5/2.0	35				



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 2 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-35 ft bgs
Material: Sch 40 PVC
Diameter: 2 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 12-35 ft bgs
Type: #2 Sand
Quantity: 10x50 lb

FILTER PACK SEAL
Interval: 10-12 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-10 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 7.5"

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-19

SHEET 2 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: Quanta

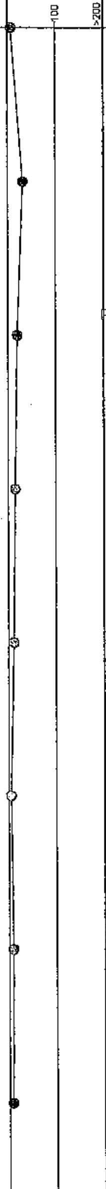
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 2/23/05
DATE COMPLETED: 2/24/05
WEATHER: P. Sunny

DATUM: Local
COORDS: N: 206,025.9 E: 1,001,783.9
GS ELEVATION: 22.9 ft
TOC ELEVATION: 25.2 ft
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		17.0 - 21.0 Oil wet, black compact fine to very fine SAND, little fine to coarse rounded gravel, slight to moderate hydrocarbon odor. *(Continued)*	SP			SS	25 50/.5	0.5/2.0	35			
		21.0 - 23.0 Oil wet, Saturated black, compact well graded medium to fine SAND, strong hydrocarbon odor.	SW		1.9 21.0	SS	6 10 9 11	1.9/2.0	146 115 156			
	0	23.0 - 31.0 Oil wet, Saturated black, compact fine to very fine SAND, trace fines, strong hydrocaron odor.	SM		-0.1 23.0	SS	6 7 9 9	1.4/2.0	98 90			
25						SS	5 10 13 15	1.6/2.0	72 72 69			
	-5					SS	5 6 8 11	0.7/2.0	58 58			
30						SS	6 13 15 12	1.8/2.0	22 21 20			
		31.0 - 33.0 Black (oil stained), compact medium to fine SAND, trace fine Gravel. Oil stained with moderate hydrocarbon odor.	SP		-8.1 31.0	SS	8 8 8 10	1.5/2.0	38 42 41			
	-10	33.0 - 35.0 Saturated, black oil stained, compact fine to very fine SAND, trace coarse gravel, trace fine subangular gravel, slight to moderate hydrocarbon odor.	SP		-10.1 33.0	SS	12 15 11 17	1.0/2.0	36 35 30			
35		Boring completed at 35.0 ft			-12.1							
	-15											
40												

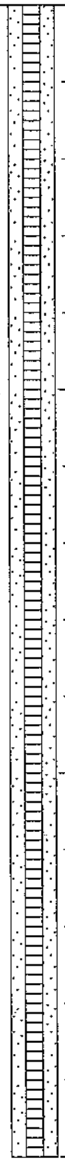
Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

#1 Sand Filter Pack12-35 ft bgs

0.020 (2 inch PVC) Slot Screen 15-35 ft5 bgs



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-35 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 12-35 ft bgs
Type: #2 Sand
Quantity: 10x50 lb

FILTER PACK SEAL
Interval: 10-12 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-10 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE DIAMETER: 7.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-20

SHEET 1 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: Quanta

DRILL METHOD: Geoprobe
DRILL RIG: Geoprobe
DATE STARTED: 2/28/05
DATE COMPLETED: 3/1/05
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 206,063.8 E: 1,001,854.2
GS ELEVATION: 27.8 ft
TOC ELEVATION: 29.9 ft
TEMPERATURE: 20-25 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
0.0 - 12.0 Soft sand, silt and debris FILL inside containment concretre walls.	FILL	15.8								
12.0 - 14.0 Concrete, rock and brick FILL debris.	FILL	12.0 13.8								
14.0 - 15.0 Moist, black oil stained, very fine SANDY SILT, little coarse gravel and trace fine gravel, strong hydrocarbon odor.	SM	14.0 12.8	GRAB	NA	$\frac{1.0}{1.0}$	NA				
15.0 - 15.5 Moist, Lt Brown (intermittent staining), medium to fine SAND, little gravel, strong hydrocarbon odor	SP	15.0 12.3	CORE	NA	$\frac{5.0}{5.0}$	NA				
15.5 - 16.5 Moist, gray-brown very fine SANDY SILT, slight odor.	SM	15.5 11.3								
16.5 - 17.0 Moist, black stained, SILTY very fine SAND, strong hydrocarbon odor.	SM	16.5 10.8								
17.0 - 17.5 Tan-brown, SILTY CLAY, slight odor.	CL-ML	17.0 10.3								
17.5 - 19.0 Gray-brown, CLAY, trace very fine sand, moderate odor.	CL	17.5 8.8								
19.0 - 20.0 Oil wet, black SILTY CLAY and coarse gravel, strong hydrocarbon odor.	CL-ML	19.0 7.8								

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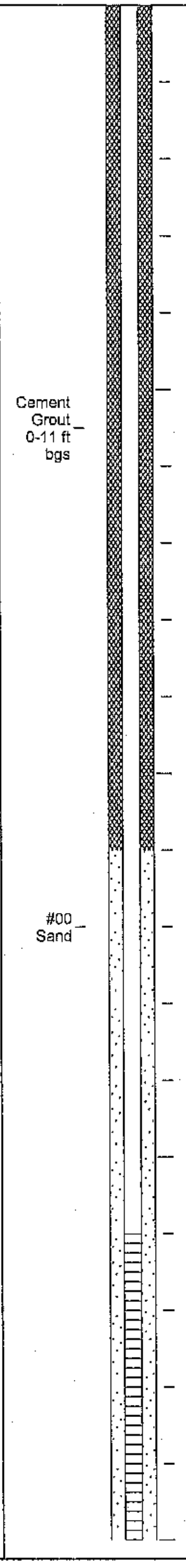
MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Joint Type: Threaded

WELL SCREEN
Interval: 16-33 ft bgs
Material: Sch 40 PVC
Diameter: 2 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-16 ft bgs
Type: #2 Sand
Quantity: 10x50 lb

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 7.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

RECORD OF BOREHOLE GAL-20

SHEET 2 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: Quanta

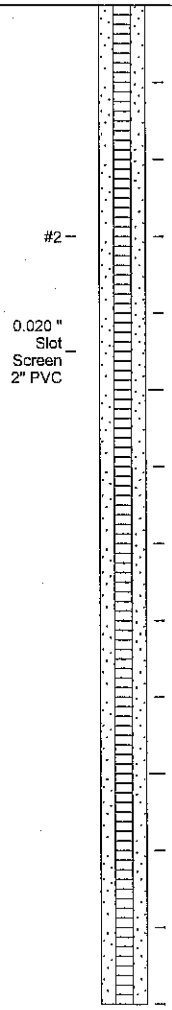
DRILL METHOD: Geoprobe
DRILL RIG: Geoprobe
DATE STARTED: 2/28/05
DATE COMPLETED: 3/1/05
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 206,063.8 E: 1,001,854.2
GS ELEVATION: 27.8 ft
TOC ELEVATION: 29.9 ft
TEMPERATURE: 20-25 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
20		20.0 - 33.0 Saturated some intermittent staining, dark gray-brown M SAND, little fine to coarse gravel, strong hydrocarcon odor.	SP		20.0								
	5					CORE	NA	$\frac{5.0}{5.0}$	NA				
25													
	0												
30													
	-5				-5.2								
		Boring completed at 33.0 ft											
35													
	-10												
40													

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 2 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 16-33 ft bgs
Material: Sch 40 PVC
Diameter: 2 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-16 ft bgs
Type: #2 Sand
Quantity: 10x50 lb

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 7.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-21

SHEET 1 of 2

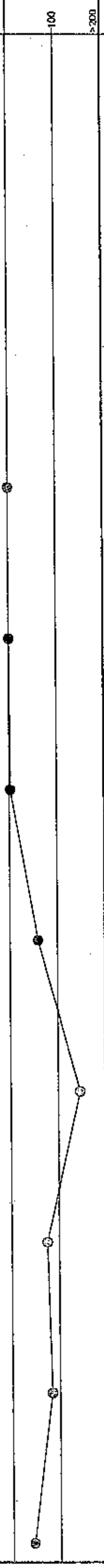
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/30/05
DATE COMPLETED: 3/30/05
WEATHER: Sunny

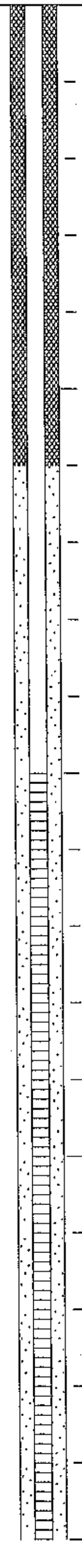
DATUM: Local
COORDS: N: 206,064.0 E: 1,001,657.5
GS ELEVATION: 17.8 ft
TOC ELEVATION: 17.5 ft
TEMPERATURE: 60-62 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE			SAMPLES						
		DESCRIPTION	USCS	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample interval	Laboratory Sample ID Date/Time Collected	Analyses
0	15	0.0 - 5.0 Fill material - sand, gravel, cobbles, concrete, brick fragments, wood.	FILL	12.8							
5		5.0 - 7.0 Very moist, soft dark brown CLAYEY SILT, some medium sand, little timber, rock fragments and fill debris.	CL-ML	5.0 10.8	SS	1 1 5 2	0.3/2.0	0.2			
	10	7.0 - 8.0 Moist, tannish brown, compact SILTY medium SAND.	SP-SM	7.0 9.8	SS	4 13 16 16	1.8/2.0	0.9 1.1 2.1			
		8.0 - 8.8 Moist, grayish black, compact medium to coarse SAND, with some fine rounded gravel.	SW	8.0 9.0							
10		8.8 - 11.0 Moist, grayish brown, compact medium SAND, well sorted, slight odor.	SW	8.8 6.8	SS	3 5 6 7	1.3/2.0	2.3 12			
	5	11.0 - 13.0 Moist, grayish brown, compact medium to fine SAND, with trace fine rounded gravel, slight to moderate odor.	SP	11.0 4.8	SS	9 9 9 9	4.4/2.0	24.1 63.2 296			
15		13.0 - 17.0 Oil wet, black, compact medium to fine SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP	13.0	SS	6 8 11 14	1.2/2.0	732 464			
				0.8	SS	3 9 8 12	1.4/2.0	377 362 359			
	0	17.0 - 19.0 Wet, oil stained black compact medium SAND, with trace fine rounded gravel, strong hydrocarbon odor.	SP	17.0 -1.2	SS	6 7 9 9	1.3/2.0	421 330 260			
20		Log continued on next page	SW	19.0	SS	7 4 9 9	1.4/2.0	150 180 222			



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-25 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-33 ft
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-21

SHEET 2 of 2

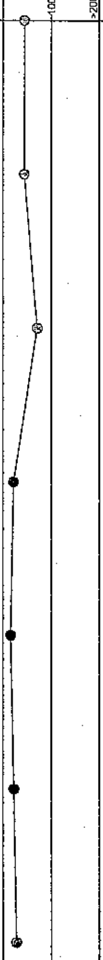
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 33.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/30/05
DATE COMPLETED: 3/30/05
WEATHER: Sunny

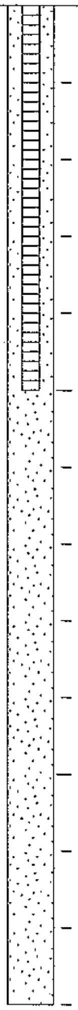
DATUM: Local
COORDS: N: 206,064.0 E: 1,001,657.5
GS ELEVATION: 17.8 ft
TOC ELEVATION: 17.5 ft
TEMPERATURE: 60-62 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
20		19.0 - 21.0 Wet, oil stained grayish black (intermittent staining) compact medium to coarse SAND, trace fine rounded gravel, strong hydrocarbon odor. *(Continued)*	SW		-3.2	SS	7 4 9 9	1.4 / 2.0	150 180 222				
		21.0 - 25.0 Wet, grayish brown and tan brown, compact medium SAND, trace coarse to fine rounded gravel, strong hydrocarbon odor.	SP		21.0 -7.2	SS	4 4 6 6	2.0 / 2.0	220 200 190				
	-5					SS	6 9 7 10	1.7 / 2.0	355 150 140				
25		25.0 - 27.0 Wet, dark brown and tan brown, compact medium SAND, with trace fine rounded gravel, slight hydrocarbon odor.	SP		25.0 -9.2	SS	5 10 12 18	2.0 / 2.0	110 90 82				
	-10	27.0 - 29.0 Wet, grayish brown and tan brown, compact medium SAND, trace coarse to fine rounded gravel, slight hydrocarbon odor.	SW		27.0 -11.2	SS	7 13 18 20	3.0 / 2.0	80 70 75				
30		29.0 - 31.0 Wet, grayish brown, compact, well sorted medium to fine SAND, with trace fine rounded gravel, slight hydrocarbon odor.	SW		29.0 -13.2	SS	3 3 8 15	2.0 / 2.0	114 70 60				
	-15	31.0 - 33.0 Wet, grayish brown, compact to dense, fine to very fine SAND, slight hydrocarbon odor.	SP		31.0 -15.2	SS	10 13 18 24	2.0 / 2.0	140 130 56				
35		33.0: End of Boring. Boring completed at 33.0 ft											
	-20												
40													



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-25 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-33 ft
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-22

SHEET 1 of 2

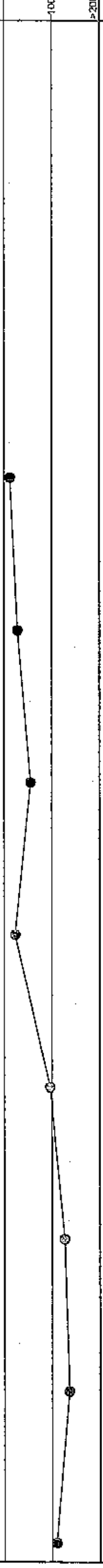
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/31/05
DATE COMPLETED: 3/31/05
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,197.0 E: 1,001,757.1
GS ELEVATION: 21.3 ft
TOC ELEVATION: 21.3 ft
TEMPERATURE: 60-65 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE				SAMPLES							
DESCRIPTION	USCS	ELEV.	DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
0.0 - 5.0 Fill material - sand, gravel, cobbles, concrete, brick fragments, wood.	FILL	16.3									
5.0 - 7.0 Moist, tan brown, compact silty sand FILL, some rock and brick debris.	FILL	14.3	5.0	SS	7 8 6 4	0.8 / 2.0	60.4 48				
7.0 - 9.0 Moist, gray and tan brown (intermittent staining), loose medium to fine SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP	12.3	7.0	SS	4 4 3 3	1.4 / 2.0	140 116				
9.0 - 13.0 Moist, grayish brown, compact medium SAND, little fine rounded gravel, strong hydrocarbon odor.	SP	8.3	9.0	SS	3 5 7 7	1.0 / 2.0	24 276				
				SS	9 9 9 9	1.3 / 2.0	113 115				
13.0 - 13.5 Moist, grayish brown, compact medium SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP	7.8	13.0	SS	4 6 6 8	1.1 / 2.0	457 480				
13.5 - 15.0 Moist, grayish brown, compact medium SAND, trace coarse to fine rounded gravel, strong hydrocarbon odor.	SP	6.3	13.5								
15.0 - 17.0 Moist, grayish brown, compact medium to fine SAND, trace to little fine rounded gravel, strong hydrocarbon odor.	SP	4.3	15.0	SS	3 6 7 8	1.0 / 2.0	450 632				
17.0 - 18.0 Oil wet, dark grayish brown, compact well graded, medium to fine SAND, trace coarse to fine rounded gravel, strong hydrocarbon odor.	SW	3.3	17.0	SS	10 8 8 8	1.0 / 2.0	680 480				
18.0 - 19.0 Coarse to fine GRAVEL lense.	GP	2.3	18.0								
	SP		19.0	SS	3 5 6 7	1.0 / 2.0	434 547 469				



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MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

Cement Grout 0-11 ft bgs

Choker Sand #00 11-13 ft bgs

WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-31 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-22

SHEET 2 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

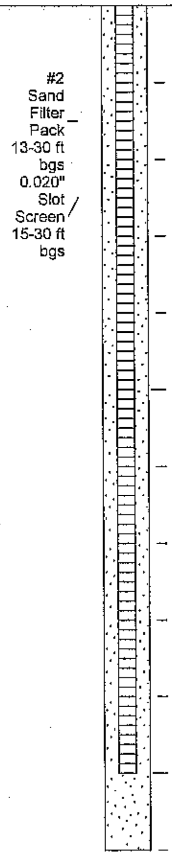
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/31/05
DATE COMPLETED: 3/31/05
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,197.0 E: 1,001,757.1
GS ELEVATION: 21.3 ft
TOC ELEVATION: 21.3 ft
TEMPERATURE: 60-65 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES							
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
20		19.0 - 21.0 Oil, wet, (intermittent staining) loose to compact grayish brown, coarse to fine SAND, trace fine rounded gravel, strong hydrocarbon odor. *(Continued)*	SP		0.3	SS	3 5 6 7	1.0/2.0	434 547 469				
	0	21.0 - 23.0 Wet, black staining, grayish brown to tan brown, compact coarse to medium SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP		21.0 -1.7	SS	6 8 10 12	1.9/2.0	369 686 719				
		23.0 - 25.0 Wet, light grayish brown, compact medium to fine SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP		23.0 -3.7	SS	4 10 9 9	1.4/2.0	222 130 113				
25	-5	25.0 - 27.0 Wet, light grayish brown, compact coarse to medium SAND, little fine rounded gravel, moderate to strong hydrocarbon odor.	SP		25.0 -5.7	SS	4 6 7 8	1.4/2.0	69 76 97				
		27.0 - 31.0 Wet, light grayish brown, compact, coarse to medium SAND, little coarse to fine rounded gravel, moderate odor.	SW		27.0	SS	4 7 9 13	1.5/2.0	71 73 70				
30					-9.7	SS	1 3 4 6	0.8/2.0	16 10				
	-10	31.0: End of Boring. Boring completed at 31.0 ft											
35	-15												
40													

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-15 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 15-30 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 13-31 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 11-13 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-11 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-23

SHEET 1 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 27.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 4/1/05
DATE COMPLETED: 4/1/05
WEATHER: Overcast

DATUM: Local
COORDS: N: 206,138.6 E: 1,001,673.8
GS ELEVATION: 18.0 ft
TOC ELEVATION: 17.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

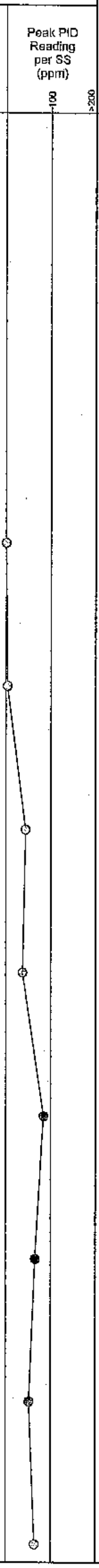
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0		0.0 - 7.0 Fill material - sand, gravel, cobbles, concrete, brick fragments, wood.	FILL	11.0 7.0
	15			
5				
		7.0 - 9.0 Moist, grayish brown, loose, medium to fine SAND, trace fine rounded gravel, slight odor.	SP	9.0 9.0
	10			
10		9.0 - 13.0 Moist, grayish brown (some staining), loose medium SAND, trace coarse to fine gravel, strong odor.	SP	5.0 13.0
	5	13.0 - 13.8 Oil wet, dark grayish brown, loose medium to coarse SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP	4.2 13.8
		13.8 - 15.0 Oil wet dark grayish brown, medium to fine SAND, strong hydrocarbon odor.	SP	3.0 15.0
15		15.0 - 17.0 Oil wet, dark grayish brown compact coarse to medium SAND, some coarse to fine rounded gravel, strong hydrocarbon odor	SW	0.9 17.0
		17.0 - 18.0 Oil wet, dark grayish brown, compact, coarse to medium SAND, some coarse to fine rounded gravel, strong hydrocarbon odor.	SW	-0.1 18.0
	0	18.0 - 19.0 Coarse to fine GRAVEL lense.	GP	-1.1 19.0
20		19.0 - 23.0 Wet, dark grayish brown, compact medium to fine SAND, trace fine rounded gravel, moderate hydrocarbon odor.	SP	

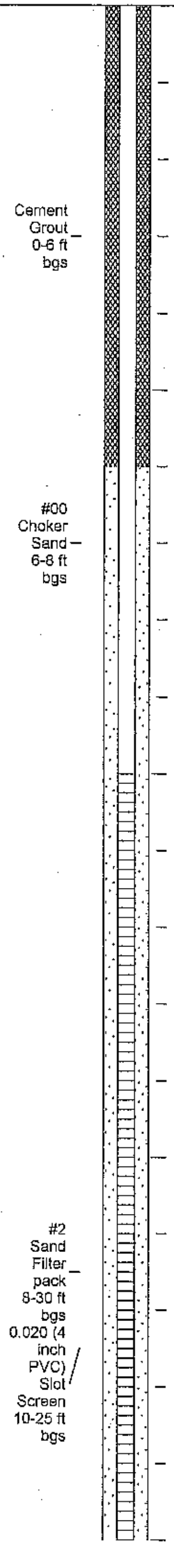
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	4 4 4 5	0.2 / 2.0	3.3			
SS	6 4 4 4	0.4 / 2.0	17.7			
SS	2 3 4 2	0.9 / 2.0	130 219			
SS	3 4 4 4	1.2 / 2.0	181 188			
SS	2 4 5 9	1.6 / 2.0	421 313			
SS	5 6 5 6	0.8 / 2.0	277 328			
SS	8 10 12 14	1.3 / 2.0	149 260			
SS	4 6 7 8	1.4 / 2.0	320 300 224			



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-25 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-30 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quanlity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-23

SHEET 2 of 2

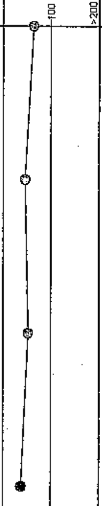
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 27.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 4/1/05
DATE COMPLETED: 4/1/05
WEATHER: Overcast

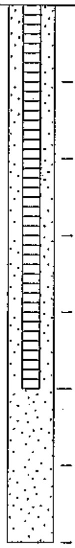
DATUM: Local
COORDS: N: 206,138.6 E: 1,001,673.8
GS ELEVATION: 18.0 ft
TOC ELEVATION: 17.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES							
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
20		19.0 - 23.0 Wet, dark grayish brown, compact medium to fine SAND, trace fine rounded gravel, moderate hydrocarbon odor. *(Continued)*	SP		-5.1 23.0	SS	4 6 7 8	1.4/2.0	320 300 224				
						SS	3 5 7 11	1.7/2.0	230 113 127				
	-5	23.0 - 25.0 Wet, grayish brown, compact medium to fine SAND, trace fine rounded gravel, moderate hydrocarbon odor.	SP		-7.1 25.0	SS	8 10 14 15	1.9/2.0	37 262 117				
25		25.0 - 26.0 Wet, gray, compact fine to very fine SAND, moderate hydrocarbon odor.	SP		-8.1 26.0	SS	11 16 16 18	2.0/2.0	77 121 188				
		26.0 - 27.0 Wet, grayish brown, compact medium to fine SAND, little fine rounded gravel, moderate hydrocarbon odor.	SW		-9.1								
		27.0: End of Boring. Boring completed at 27.0 ft											
	-10												
30													
	-15												
35													
	-20												
40													



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-10 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 10-25 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 8-30 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 6-8 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-6 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

QUANTA SOIL BOF QUANTA~1.GPJ GOLDER NJ-PA.GDT 6/8/05

RECORD OF BOREHOLE GAL-24

SHEET 1 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 30.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/29/05
DATE COMPLETED: 3/29/05
WEATHER: P. Sunny

DATUM: Local
COORDS: N: 206,230.1 E: 1,001,665.0
GS ELEVATION: 18.4 ft
TOC ELEVATION: 17.9 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE			SAMPLES						
DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0.0 - 5.0 Fill material - sand, gravel, cobbles, concrete, brick fragments, wood.	FILL	13.4							
5.0 - 7.0 Moist, dark gray brown, loose, medium sand FILL trace silt and brick fragments, slight odor.	FILL	5.0 11.4	SS	4 5 5 5	0.3/2.0	2.8			
7.0 - 9.0 Moist, grayish black, compact medium SAND, little coarse to fine subangular gravel, slight odor.	SP	7.0 9.4	SS	3 4 7 50	1.0/2.0	4.2 12.6			
9.0 - 12.0 Moist, grayish brown, compact, medium to coarse SAND, little subangular coarse gravel, trace fine rounded gravel, slight odor.	SW	9.0 6.4	SS	20 15 13 15	0.9/2.0	6.2 24.1			
12.0 - 14.0 Moist, grayish brown (some black) staining, compact medium SAND, little fine rounded gravel, moderate hydrocarbon, odor.	SP	12.0 4.4	SS	5 14 12 14	1.0/2.0	30.3 25.6			
14.0 - 16.0 Oil wet, dark grayish brown, compact medium to coarse SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP	14.0 2.4	SS	4 7 8 10	1.4/2.0	565 550 461			
16.0 - 18.0 Oil wet, grayish black, compact medium to fine SAND, trace fine rounded gravel, strong hydrocarbon odor.	SP	16.0 0.4	SS	6 8 9 9	1.6/2.0	350 337			
18.0 - 20.0 Oil wet and stained grayish brown, compact, medium to fine SAND, well sorted, trace fine rounded gravel, strong hydrocarbon odor.	SW	18.0 -1.6	SS	3 6 8 10	1.6/2.0	419 483 377			

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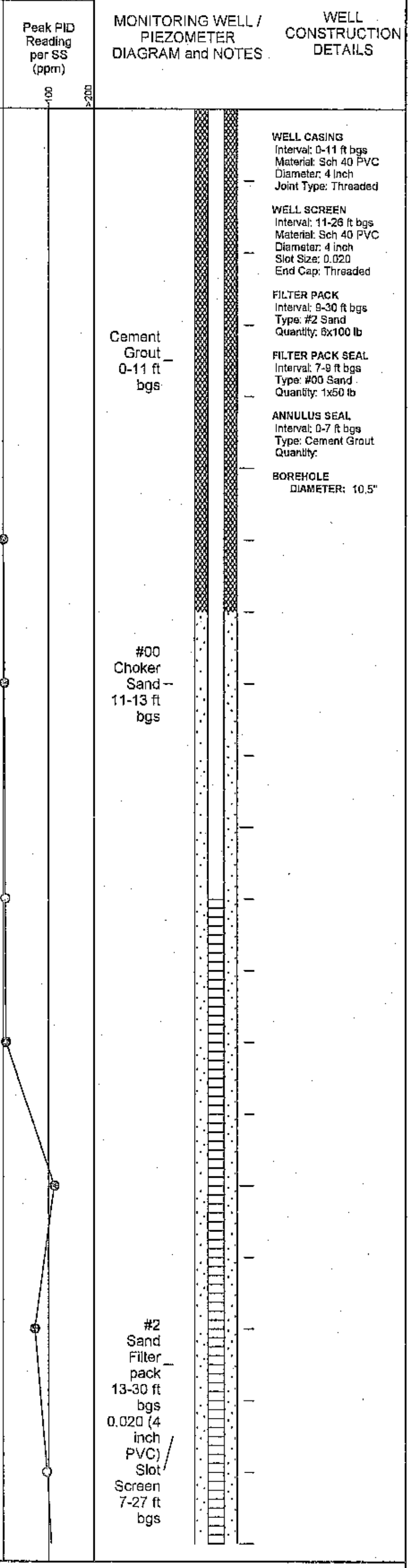


WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-26 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-30 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-24

SHEET 2 of 2

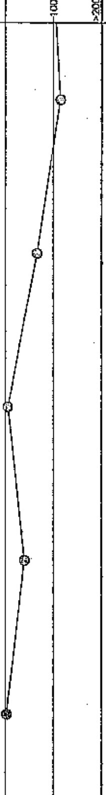
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 30.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 3/29/05
DATE COMPLETED: 3/29/05
WEATHER: P. Sunny

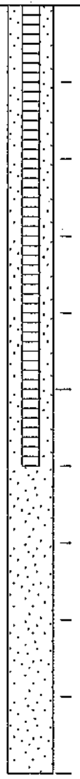
DATUM: Local
COORDS: N: 206,230.1 E: 1,001,665.0
GS ELEVATION: 18.4 ft
TOC ELEVATION: 17.9 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES							
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
20		20.0 - 22.0 Oil stained, wet, grayish brown, compact well sorted medium SAND, little fine to coarse rounded gravel, strong hydrocarbon odor.	SW		20.0 -3.6	SS	4 11 12 19	1.5/2.0	460 575 100				
	-5	22.0 - 24.0 Wet, grayish brown, compact medium SAND, trace rounded coarse gravel, moderate hydrocarbon odor.	SP		22.0 -5.6	SS	3 13 14 13	1.9/2.0	331 250 83.1				
25		24.0 - 26.0 Wet, grayish brown, compact medium to coarse SAND, trace to little coarse to fine gravel, moderate hydrocarbon odor.	SW		24.0 -7.6	SS	4 8 11 12	1.7/2.0	25 14 13				
		26.0 - 30.0 Wet, grayish brown, compact, medium to fine SAND, trace to little coarse to fine gravel, slight hydrocarbon odor.	SW		26.0 -11.6	SS	7 8 12 16	1.4/2.0	200 15.6 9.0				
	-10					SS	6 7 11 11	1.0/2.0	11 7				
30		30.0: End of Boring. Boring completed at 30.0 ft											
	-15												
35													
	-20												
40													



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-11 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 11-26 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 9-30 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 7-9 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-7 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-25

SHEET 1 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage

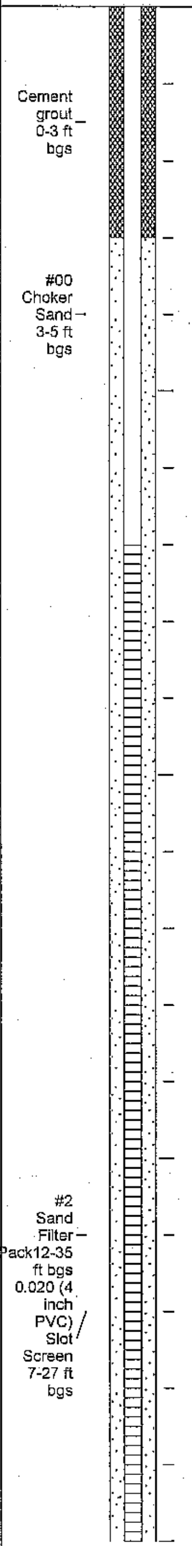
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 4/3/05
DATE COMPLETED: 4/3/05
WEATHER: Lt Rain

DATUM: Local
COORDS: N: 205,829.1 E: 1,001,912.8
GS ELEVATION: 16.4 ft
TOC ELEVATION: 15.8 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES							
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
0	15	0.0 - 5.0 Fill material - sand, gravel, cobbles, concrete, brick fragments, wood.	FILL	▨	11.4								
5	10	5.0 - 7.4 Moist, brown, very loose silty fine sand FILL, little brick fragments.	FILL	▨	5.0 9.0	SS	10 2 1 1	0.5/2.0	0				●
		7.4 - 9.0 Moist, dark grayish brown, loose fine to very fine sand, FILL trace subangular gravel. Slight to moderate odor.	FILL	▨	7.4 7.4	SS	2 1 3 9	0.8/2.0	0				●
10		9.0 - 11.0 Moist, dark gray brown, compact fine to very fine SAND, trace coarse to fine gravel, slight hydrocarbon odor.	SP		9.0 5.4	SS	9 9 9 7	0.4/2.0	11.1				●
	5	11.0 - 13.0 No Recovery.			11.0 3.4	SS	7 7 9 9	0.0/2.0					
		13.0 - 15.0 Very moist to wet, dark grayish brown (oil stained), compact fine SAND, trace coarse gravel, moderate hydrocarbon odor.	SP		13.0 1.4	SS	5 5 5 6	1.0/2.0	14.4 15.1				●
15	0	15.0 - 17.0 Very moist to wet, dark grayish brown (oil stained) loose fine to medium SAND, trace coarse subangular gravel, moderate hydrocarbon odor.	SP		15.0 -0.6	SS	2 4 4 5	1.0/2.0	17 20				●
		17.0 - 19.0 Wet, dark grayish brown (oil stained) compact fine to very fine SAND, trace fine rounded gravel, moderate hydrocarbon odor.	SP		17.0 -2.6	SS	4 7 14 15	1.4/2.0	17 16				●
20		Log continued on next page	SW		19.0	SS	9 7 10 10	2.0/2.0	16 17 22				●

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-7 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 7-27 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 5-31 ft bgs
Type: #2 Sand
Quantity: 8x100 lb

FILTER PACK SEAL
Interval: 3-5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-3 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-25

SHEET 2 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 31.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 4/3/05
DATE COMPLETED: 4/3/05
WEATHER: Lt Rain

DATUM: Local
COORDS: N: 205,829.1 E: 1,001,912.8
GS ELEVATION: 16.4 ft
TOC ELEVATION: 15.8 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

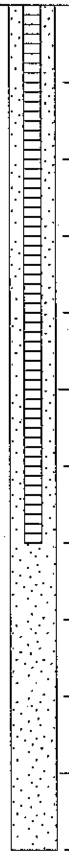
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
20		19.0 - 21.5 Wet, dark grayish brown (oil stained), compact well graded, coarse to fine SAND, trace fine rounded gravel, moderate hydrocarbon odor. *(Continued)*	SW		-5.1 21.5
	-5	21.5 - 23.0 Fine to very fine SAND, slight hydrocarbon odor.	SP		-6.6 23.0
25	-10	23.0 - 27.0 Wet, light grayish brown, compact medium to fine SAND, trace fine rounded gravel, slight hydrocarbon odor.	SP		-10.6 27.0
30		27.0 - 31.0 Wet, dark grayish brown, compact fine to medium SAND, trace fine rounded gravel, slight hydrocarbon odor.	SP		-14.6
	-15	31.0: End of Boring. Boring completed at 31.0 ft			
35	-20				
40					

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
SS	9 7 10 10	2.0 / 2.0	16 17 22				
SS	4 3 1 9	2.0 / 2.0	9 10 12				
SS	8 8 8 10	2.0 / 2.0	7 10 21				
SS	6 7 7 10	1.0 / 2.0	11.4 19.9				
SS	5 6 12 12	2.0 / 2.0	4.1 7.2 12				
SS	7 10 10 9	12.0 / 2.0	14.2				

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-7 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 7-27 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 5-31 ft bgs
Type: #2 Sand
Quantity: 6x100 lb

FILTER PACK SEAL
Interval: 3-5 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-3 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-26

SHEET 1 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 32.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 4/3/05
DATE COMPLETED: 4/3/05
WEATHER: Lt Rain

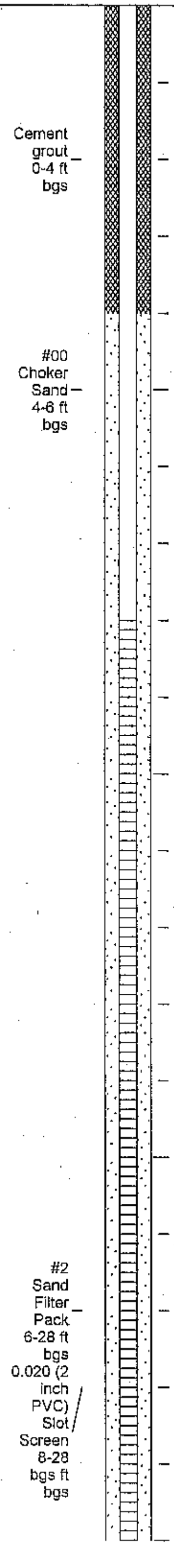
DATUM: Local
COORDS: N: 205,764.7 E: 1,001,837.1
GS ELEVATION: 15.8 ft
TOC ELEVATION: 15.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE				SAMPLES							
DESCRIPTION	USCS	ELEV.	DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
0.0 - 5.0 Fill material - sand, gravel, cobbles, concrete, brick fragments, wood.	FILL	10.8									
5.0 - 7.0 No Sample Taken.		8.8	5.0								
7.0 - 9.0 Very moist, dark brown to black, loose SILTY medium SAND, slight hydrocarbon odor	SM	6.8	7.0	SS	4 3 4 7	0.2/2.0	4.6				
9.0 - 10.0 Very moist, dark grayish brown, oil stained, loose fine to very fine SAND, trace fine rounded gravel, slight hydrocarbon odor.	SP	5.8	9.0	SS	4 4	0.9/2.0	0.8				
10.0 - 12.0 Very moist to wet, dark grayish to black, oil stained, loose fine SAND, trace fine rounded gravel, slight hydrocarbon odor.	SP	3.8	10.0	SS	5 4 4 4	0.5/2.0	16.6				
12.0 - 14.0 Wet, dark grayish black, oil stained, compact medium SAND, trace fine rounded gravel, slight hydrocarbon odor.	SP	1.8	12.0	SS	6 10 15 17	0.5/2.0	9.0				
14.0 - 18.0 Wet, dark brown to dark gray, compact fine to medium SAND, trace fine rounded gravel, slight hydrocarbon odor.	SW	-2.2	14.0	SS	5 8 13 13	1.0/2.0	19.4 20				
				SS	50	0.5/2.0	14				
18.0 - 20.0 No Recovery.		-4.2	18.0	SS		2.0					

Log continued on next page

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



Cement grout 0-4 ft bgs

#00 Choker Sand 4-6 ft bgs

#2 Sand Filter Pack 6-28 ft bgs

0.020 (2 inch PVC) Slot Screen 8-28 bgs ft bgs

WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-8 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 8-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 6-32 ft bgs
Type: #2 Sand
Quantity: 8x100 lb

FILTER PACK SEAL
Interval: 4-6 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-4 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Mike Gram

GA INSPECTOR: Yon W.
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-26

SHEET 2 of 2

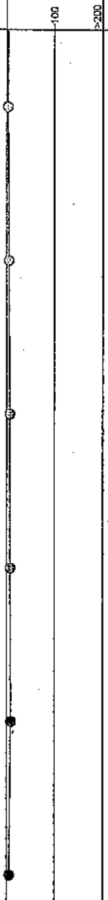
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 32.0 ft
AZIMUTH: N/A
LOCATION: Phoenix Beverage

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 4/3/05
DATE COMPLETED: 4/3/05
WEATHER: Lt Rain

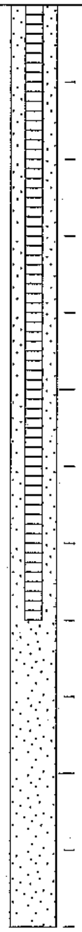
DATUM: Local
COORDS: N: 205,764.7 E: 1,001,837.1
GS ELEVATION: 15.8 ft
TOC ELEVATION: 15.6 ft
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES							
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
20	-5	20.0 - 22.0 Wet, dark brown to dark grayish brown, compact fine to medium SAND, trace fine rounded gravel, slight hydrocarbon odor.	SP		20.0 -6.2	SS	7 16 16 21	0.5 / 2.0	12.3				
		22.0 - 24.0 Wet, dark bray brown, dense, medium to coarse SAND, slight hydrocarbon odor.	SP		22.0 -8.2	SS	21 21 21 21	1.8 / 2.0	17 22.5 18				
25	-10	24.0 - 26.0 Wet, dark brown, very dense, medium to coarse SAND, slight hydrocarbon odor.	SW		24.0 -10.2	SS	9 15 18 20	1.0 / 2.0	34.3 30				
		26.0 - 30.0 Wet, dark brown, very dense, medium to coarse SAND, slight hydrocarbon odor.	SW		26.0 -14.2	SS	22 28 32 42	1.6 / 2.0	36.2 33				
						SS	22 28 55 28	1.0 / 2.0	43.4 36				
30	-15	30.0 - 32.0 Wet, dark brown, very dense, medium to coarse SAND, trace fine rounded gravel, slight odor.	SW		30.0 -16.2	SS	35 35 50	1.0 / 2.0	26 22				
35 40	-20	32.0: End of Boring. Boring completed at 32.0 ft											



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-8 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Joint Type: Threaded

WELL SCREEN
Interval: 8-28 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 6-32 ft bgs
Type: #2 Sand
Quantity: 8x100 lb

FILTER PACK SEAL
Interval: 4-6 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-4 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Mike Gram

GA INSPECTOR: Yon W.
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-27

SHEET 1 of 2

PROJECT: Quanta	DRILL METHOD: Hollow-stem auger	DATUM: Local	INCLINATION: -90
PROJECT NUMBER: 023-6151	DRILL RIG: Mobile B-58	COORDS: N: 205,688.4 E: 1,001,626.4	DEPTH W.L.:
DRILLED DEPTH: 26.0 ft	DATE STARTED: 2/25/05	GS ELEVATION: 13.0 ft	ELEVATION W.L.:
AZIMUTH: N/A	DATE COMPLETED: 2/25/05	TOC ELEVATION: 12.5 ft	DATE W.L.:
LOCATION: South Capasso Property	WEATHER: P. Sunny	TEMPERATURE: 38-40 F	TIME W.L.:

SOIL PROFILE					SAMPLES							
DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)
0.0 - 0.5 CONCRETE AND ASPHALT.	CONC		12.5	0.5								
0.5 - 8.0 Fragmented brick and rock FILL.	FILL		5.0	8.0								
8.0 - 11.0 Black stained, very loose, very fine to fine SAND, trace fines, saturated @ 8 ft bgs, strong odor.	SP				SS	1 1 1 1	0.4/2.0	156				
			2.0	11.0	SS	1 0 1 0	1.8/2.0	54 38 5				
11.0 - 13.0 Lt brown, very soft SANDY SILT, trace fines, slight odor.	SM		0.0	13.0	SS	0 1 1 1	0.6/2.0	2.9 2				
13.0 - 16.0 Lt brown, very soft, very fine SANDY SILT, trace coarse gravel, slight odor.	SM		-3.0	16.0	SS	3 1 3 1	1.5/2.0	0.7 0.6 0.6				
16.0 - 18.0 Lt bown, very loose, very fine SANDY SILT.	SM		-5.0	18.0	SS	1 0 1 1	2.0/2.0	0.0 0.0 0.0				
18.0 - 20.0 Brown, very soft SILTY CLAY, little timber fragments.	CL-ML		-7.0		SS	1 2 2 1	2.0/2.0	0.0 0.0 0.0				

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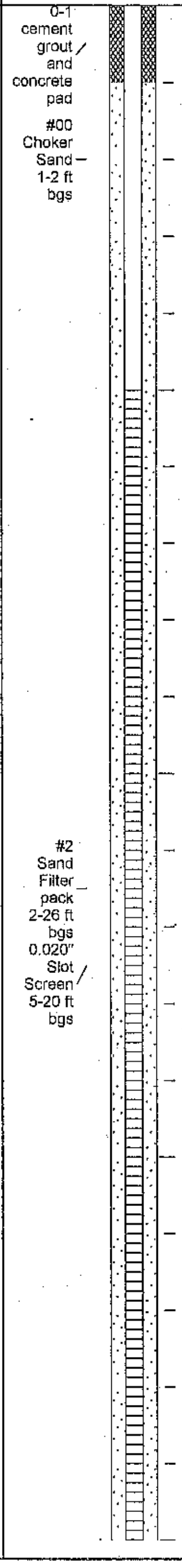


WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 5-20 ft bgs
Material: Sch 40 PVC
Diameter: 4 Inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 2-26 ft bgs
Type: #2 Sand
Quantity: 6X100 lb

FILTER PACK SEAL
Interval: 1-2 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-1 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-27

SHEET 2 of 2

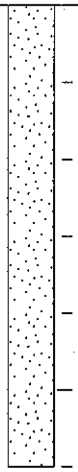
PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 26.0 ft
AZIMUTH: N/A
LOCATION: South Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 2/25/05
DATE COMPLETED: 2/25/05
WEATHER: P. Sunny

DATUM: Local
COORDS: N: 205,688.4 E: 1,001,626.4
GS ELEVATION: 13.0 ft
TOC ELEVATION: 12.5 ft
TEMPERATURE: 38-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES
20		20.0 - 24.0 Brown, compact very fine SANDY CLAY, slight odor.	CLS		20.0 -11.0	SS	1 1 1 1	0.5/2.0	0.0				●	
	-10					SS	7 9 9 12	2.0/2.0	1.0 0.5 0.0				●	
25		24.0 - 26.0 Gray-brown, very fine to fine SAND, with varve-like features.	SP		24.0 -13.0	SS	6 7 8 8	2.0/2.0	0.0 0.0 0.0				●	
		Boring completed at 26.0 ft												
30	-15													
35	-20													
40	-25													



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 5-20 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 2-26 ft bgs
Type: #2 Sand
Quantity: 6X100 lb

FILTER PACK SEAL
Interval: 1-2 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-1 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-28

SHEET 1 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 26.0 ft
AZIMUTH: N/A
LOCATION: South Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 2/28/05
DATE COMPLETED: 2/28/05
WEATHER: Overcast

DATUM: Local
COORDS: N: 205,720.5 E: 1,001,534.0
GS ELEVATION: 12.5 ft
TOC ELEVATION: 12.4 ft
TEMPERATURE: 30-35 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

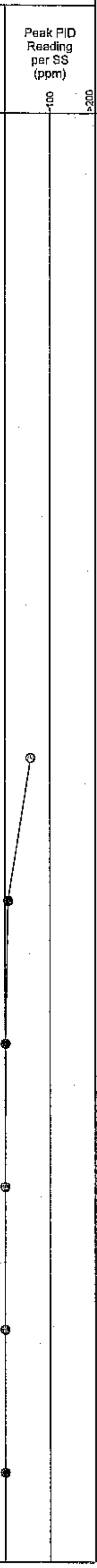
SOIL PROFILE

DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 0.5 CONCRETE AND ASPHALT.	CONC	12.0 0.5
0.5 - 8.0 Fragmented brick and rock FILL.	FILL	4.5 8.0
8.0 - 11.0 Saturated, black stained very loose SILT and very fine SAND, little fine gravel, strong odor	SM	1.5 11.0
11.0 - 13.0 Saturated, gray-brown, very loose SILTY fine SAND, slight to moderate odor.	SM	-0.5 13.0
13.0 - 15.0 Saturated, lt brown, very soft very fine SANDY SILT, trace fines and fine gravel, slight odor.	SM	-2.5 15.0
15.0 - 18.0 Saturated, lt brown, very loose SILTY very fine SAND, trace fine rounded gravel, slight odor.	SM	-5.5 18.0
18.0 - 22.0 Saturated, tan-brown, very loose very fine to fine SAND, trace fines and fine subangular gravel.	SP	

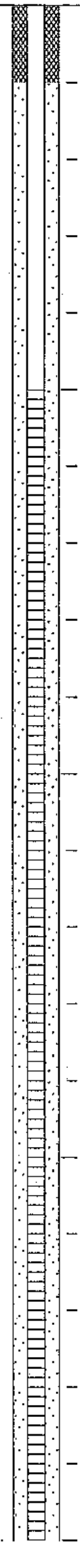
Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID / Date/Time Collected	Analyses
SS	1 1 1 1	0.6 / 2.0	285			
SS	1 1 1 0	0.8 / 2.0	35 7			
SS	1 0 1 0	1.7 / 2.0	6.5 5.3 5.6			
SS	1 1 1 0	0.3 / 2.0	3.3			
SS	1 0 1 1	0.4 / 2.0	1.6			
SS	1 1 1 1	1.3 / 2.0	1.1 0.8			



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



Cement Grout – 0-10'

#00 Choker Sand – 1-2 ft bgs

#2 Sand Filter pack 2-26 ft bgs

0.020 (4 inch PVC) Slot Screen 8-28 bgs ft bgs

WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 5-20 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 2-26 ft bgs
Type: #2 Sand
Quantity: 6X100 lb

FILTER PACK SEAL
Interval: 1-2 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-1 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE GAL-28

SHEET 2 of 2

PROJECT: Quanta
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 26.0 ft
AZIMUTH: N/A
LOCATION: South Capasso Property

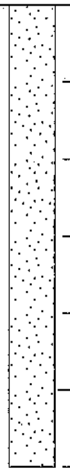
DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 2/28/05
DATE COMPLETED: 2/28/05
WEATHER: Overcast

DATUM: Local
COORDS: N: 205,720.5 E: 1,001,534.0
GS ELEVATION: 12.5 ft
TOC ELEVATION: 12.4 ft
TEMPERATURE: 30-35 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200
20		18.0 - 22.0 Saturated, tan-brown, very loose very fine to fine SAND, trace fines and fine subangular gravel. *(Continued)*	SP	⛶	-9.5 22.0	SS	1 0 1 0	0.1/2.0	0.1				●
	-10	22.0 - 23.0 Saturated, gray, very loose fine to medium SAND, slight odor.	SP	⛶	-10.5 23.0	SS	1 2 1 2	2.0/2.0	3.2 0.0 0.0				●
25		23.0 - 25.5 Saturated, dark gray, very soft CLAY, trace very fine sand.	CL	▨	-13.0 25.5	SS	3 3 4 6	2.0/2.0	0.0 0.0 0.0				●
		25.5 - 26.0 Gray-brown very fine SAND, trace fines. Boring completed at 26.0 ft	SP	⛶	-13.5								

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: 0-5 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Joint Type: Threaded

WELL SCREEN
Interval: 5-20 ft bgs
Material: Sch 40 PVC
Diameter: 4 inch
Slot Size: 0.020
End Cap: Threaded

FILTER PACK
Interval: 2-26 ft bgs
Type: #2 Sand
Quantity: 6X100 lb

FILTER PACK SEAL
Interval: 1-2 ft bgs
Type: #00 Sand
Quantity: 1x50 lb

ANNULUS SEAL
Interval: 0-1 ft bgs
Type: Cement Grout
Quantity:

BOREHOLE
DIAMETER: 10.5"

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: JLH
CHECKED BY: SDM
DATE: 6/8/05

Golder Associates

RECORD OF BOREHOLE SB-05

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/29/03
DATE COMPLETED: 12/29/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,069.9 E: 1,001,899.8
GS ELEVATION: 26.0 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE			SAMPLES				
DESCRIPTION	USCS	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID / Date/Time Collected
0.0 - 3.0 wet, dark yellowish brown, poorly sorted, silty SAND and some medium gravel and medium brick frags; faint HC odor	FILL	23.0 / 3.0	GRAB GRAB GRAB		1.0 1.0 1.0	4.7 29 34.5	
3.0 - 4.5 wet, dark yellowish brown, poorly sorted, silty SAND and some medium gravel and medium brick frags; faint HC odor	FILL	21.5 / 4.5	SS	6 3 4 5	1.5	6.2 9.8 31.1	
4.5 - 5.0 oil wet, olive balck, silty SAND and some medium gravel; moderate HC odor	FILL	21.0 / 5.0	SS	3 1 14 10	1.5	7.1 6.3	SB050105 12/29/2003 10:30:00 AM
5.0 - 6.0 wet, brownish gray, poorly sorted silty SAND and some medium gravel; faint HC odor	FILL	20.0 / 6.0					
6.0 - 7.0 moist to damp, olive balck to brownish black, moderately compact silty SAND AND medium angular GRAVEL with trace coarse brick frags; moderate HC odor	FILL	19.0 / 7.0	SS	3 4 5 12	1.0	27.6	SB050207 12/29/2003 10:40:00 AM
7.0 - 8.5 oil saturated to wet, olive black, poorly sorted silty SAND and some coarse gravel, 1 large rock frag @ 8.5 ft; moderate HC odor	FILL	17.5 / 8.5					SB050309 12/29/2003 10:50:00 AM
8.5 - 9.0 wet, dark yellowish brown, well sorted silty SAND and trace fine angular gravel; faint HC odor	FILL	17.0 / 9.0	SS	5 6 8 11	2.0	25.1 71.3	
9.0 - 11.0 moist to wet, dark yellowish brown, well sorted fine SAND and trace olive black stained medium gravel; moderate/strong HC odor	FILL	15.0 / 11.0					SB050411 12/29/2003 11:05:00 AM
11.0 - 15.0 moist, dark yellowish brown, poorly sorted fine SAND AND medium to coarse GRAVEL with brick frag in shoe; moderate/strong HC odor	FILL	11.0 / 15.0	SS SS SS	8 13 15 17 8 9 32 50/5 30 29 30/1	1.3 0.3 0.3	69.8 59.9 86 94.7	SB050513 12/29/2003 12:00:00 PM
15.0 - 16.0 damp to moist, olive gray, poorly sorted fine SAND AND coarse subangular GRAVEL with brick frags	FILL	10.0 / 16.0					SB050616 12/29/2003 12:15:00 PM
16.0 - 18.5 damp to moist, brownish gray, light brownish gray, and olive gray, well graded fine to medium SAND AND coarse GRAVEL; very strong HC odor	SWG	7.5 / 18.5	SS SS	17 38 23 20 15 20 27 25	1.5 1.5	241 230 123 198	SB050718 12/29/2003 12:30:00 PM
18.5 - 22.0 moist to damp, light brownish gray, olive gray, and trace moderate brown (brick colored) well graded very coarse GRAVEL and fine to medium SAND	GWS			4 38		503	SB050820 12/29/2003 12:35:00 PM

DEPTH (ft): 0, 5, 10, 15, 20
ELEVATION (ft): 25, 20, 15, 10

Analyses

Peak PID Reading per SS (ppm): 100, >200

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

Log continued on next page

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-05

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/29/03
DATE COMPLETED: 12/29/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,069.9 E: 1,001,899.8
GS ELEVATION: 26.0 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
20	5	18.5 - 22.0 moist to damp, light brownish gray, olive gray, and trace moderate brown (brick colored) well graded very coarse GRAVEL and fine to medium SAND *(Continued)*	GWS		4.0	SS	41 47	1.7	373 455	☒	SB050922 12/29/2003 12:45:00 PM				
		23.0 - 25.0 moist to wet, olive gray to brownish gray, very coarse ROCK FRAGS and fine to medium SAND; very strong HC odor	GP		1.0 25.0	SS	40 37 27 23	0.8	335	☒	SB051025 12/29/2003 1:10:00 PM				
25	0	25.0 - 30.0 saturated, olive gray to olive balck, well sorted fine to medium SAND and trace fine gravel; heavy HC odor	SP		-4.0 30.0	SS	5 5 7 10	1.8	82.1 79.8 70.1						
						SS	5 10 16 16	2.0	63.4 48.4 43.8	☒	SB051127 12/29/2003 1:20:00 PM				
						SS	5 10 17 27	2.0	31.7 30.9 21.9	☒	SB051229 12/29/2003 1:45:00 PM				
30	-5	30.0 - 31.0 saturated, olive gray, well graded fine to medium SAND and some medium gravel; moderate HC odor	SW		-5.0 31.0					☒	SB051331 12/29/2003 2:00:00 PM				
35	-10														
40		Boring completed at 40.0 ft													

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-06

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/6/03
DATE COMPLETED: 11/6/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 206,011.2 E: 1,001,945.8
GS ELEVATION: 25.3 ft
TOC ELEVATION:
TEMPERATURE: 50-55 f

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)
0	25
5	20
10	15
15	10
20	

SOIL PROFILE

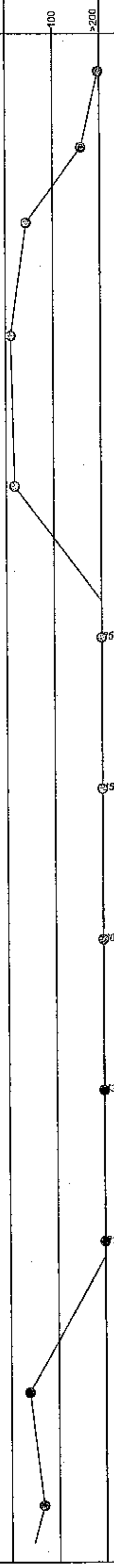
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.5 - 2.0 dry, loose, black (n1), well graded, angular to rounded medium SAND and GRAVEL; strong HC odor	FILL	
2.0 - 3.0 moist, black (n1), moderately compact to loose, angular to subangular, medium SAND and GRAVEL with trace fine sand; moderate HC odor	FILL	23.3 2.0
3.0 - 4.0 damp to moist; black (n1), moderately compact to loose, well graded, fine to medium SAND and medium GRAVEL; sticky; heavy HC odor	FILL	22.3 3.0
4.0 - 6.0 damp, olive gray, well graded, fine SAND and trace angular coarse gravel, brick frag in shoe; moderate/light HC odor	FILL	21.3 4.0
6.0 - 7.5 damp, interleaving coloring: olive gray, brownish gray, and dark greenish gray (5gy 4/1), poorly sorted, very fine SAND and BRICK FRAGS (>3" dia) and trace angular gravel; moderate HC odor	FILL	19.3 6.0
7.5 - 10.0 moist, light olive gray to olive gray, very well sorted, soft, SILT to very fine silty SAND; some clay; strong HC odor	ML	17.8 7.5
10.0 - 11.0 damp to dry, olive gray and olive black interleaving coloring, very fine silty SAND and very coarse angular GRAVEL (>3" dia), very strong HC odor	SM	15.3 10.0
11.0 - 12.0 damp to moist, light olive gray and varve like features of grayish black, well sorted, very fine silty SAND, slight coarsing to 13 ft; very strong HC odor	SM	14.3 11.0
12.0 - 13.0 moist, light olive gray and varve like features of grayish black very fine SAND, slight coarsing to 13 ft; strong HC odor	SP-SM	13.3 12.0
13.0 - 15.0 (same as above with slight fining to 15 ft); verys strong HC odor	SP-SM	12.3 13.0
15.0 - 16.5 (same matrix as above; olive black to olive gray, slight coarsing to 16.5 ft)	SP-SM	10.3 15.0
16.5 - 17.0 moist, olive brown, soft, plastic, silty CLAY	CL-ML	8.8 16.5
17.0 - 19.0 wet, INTERLEAVING dark olive gray to olive black clayey SILT AND light olive brown to light brownish gray silty CLAY,strong HC odor	CL-ML	8.3 17.0
19.0 - 19.5 wet, light olive gray, plastic, soft, silty CLAY; faint HC odor	CL	6.3 19.0
	SP	5.8 19.5

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
GRAB		1.0	197			
GRAB		1.0	160			
GRAB		1.0	44.4			
SS	8 15 16 16	1.1 / 2.0	11.6 5.6			
SS	10 11 9 15	1.8 / 2.0	11.3 17.7 18.4	☒	SBSB060307 11/6/2003 8:50:00 AM	
SS	3 2 2 4	1.7 / 2.0	7.8 70.7 258			
SS	3 4 11 15	1.8 / 2.0	318 433 453			
SS	4 5 8 9	1.9 / 2.0	557 603 204	☒	SBSB060412 11/6/2003 9:20:00 AM	
SS	2 3 6 8	1.5 / 2.0	432 103			
SS	2 4 6 6	2.0 / 2.0	218 84.5 21.8	☒	SBSB060517 11/6/2003 9:45:00 AM	
SS	2 3 3 5	2.0 / 2.0	39.3 18.3 8.4			
SS	6 10	1.0 / 1.0	68.2 31.5			

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type.
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-06

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

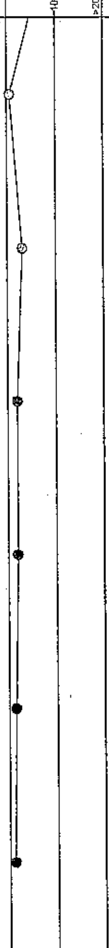
DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 11/6/03
DATE COMPLETED: 11/6/03
WEATHER: Overcast

DATUM: Local
COORDS: N: 206,011.2 E: 1,001,945.8
GS ELEVATION: 25.3 ft
TOC ELEVATION:
TEMPERATURE: 50-55 f

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE			SAMPLES						
		DESCRIPTION	USCS	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20	5	19.5 - 22.0 wet, olive gray and light brownish gray, well sorted, fine to medium SAND and strace medium gravel; faint to very faint HC odor *(Continued)*	SP	3.3 22.0	SS	4 4 10 6	0.8 / 2.0	6.2	X	SBSB060622 11/6/2003 10:50:00 AM	
		22.0 - 27.0 saturated, brownish gray to olive gray, well sorted, fine to medium SAND and trace medium gravel; very faint HC odor, coarsing to 28	SP		SS	3 3 5 7	2.0 / 2.0	31.3 21.4 21			
25	0				SS	4 6 6 7	2.0 / 2.0	19.9 17 18.1			
				-1.7 27.0	SS	5 6 8 16	2.0 / 2.0	11.9 19.7 13.2			
		27.0 - 28.0 saturated, brownish gray to olive gray, well sorted medium to coarse SAND with trace medium gravel; moderate/faint HC odor	SP	-2.7 28.0							
		28.0 - 32.0 saturated, olive gray to moderate olive brown, well sorted, medium to coarse SAND and trace medium gravel; (1" brick frag @ 29.5 ft), moderate/faint HC odor	SP		SS	4 8 8 28	2.0 / 2.0	6 7.2 14.4			
30	-5			-6.7 32.0	SS	8 10 10 10	2.0 / 2.0	6.9 9.4 11.4			
35	-10										
40		Boring completed at 40.0 ft									

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

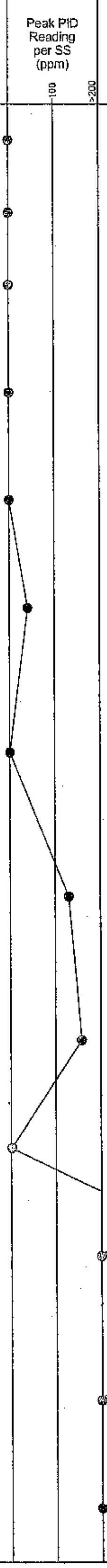
RECORD OF BOREHOLE SB-07

SHEET 1 of 2

PROJECT: Quanta Resources Site	DRILL METHOD: Hollow-stem auger	DATUM: Local	INCLINATION: -90
PROJECT NUMBER: 023-6151	DRILL RIG: CME 75	COORDS: N: 206,078.2 E: 1,001,826.3	DEPTH W.L.:
DRILLED DEPTH: 40.0 ft	DATE STARTED: 12/31/03	GS ELEVATION: 26.3 ft	ELEVATION W.L.:
AZIMUTH: N/A	DATE COMPLETED: 12/31/03	TOC ELEVATION:	DATE W.L.:
LOCATION: Quanta Property	WEATHER: Sunny	TEMPERATURE: 35-40 F	TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
0		0.0 - 5.0 moist, moderate yellowish brown, well sorted fine SAND and trace medium gravel; no HC odor	FILL		GRAB		1.0	0			
	25				GRAB		1.0	0			
					GRAB		1.0	0			
				21.3	SS	3 5 3 6	1.5/2.0	0.3 0.3	☒	SB070105 12/31/2003 9:30:00 AM	
5		5.0 - 6.0 (little recovery, blacktop in shoe)	FILL	5.0 20.3	SS	6 10 20 10	0.2/1.0	0.3			
	20	6.0 - 8.0 moist to wet, moderate yellowish brown poorly sorted silty SAND, asphalt frags, concrete frags, no HC odor	FILL	6.0 18.3	SS	10 6 10 8	0.7/2.0	40.8	☒	SB070208 12/31/2003 9:40:00 AM	
		8.0 - 10.0 (same as above) saturated	FILL	8.0 16.3	SS	6 10 8 10	0.3/2.0	1	☒	SB070310 12/31/2003 9:50:00 AM	
10	15	10.0 - 13.0 oil saturated, olive black to brownish black, poorly sorted silty SAND AND angular coarse ROCK and CONCRETE FRAGS; moderate/strong HC odor	FILL	10.0	SS	19 6 2 1	1.0/2.0	118 130	☒	SB070412 12/31/2003 10:00:00 AM	
				13.3	SS	3 6 3 8	1.5/2.0	150 158 141	☒	SB070514 12/31/2003 10:15:00 AM	
		13.0 - 13.5 moist, interleaving olive gray and moderate yellowish brown, SILT; moderate/strong HC odor	ML	13.0 12.8							
		13.5 - 14.0 moist, olive gray to brownish gray silty SAND and trace fine gravel; moderate/strong HC odor	SM	13.5 12.3							
15		14.0 - 17.0 wet to satruated, olive gray, fine to medium SAND and trace coarse gravel, some rope pieces in spoon; very strong HC odor	SP	14.0	SS	8 50/1	0.5/1.0	1.8			
	10			9.3	SS	8 40 29 15	1.5/2.0	233 268 498	☒	SB070617 12/31/2003 11:00:00 AM	
		17.0 - 19.0 saturated, olive gray, well sorted, silty SAND and some medium gravel, some rope pieces (dragged from above?) in spoon; moderate/strong HC odor	SP	17.0 7.3	SS	5 50 50/3	1.0/2.0	144 224	☒	SB070719 12/31/2003 11:15:00 AM	
20		19.0 - 21.0 dry to damp, olive gray, fine to medium SAND and trace medium gravel; rope in spoon (dragged from above)	SP	19.0	SS	15 59 44 21	0.3/1.0	482			

Log continued on next page



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

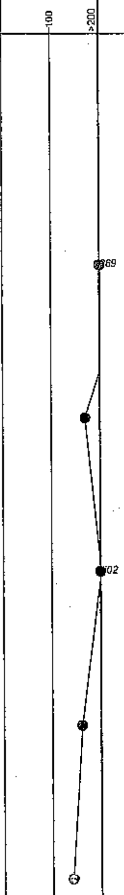
RECORD OF BOREHOLE SB-07

SHEET 2 of 2

PROJECT: Quanta Resources Site	DRILL METHOD: Hollow-stem auger	DATUM: Local	INCLINATION: -90
PROJECT NUMBER: 023-6151	DRILL RIG: CME 75	COORDS: N: 206,078.2 E: 1,001,826.3	DEPTH W.L.:
DRILLED DEPTH: 40.0 ft	DATE STARTED: 12/31/03	GS ELEVATION: 26.3 ft	ELEVATION W.L.:
AZIMUTH: N/A	DATE COMPLETED: 12/31/03	TOC ELEVATION:	DATE W.L.:
LOCATION: Quanta Property	WEATHER: Sunny	TEMPERATURE: 35-40 F	TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
20		19.0 - 21.0 dry to damp, olive gray, fine to medium SAND and trace medium gravel; rope in spoon (dragged from above) *(Continued)*	SP		5.3 21.0	SS	5 3 3 3	0.0 / 2.0		☒	SB070821 12/31/2003 11:20:00 AM	
	5	21.0 - 24.0 saturated, olive gray, well sorted medium SAND and trace medium gravel, very strong HC odor	SP		2.3 24.0	SS	5 8 18 24	1.3 / 2.0	269 258	☒ ☒	SB070923 12/31/2003 1:00:00 PM SB071024 12/31/2003 1:05:00 PM	
25		24.0 - 32.0 saturated, olive gray, well sorted fine to medium SAND and trace fine gravel; strong/moderate HC odor	SP			SS	10 8 8 12	1.5 / 2.0	170 167	☒	SB071126 12/31/2003 1:10:00 PM	
	0					SS	8 15 18 14	2.0 / 2.0	158 202 161	☒	SB071228 12/31/2003 1:20:00 PM	
						SS	9 9 12 16	2.0 / 2.0	93 159 162	☒	SB071330 12/31/2003 1:25:00 PM	
30	-5				-5.7 32.0	SS	6 6 8 8	1.5 / 2.0	132 142	☒	SB071432 12/31/2003 1:35:00 PM	
35	-10											
40		Boring completed at 40.0 ft										

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-08

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/19/03
DATE COMPLETED: 12/19/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,013.6 E: 1,001,770.6
GS ELEVATION: 22.8 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	REC / ATT	SAMPLES: TYPE	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0		0.0 - 5.0 saturated, dark brown, compact SAND, SILT, and GRAVEL; faint HC odor	FILL	▨	17.8 5.0				WELL CASING Interval: Material: Diameter: Joint Type: WELL SCREEN Interval: Material: Diameter: Slot Size: End Cap: FILTER PACK Interval: Type: Quantity: FILTER PACK SEAL Interval: Type: Quantity: ANNULUS SEAL Interval: Type: Quantity:
	20								
5		5.0 - 7.0 (same as above) with brick frags-- refusal @ 7ft	FILL	▨	15.8 7.0				
	15								
10									
	10								
15									
	5								
20		Log continued on next page							

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-08

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/19/03
DATE COMPLETED: 12/19/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 206,013.6 E: 1,001,770.6
GS ELEVATION: 22.8 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES REC / ATT	TYPE	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
20									**WELL CASING** Interval: Material: Diameter: Joint Type: **WELL SCREEN** Interval: Material: Diameter: Slot Size: End Cap: **FILTER PACK** Interval: Type: Quantity: **FILTER PACK SEAL** Interval: Type: Quantity: **ANNULUS SEAL** Interval: Type: Quantity:
	0								
25									
	-5								
30									
	-10								
35									
	-15								
40		Boring completed at 40.0 ft							

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-09

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/29/03
DATE COMPLETED: 12/29/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,931.7 E: 1,001,887.3
GS ELEVATION: 23.2 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

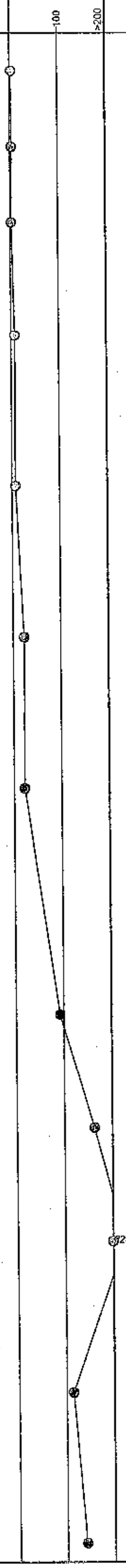
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0		0.0 - 3.0 moist, dusky yellowish brown, fine to coarse SAND and trace gravel; moderate HC odor	FILL	20.2
	20	3.0 - 4.0 moist, brownish black, silty CLAY; slight HC odor	FILL	3.0 19.2
5		4.0 - 7.0 moist, olive black, well graded fine to coarse SAND AND GRAVEL and some brick and wood frags; slight HC odor	FILL	4.0 16.2
		7.0 - 8.0 moist, olive gray, fine SAND; slight HC odor	SP	7.0 15.2
	15	8.0 - 9.0 moist, olive black, fine SAND with black staining; slight HC odor	SP	8.0 14.2
		9.0 - 9.3 damp, light olive gray to olive gray, CLAY; slight HC odor	CL	13.9
10		9.3 - 9.5 black, fine SAND and little silt; moderate HC odor	SP	13.7
		9.5 - 11.0 black, fine SAND and little to trace fine gravel; black staining; moderate HC odor	SP	9.5 12.2
	10	11.0 - 14.0 moist, brownish gray, well graded fine to coarse SAND AND fine to medium GRAVEL	SWG	11.0 9.2
		14.0 - 15.0 red, ROCK FRAGS of quartz and SS, moderate HC odor	GP	14.0 8.2
15		15.0 - 15.5 damp, brownish gray, well graded fine to coarse SAND and trace fine gravel; moderate HC odor	SW	15.0 7.7
		15.5 - 16.0 brownish gray, coarse GRAVEL AND COBBLE FRAGS, little fine to coarse sand	GP	15.5 7.2
		16.0 - 17.0 dark yellow brown, well graded, fine to coarse SAND AND medium GRAVEL, some sandstone cobble fragments @16.5 ft	SWG	16.0 6.2
	5	17.0 - 19.0 moist, dark yellowish brown, medium to fine SAND; moderate HC odor	SP	17.0 4.2
20		19.0 - 23.0 wet, dark yellowish brown, medium to fine SAND and trace fine gravel; moderate HC odor	SP	19.0

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
GRAB		1.0	2.8			
GRAB		1.0	3.1			
GRAB		1.0	1.9			
SS	WOR WOR WOR WOR	1.3/2.0	2 8	☒	SB090104 12/23/2003 10:15:00 AM	
SS	3 1 4 2	1.2/2.0	2.4 7.2	☒	SB090207 12/23/2003 10:30:00 AM	
SS	2 2 3 5	1.3/2.0	23 20	☒	SB090308 12/23/2003 10:45:00 AM	
SS	10 18 12 20	1.7/2.0	17 22 16	☒	SB090410 12/23/2003 10:50:00 AM	
SS	14 60/5	0.0/1.0				
SS	10 25 18 20	1.3/2.0	63 92	☒	SB090514 12/23/2003 11:15:00 AM	
SS	11 35 50/3	0.7/1.0	163			
SS	5 28 26 14	1.7/2.0	200 175 225	☒	SB090617 12/23/2003 11:30:00 AM	
SS	10 12 15 13	1.3/2.0	74 114	☒	SB090719 12/23/2003 1:00:00 PM	
SS	6 15 15 2	1.6/2.0	90 100 141			

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-09

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/29/03
DATE COMPLETED: 12/29/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,931.7 E: 1,001,887.3
GS ELEVATION: 23.2 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)
20	
	0
25	
	-5
30	
	-10
35	
	-15
40	

SOIL PROFILE

DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
19.0 - 23.0 wet, dark yellowish brown, medium to fine SAND and trace fine gravel; moderate HC odor *(Continued)*	SP		0.2 23.0
23.0 - 25.0 saturated, dark yellowish brown, well graded, fine to coarse SAND and trace fine gravel with black staining; moderate HC odor	SP		-1.8 25.0
25.0 - 27.0 saturated, dark yellowish brown, well sorted fine to medium SAND and trace fine gravel; trace dark gray veins; moderate HC odor	SP		-3.8 27.0
27.0 - 28.5 saturated, brownish gray to olive gray, very well graded, fine to coarse SAND AND medium to coarse GRAVEL; moderate HC odor	SWG		-5.3 28.5
28.5 - 29.0 saturated, olive gray to olive black, well sorted, fine to medium SAND and trace fine gravel; moderate HC odor	SP		-5.8 29.0
29.0 - 30.0 saturated, brownish gray to olive gray, very well graded, fine to coarse SAND AND coarse GRAVEL; moderate HC odor	SWG		-6.8 30.0
30.0 - 31.0 saturated, grayish black to black (n1), well sorted, fine to medium sand;	SP		-7.8 31.0
31.0 - 34.0 saturated, grayish black to olive black, well sorted, fine to medium SAND and trace fine gravel; moderate HC odor	SP		-10.8 34.0
34.0 - 35.0 saturated, grayish black to black, well sorted medium SAND and trace medium gravel; moderate/faint HC odor	SP		-11.8 35.0

Boring completed at 40.0 ft

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)
SS	6 15 15 2	1.6 / 2.0	90 100 141
SS	6 18 20 19	1.6 / 2.0	135 92 112
SS		1.7 / 2.0	80 180 195
SS	4 8 12 13	2.0 / 2.0	53.9 71.8 71.2
SS	54 34 29 27	2.0 / 2.0	79.1 122 100
SS	12 17 12 26	2.0 / 2.0	44.5 44 36
SS	5 13 20 22	2.0 / 2.0	34.3 24.1 21.4
SS	8 9 26 23	2.0 / 2.0	18.5 17.5 14

Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
☒	SB090821 12/23/2003 1:15:00 PM	
☒	SB090922 12/23/2003 1:55:00 PM	
☒	SB091025 12/23/2003 2:10:00 PM	
☒	SB091127 12/29/2003 9:20:00 AM	
☒	SB091229 12/29/2003 9:50:00 AM	
☒	SB091331 12/29/2003 10:10:00 AM	
☒	SB091433 12/29/2003 10:20:00 AM	
☒	SB091535 12/29/2003 10:25:00 AM	

Peak PID Reading per SS (ppm)

MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval.
Type:
Quantity.

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-10

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/19/03
DATE COMPLETED: 12/19/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,923.3 E: 1,001,788.8
GS ELEVATION: 25.6 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:-

SOIL PROFILE

DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)
0.0 - 5.0 moist, light brownish, well graded fine to coarse SAND; no HC odor	FILL	▨	
5.0 - 5.5 moist, black, SAND AND WOOD DEBRIS; moderate HC odor	FILL	▨	20.6 5.0
5.5 - 6.0 moist to wet, moderate brown, well graded, fine to coarse SAND; slight HC odor	FILL	▨	20.1 5.5
6.0 - 7.0 wet, grayish black, well graded, angular, SAND AND GRAVEL, moderate HC odor	FILL	▨	19.6 6.0
7.0 - 9.0 moist, black, fine to medium SAND and some to little silt and fine gravel; strong HC odor	FILL	▨	18.6 7.0
9.0 - 10.5 dry to damp, brownish gray to blackish gray,SAND AND GRAVEL; moderate HC odor	FILL	▨	16.6 9.0
10.5 - 13.0 dry, brownish gray, well graded SAND and little fine gravel; moderate HC odor	FILL	▨	15.1 10.5
13.0 - 14.0 damp, moderate brown (5yr4/4), well sorted, fine to medium SAND; slight HC odor	SP	░	12.6 13.0
14.0 - 15.5 (same as above) moderate HC odor	SP	░	11.6 14.0
15.5 - 17.0 wet, dark yellowish with some staining, fine to medium SAND and trace fine gravel; moderate HC odor	SP	░	10.1 15.5
17.0 - 18.0 damp to moist, dark yellowish brown, well graded fine to coarse SAND, and trace fine gravel; slight HC odor	SW	░	8.6 17.0
18.0 - 19.0 damp to moist, dark moderate yellow brown, fine to medium SAND; slight HC odor	SP	░	7.6 18.0
19.0 - 21.0 damp to moist, dark yellowish brown well graded fine to medium SAND; slight HC odor	SW	░	6.6 19.0

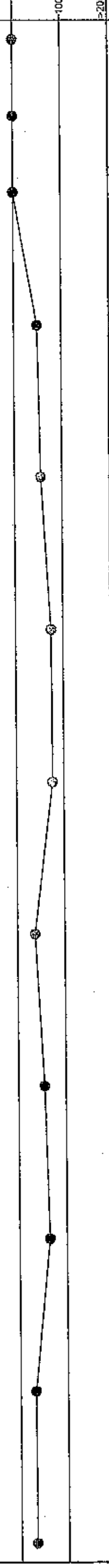
DEPTH (ft): 0, 5, 10, 15, 20
ELEVATION (ft): 25, 20, 15, 10

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
GRAB		/0.5	0			
GRAB		/0.5	0			
GRAB		/0.5	0			
SS	WOR WOR WOR 50/1	0.7/2.0	3.4 48.7	☒	SB100105 12/19/2003 2:00:00 PM	
SS	2 2 17 60	1.0/2.0	38.7 55.2	☒	SB100206 12/19/2003 2:10:00 PM	
SS	17 22 25 27	1.7/2.0	75 73 60	☒	SB100308 12/19/2003 2:25:00 PM	
SS	25 22 23 24	1.1/2.0	76 72	☒	SB100411 12/19/2003 2:40:00 PM	
SS	6 8 10 10	0.5/2.0	37	☒	SB100512 12/19/2003 2:50:00 PM	
SS	2 6 9 10	1.6/2.0	38 35 55	☒	SB100615 12/22/2003 9:10:00 AM	
SS	5 6 9 9	1.7/2.0	64 55 52	☒	SB100716 12/22/2003 9:25:00 AM	
SS	5 9 12 10	1.3/2.0	22 32	☒	SB100818 12/22/2003 9:40:00 AM	
SS	5 8 12 10	1.5/2.0	33 28 31	☒	SB100920 12/22/2003 9:50:00 AM	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-10

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/19/03
DATE COMPLETED: 12/19/03
WEATHER: Sunny

DATUM: Local
COORDS: N: 205,923.3 E: 1,001,788.8
GS ELEVATION: 25.6 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

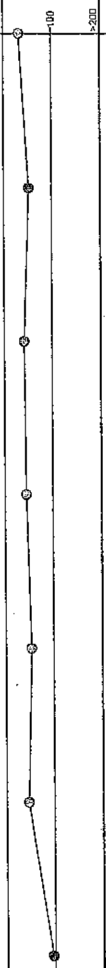
DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
20	19.0 - 21.0 damp to moist, dark yellowish brown well graded fine to medium SAND; slight HC odor *(Continued)*	SW	4.6 21.0
	21.0 - 28.0 saturated, blackish brown,fine to medium SAND and trace fine gravel; moderate HC odor	SP	-2.4 28.0
	28.0 - 29.0 saturated, olive gray, well graded, fine to medium SAND; moderate HC odor	SP	-3.4 29.0
	29.0 - 30.0 saturated, brownish black, fine to medium SAND and trace fine gravel; moderate HC odor	SP	-4.4 30.0
30	30.0 - 33.0 saturated, olive gray, well graded, fine to medium SAND; moderate HC odor	SP	-7.4 33.0
40	Boring completed at 40.0 ft		

Depth scale (ft): 20, 25, 30, 35, 40
Elevation scale (ft): 5, 0, -5, -10

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	5 8 12 10	1.5 / 2.0	33 28 31			
SS	9 10 12 13	1.7 / 2.0	42 37 53	☒	SB101023 12/22/2003 10:45:00 AM	
SS	3 9 9 12	0.8 / 2.0	42 32	☒	SB101124 12/22/2003 11:00:00 AM	
SS	5 9 9 5	1.7 / 2.0	45 43 45	☒	SB101227 12/22/2003 12:20:00 PM	
SS	WOR WOR WOR 12	2.0 / 2.0	34 44 54	☒	SB101329 12/22/2003 1:30:00 PM	
SS	5 7 9 11	2.0 / 2.0	35 47 41	☒	SB101430 12/22/2003 1:40:00 PM	
SS	8 12 16 16	1.7 / 2.0	96 91 92	☒	SB101532 12/22/2003 2:05:00 PM	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-11

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/29/03
DATE COMPLETED: 12/29/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,901.9 E: 1,001,702.6
GS ELEVATION: 18.7 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

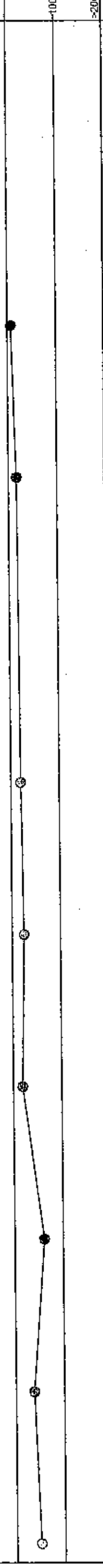
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
3.0 - 7.0 damp to oil moist, olive black with brick frags, poorly sorted, angular, silty SAND to medium gravel, oil saturation increasing to 4.75 ft; moderate/ strong HC odor	FILL	11.7 / 7.0
7.0 - 10.0 oil wet, BRICKS AND olive black to olive gray, silty SAND and some angular medium gravel; moderate/strong HC odor	FILL	8.7 / 10.0
10.0 - 11.0 wet to oil wet, olive gray and brownish gray , well graded, medium to coarse SAND AND coarse GRAVEL; moderate HC odor	SWG	7.7 / 11.0
11.0 - 13.5 wet to oil wet, olive gray to brownish gray, well sorted, fine to medium SAND and trace medium gravel; moderate HC odor	SP	5.2 / 13.5
13.5 - 15.0 moist to wet, olive gray and brownish gray, well graded fine to coarse SAND, loose, clean; moderate HC odor	SW	3.7 / 15.0
15.0 - 18.5 saturated to oil saturated, olive gray to oive black, well sorted, fine to medium SAND and trace fine gravel; moderate HC odor	SP	0.2 / 18.5
18.5 - 19.0 saturated, olive gray, well sorted, fine to very fine SAND, light HC odor	SP	-0.3 / 19.0
	SP	

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
SS	WOR WOR 6 8	1.3 / 2.0	1.3 7.3	SB110105 12/29/2003 1:30:00 PM
SS	6 6 6 7	0.3 / 2.0	13.2 12.1 16.8	SB110207 12/29/2003 1:40:00 PM
SS	6 21 33 26	1.3 / 2.0		SB110309 12/29/2003 1:45:00 PM
SS	26 24 43 26	1.7 / 2.0	2.9 17.3 20.4	SB110411 12/29/2003 2:00:00 PM
SS	6 7 13 8	1.5 / 2.0	15.9 25 15.4	SB110513 12/29/2003 2:15:00 PM
SS	5 6 9 6	1.5 / 2.0	17.5 19.6	SB110615 12/29/2003 2:30:00 PM
SS	6 6 9 16	1.7 / 2.0	61.3 59.4 61.6	SB110717 12/29/2003 2:40:00 PM
SS	3 6 9 12	2.0 / 2.0	29.7 31.8 38	SB110819 12/29/2003 2:50:00 PM
SS	4 9 14 15	2.0 / 2.0	27.2 34.3 51	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-11

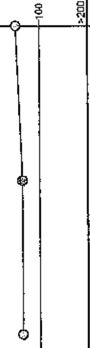
SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/29/03
DATE COMPLETED: 12/29/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,901.9 E: 1,001,702.6
GS ELEVATION: 18.7 ft
TOC ELEVATION:
TEMPERATURE: 35-40 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES								MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200		
20		19.0 - 25.0 oil saturated, olive black to black, well sorted fine to medium SAND and trace fine gravel; very strong HC odor *(Continued)*	SP			SS	4 9 14 15	2.0 2.0	27.2 34.3 51	☒	SB110921 12/30/2003 8:00:00 AM				WELL CASING Interval: Material: Diameter: Joint Type:
						SS	4 4 5 4	2.0 2.0	50.4 64.1 59.4	☒	SB111023 12/30/2003 8:10:00 AM				WELL SCREEN Interval: Material: Diameter: Slot Size: End Cap: FILTER PACK Interval: Type: Quantity:
	-5				-6.3 25.0	SS	4 9 13 15	2.0 2.0	41 64.2 54.8	☒	SB111125 12/30/2003 8:20:00 AM				FILTER PACK SEAL Interval: Type: Quantity: ANNULUS SEAL Interval: Type: Quantity:
25															
	-10														
30															
	-15														
35															
	-20														
40		Boring completed at 40.0 ft													

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-12

SHEET 1 of 2

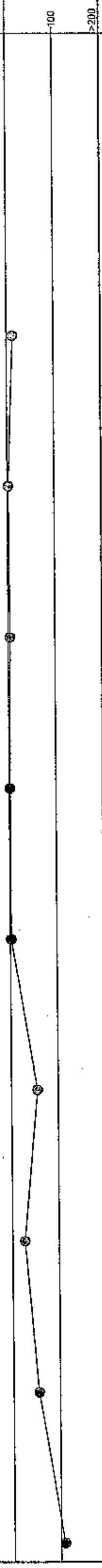
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/18/03
DATE COMPLETED: 12/18/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,813.4 E: 1,001,719.6
GS ELEVATION: 19.1 ft
TOC ELEVATION:
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES								MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 >200		
0		0.0 - 3.0 wet to moist, light olive gray to olive gray, poorly sorted, angular, silty SAND AND coarse GRAVEL, faint HC odor	FILL		16.1 3.0										WELL CASING Interval: Material: Diameter Joint Type: WELL SCREEN Interval: Material: Diameter: Slot Size: End Cap: FILTER PACK Interval: Type: Quantity: FILTER PACK SEAL Interval: Type: Quantity: ANNULUS SEAL Interval: Type: Quantity:
	15	3.0 - 4.0 wet to moist, light olive gray to olive gray, poorly sorted, angular, silty SAND AND coarse GRAVEL, faint HC odor	FILL		15.1 4.0	SS	3 4 9 4	1.7/2.0	11 12.4 8.1						
		4.0 - 5.0 wet to moist, black, SILT AND BRICK FRAGS with some to trace angular gravel; trace HC odor	FILL		14.1 5.0										
5		5.0 - 7.0 saturated, black to olive black, fine to medium SAND and trace silty sand with trace brick frags; faint HC odor	FILL		12.1 7.0	SS	WOR 4 10 12	1.7/2.0	1.2 2.1 2	☒	SB120107 12/18/2003 9:55:00 AM				
		7.0 - 9.0 moist, olive gray, well sorted fine to medium SAND; moderate HC odor	SP		10.1 9.0	SS	3 3 3 5	2.0/2.0	3.9 3.1 2.6	☒	SB120209 12/18/2003 10:10:00 AM				
10	10	9.0 - 13.0 moist, olive gray, fine to medium SAND; very faint HC odor	SP			SS	10 4 5 5	2.0/2.0	1.4 1.3 1.7	☒	SB120311 12/18/2003 10:15:00 AM				
					6.1 13.0	SS	8 3 5 8	2.0/2.0	1.5 1.7 2	☒	SB120413 12/18/2003 10:20:00 AM				
15	5	13.0 - 17.0 saturated, olive gray to brownish gray, well sorted fine to medium SAND and trace fine gravel; moderate HC odor	SP			SS	3 5 7 10	1.3/2.0	37.5 35.3 55.9	☒	SB120515 12/18/2003 10:25:00 AM				
					2.1 17.0	SS	2 2 6 9	1.8/2.0	13.6 22.6 26.6	☒	SB120617 12/18/2003 10:35:00 AM				
		17.0 - 19.0 saturated to oil saturated, olive black to black, well sorted fine to medium SAND and trace fine gravel; very strong HC odor	SP		0.1 19.0	SS	5 11 11 11	2.0/2.0	21.2 34.5 54.9	☒	SB120719 12/18/2003 10:40:00 AM				
20	0		SP			SS	5 12 12 22	2.0/2.0	67.3 104 109						



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LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-12

SHEET 2 of 2

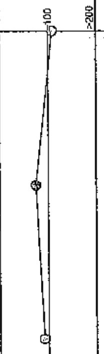
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/18/03
DATE COMPLETED: 12/18/03
WEATHER: P. Cloudy

DATUM: Local
COORDS: N: 205,813.4 E: 1,001,719.6
GS ELEVATION: 19.1 ft
TOC ELEVATION:
TEMPERATURE: 40-45 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES									
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
20		19.0 - 21.0 saturated to oil saturated, olive gray to brownish gray, well sorted fine to medium SAND @ 19 grading to medium to coarse sand and some medium gravel at 21; very strong HC odor *(Continued)*	SP		-1.9 21.0	SS	5 12 12 22	2.0/2.0	67.3 104 109	☒	SB120821 12/18/2003 10:50:00 AM				
		21.0 - 24.0 saturated to oil saturated, olive gray , well graded, fine to coarse SAND AND medium to coarse GRAVEL; strong HC odor	SWG		-4.9 24.0	SS	16 30 22 22	1.5/2.0	71.1 74.8 64.4	☒	SB120923 12/18/2003 11:05:00 AM				
	-5	24.0 - 25.0 saturated to oil saturated, olive gray, welll sorted fine to medium SAND and trace medium gravel	SP		-5.9 25.0	SS	16 11 7 12	1.5/2.0	57.1 68.1 91.1	☒	SB121025 12/18/2003 11:15:00 AM				
25															
	-10														
30															
	-15														
35															
	-20														
40		Boring completed at 40.0 ft													



WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-14

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/17/03
DATE COMPLETED: 12/17/03
WEATHER: Steady Rain

DATUM: Local
COORDS: N: 205,855.3 E: 1,001,668.9
GS ELEVATION: 17.7 ft
TOC ELEVATION:
TEMPERATURE: 45-50 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

SOIL PROFILE

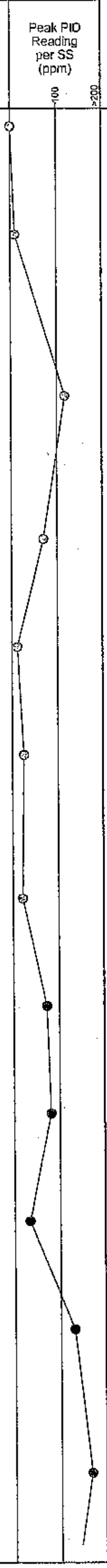
DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0.0 - 3.0 wet to saturated, grayish black to black, poorly sorted, angular, fine SAND AND coarse GRAVEL, strong HC odor	FILL	14.7
3.0 - 5.0 wet to saturated, grayish black to black, poorly sorted, angular, fine SAND AND coarse GRAVEL, strong HC odor	FILL	3.0 12.7
5.0 - 7.0 dry, very compact to dense, well graded, angular, brownish black and brownish gray GRAVEL AND fine SAND; moderate HC odor	FILL	5.0 10.7
7.0 - 11.0 oil wet to moist, black, well graded, fine to medium SAND AND medium subangular to angular GRAVEL; wood chunk from 9.5 to 10, moderate/heavy HC odor	FILL	7.0 6.7
11.0 - 12.0 wet, olive gray to olive brown, well sorted fine to medium SAND; moderate/faint HC odor	FILL	11.0 5.7
12.0 - 14.0 oil saturated, black, loose, poorly sorted fine SAND TO coarse GRAVEL; moderate/strong HC odor	SWG	12.0 3.7
14.0 - 16.5 (same as above) very strong HC odor	SWG	14.0 1.2
16.5 - 18.0 saturated to oil saturated, olive gray to olive black, well sorted, fine to medium SAND with some to trace medium gravel; very strong HC odor	SP	16.5 -0.4
18.0 - 20.0 sturated, olive gray to olive black, well sorted fine to medium SAND and trace medium gravel; very strong HC odor	SP	18.0 -2.4

Log continued on next page

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Laboratory Sample ID Date/Time Collected
GRAB		-/0.5	0	
GRAB		-/0.5	9.9	
SS	WOR 1 10 6	1.2/2.0	118 92	
SS	6 10 30 30	1.2/2.0	70.2 31.9	SB140107 12/17/2003 10:05:00 AM
SS	2 50/0	0.5/1.0	12.1	SB140208 12/17/2003 10:30:00 AM
SS	10 11 10 12	2.0/2.0	12.6 25.6 21.7	SB140310 12/17/2003 10:40:00 AM
SS	7 8 7 6	2.0/2.0	12.1 18.7 21.2	SB140411 12/17/2003 10:55:00 AM SB140512 12/17/2003 11:00:00 AM
SS	41 50 40 40	1.5/1.0	40 73	
SS	10 20 28 11	1.1/2.0	69.1 81 78.8	SB140614 12/17/2003 11:20:00 AM
SS	20 22 32 32	0.3/1.0	33.5	
SS	4 10 11 10	1.3/2.0	108 131 124	SB140717 12/17/2003 1:10:00 PM
SS	4 4 5 6	1.7/2.0	128 166 169	SB140820 12/17/2003 1:20:00 PM

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-14

SHEET 2 of 2

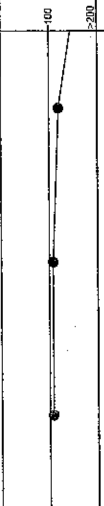
PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 40.0 ft
AZIMUTH: N/A
LOCATION: Quanta Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: CME 75
DATE STARTED: 12/17/03
DATE COMPLETED: 12/17/03
WEATHER: Steady Rain

DATUM: Local
COORDS: N: 205,855.3 E: 1,001,668.9
GS ELEVATION: 17.7 ft
TOC ELEVATION:
TEMPERATURE: 45-50 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm)	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES
20		20.0 - 22.0 saturated, olive gray to brownish gray, well sorted, fine to medium SAND and trace fine gravel; very strong HC odor (distinct)	SP		20.0 -4.4	SS	4 4 4 4	1.5 / 2.0	119 118 120	☒	SB140922 12/17/2003 1:35:00 PM			
	-5	22.0 - 26.0 wet to saturated, olive gray to brownish gray, well sorted, fine to medium SAND and trace fine to medium gravel; very strong HC odor	SP		22.0	SS	20 36 32 36	2.0 / 2.0	72.9 91.7 108	☒	SB141024 12/17/2003 2:05:00 PM			
25					-8.4 26.0	SS	25 26 28 25	1.9 / 2.0	108 92 99	☒	SB141126 12/17/2003 2:15:00 PM			
30	-10													
35	-15													
40	-20	Boring completed at 40.0 ft												



WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Aquifer Drilling and Testing
DRILLER: Chris Stratton

GA INSPECTOR: J.Ford
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-15

SHEET 1 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/25/04
DATE COMPLETED: 6/25/04
WEATHER: Overcast/Breeze

DATUM: Local
COORDS: N: 205,945.0 E: 1,001,624.8
GS ELEVATION: 15.1 ft
TOC ELEVATION:
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

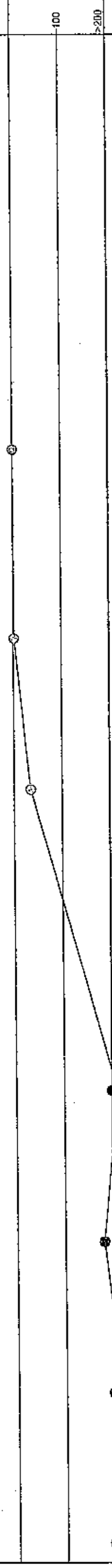
SOIL PROFILE

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)
0	15	0.0 - 5.0 Concrete slab/asphalt, concrete fragments and fill debris (timber, brick fragments)	FILL	10.1
5	10	5.0 - 7.0 Gray black, slighly moist stiff SILT, trace VF sand and coarse gravel	ML	5.0 8.1
		7.0 - 13.0 Moist, brownish black loose to compact silty MF SAND, trace cobbles (moderate HC odor)	SP	7.0 2.1
10	5			
		13.0 - 17.0 Oil Saturated, black stained dense CF SAND, trace to little coarse gravel and silt (strong HC odor)	SP	13.0 -1.9
15	0			
		17.0 - 23.0 Oil Saturated, Grayish black well graded compact F-C SAND with balck streaking trace to little coarse gravel (strong HC odor)	SW	17.0
20		Log continued on next page		

SAMPLES

TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses
SS	8 5 4 2	1.8 / 1.0	0.4 0.6	☒	SB-1501-07 6/25/2004	
SS	7 4 4 3	0.4 / 2.0	1.7	☒	SB-1502-09 6/25/2004	
SS	6 6 6 11	0.6 / 2.0	35	☒	SB-1503-11 6/25/2004	
SS	5 50/0.4	0.0 / 2.0	N/A N/A N/A			
SS	2 16 25 12	0.5 / 2.0	212	☒	SB-1504-15 6/25/2004	
SS	10 21 20 10	1.6 / 2.0	135 182 120	☒	SB-1505-16 6/25/2004	
SS	15 8 9 10	1.2 / 2.0	150 220	☒	SB-1506-19 6/25/2004	
SS	11 12 17 15	1.7 / 2.0	370 500 402	☒	SB-1507-20 6/25/2004	

Peak PID Reading per SS (ppm)



MONITORING WELL / PIEZOMETER DIAGRAM and NOTES

WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quanilty:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quanlity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

RECORD OF BOREHOLE SB-15

SHEET 2 of 2

PROJECT: Quanta Resources Site
PROJECT NUMBER: 023-6151
DRILLED DEPTH: 35.0 ft
AZIMUTH: N/A
LOCATION: North Capasso Property

DRILL METHOD: Hollow-stem auger
DRILL RIG: Mobile B-58
DATE STARTED: 6/25/04
DATE COMPLETED: 6/25/04
WEATHER: Overcast/Breeze

DATUM: Local
COORDS: N: 205,945.0 E: 1,001,624.8
GS ELEVATION: 15.1 ft
TOC ELEVATION:
TEMPERATURE: 70-80 F

INCLINATION: -90
DEPTH W.L.:
ELEVATION W.L.:
DATE W.L.:
TIME W.L.:

		SOIL PROFILE				SAMPLES									
DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	TYPE	BLOWS per 6 in	REC / ATT	PID per 6" (ppm)	Sample Interval	Laboratory Sample ID Date/Time Collected	Analyses	Peak PID Reading per SS (ppm) 100 200	MONITORING WELL / PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
20	-5	17.0 - 23.0 Oil Saturated, Grayish black well graded compact F-C SAND with balck streaking trace to little coarse gravel (strong HC odor) *(Continued)*				SS	11 12 17 15	$\frac{1.7}{2.0}$	370 500 402				500		
			SW		-7.9	SS	3 9 10 11	$\frac{1.5}{2.0}$	440 640 8.55	☒	SB-1509-23 6/25/2004		640		
		23.0 - 25.0 Oil/water saturated Gray brown compact well graded CF SAND, little rounded coarse gravel (strong HC odor)	SP		23.0 -9.9	SS	11 14 13 13	$\frac{2.0}{2.0}$	230 500 370				500		
25	-10	25.0 - 35.0 Grayish brown water saturated compact CF SAND, little to some CF GRAVEL (strong HC odor)			25.0	SS	3 10 14 15	$\frac{2.0}{2.0}$	440 360 250	☒	SB-1511-26 6/25/2004		440		
						SS	11 16 18 16	$\frac{2.0}{2.0}$	330 450 680	☒	SB-1512-29 6/25/2004		680		
30	-15		SW			SS	4 11 18 18	$\frac{1.7}{2.0}$	270 136 238				270		
						SS	5 7 9 8	$\frac{1.5}{2.0}$	120 315 430	☒	SB-1514-33 6/25/2004		430		
					-19.9	SS	4 8 11 15	$\frac{1.8}{2.0}$	517 722 930				930		
35	-20	Boring completed at 35.0 ft													
40															

WELL CASING
Interval:
Material:
Diameter:
Joint Type:

WELL SCREEN
Interval:
Material:
Diameter:
Slot Size:
End Cap:

FILTER PACK
Interval:
Type:
Quantity:

FILTER PACK SEAL
Interval:
Type:
Quantity:

ANNULUS SEAL
Interval:
Type:
Quantity:

LOG SCALE: 1 in to 3 ft
DRILLING COMPANY: Ameridrill
DRILLER: Andre Boutoille

GA INSPECTOR: TIR/JLH
CHECKED BY: SDM
DATE:

Golder Associates

PRE-RI BORING/MONITORING WELL INSTALLATION LOGS

Well No. GW 1
Project No. 576 002

Project Name Quanta Resources

Client NYSDEC

MONITORING WELL COMPLETION LOG

Location Long Island City, NYC

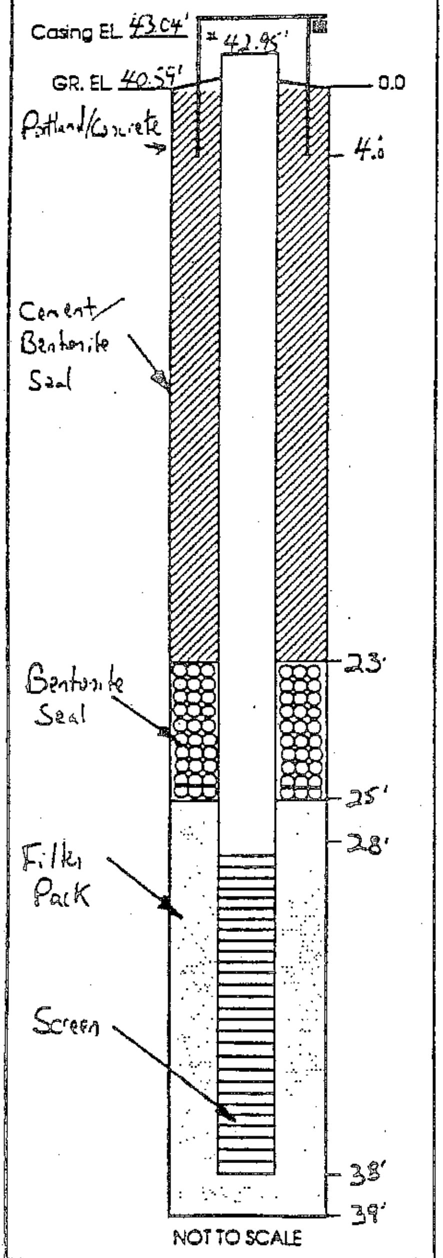
Date Drilled 11-16-88

Date Developed (Purged 12-6-88

Developing Method Purge/develop Bailing

Well Construction Completed 11-17-88

WELL CONSTRUCTION DETAIL



NOT TO SCALE

Inspector Steve Miller, A Magliocchino
Drilling Contractor Soil Testing

Type of Well Monitoring Well - Overburden
Static Water Level 22.61' below grade Date 2-22-90
Measuring Point (M.P.) grade @ 40.59' elevation
Total Depth of Well 37.98' below ground surface
Total Depth of boring 39' below grade.

Drilling Method
Type Hollow Stem Auger Diameter 4 in. ID
Casing H.S.A.

Sampling Method
Type Split Spoon Diameter 1 3/8" ID
Weight 140 # Fall 30 in
Interval 5 ft and continuous

Riser Pipe Left in Place
Material Sch 40 PVC Diameter 2" ID
Length 30.34 ft Joint Type threaded/flush

Screen
Material Sch 40 PVC Diameter 2" I.D.
Slot Size 0.010" Length 10 ft
Stratigraphic Unit Screened gravelly Sands

Filter Pack
Sand ✓ Gravel Natural
Grade #2
Amount Interval 39' to 25' below grade

Seal(s)
Type Bentonite Interval 25' to 23' below grade
Type Cement/bentonite Grout Interval 23' to 4' below grade
Type Port. Concrete Interval 4' to grade

Locking Casing ☑ Yes ☐ No
Notes: *protective casing and riser cut down 2-22-90 PVC @ 1.57' above grade.
Thin veneer of golden brown oily product floating above water table in casing.
(Approximately 2 oz of floating oil removed from casing on 2-22-90)

LAWLER, MATUSKY SKELLY ENGINEERS

Data by S Miller /A. Magliochino / E. Hastings

Sheet 1 of 3

SUBSURFACE EXPLORATION - TEST BORING LOG

Boring No. GW1
Project No. 576-002

Project Name Quanta Resources
Client NYSDEC
Driller Soil Testing
Monitoring Instrument(s) HNU (instrument readings above background)

SAMPLE HAMMER
Weight 140 lb
Fall 30 in.

Date 11-16-88 start 11-16-88 finish
Boring Location inside Review Ave. Fence
Total Depth 39' below grade
Depth to Water 22.61' below grade 2/22/90
Hole Diameter approx 8" boring
Ground Surface Elevation 40.59'
(relative to west side of Review Ave, assumed 40.00 ft elevation)
Beaver B-57 mobile drilling
Hollow Stem Auger 4 in ID

(2.60' floating oil inferred from nearby piezometers 2/22/90)

Depth	BLOWS ON SAMPLER				Retained Sample	Recovery (feet)	Sample No.	Instrument Reading above background	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
	0" to 6"	6" to 12"	12" to 18"	18" to 24"								
0'											0.1' ASPHALT	
	8							↑	Dry		Brown coarse medium SAND little - Silt, little - fine Gravel ; .5' thick	
1'		12						cuttings				
			16					17&20		Fill	Black medium fine SAND, trace Silt, little + medium fine Gravel, .5' thick	
2'				10	✓	12		↓			Blk Silt and medium fine Sand, little - medium fine Gravel; .2' thick	cinders ash
									—			
3'												
4'												
	3							cuttings ↑	Dry		Black medium fine SAND, little Silt, little fine Gravel, 0.5' thick	bits of brick brick, coal ash, slag, tires, st, Possible cobbles, boulders, bricks
5'		2						in	--	Fill		
			3					air ↓	Moist		Dark gray coarse medium and fine SAND, Some - Silt, little + fine Gravel; 1' thick	
6'				4	✓	12		3 to 10				
											(includes 1cm wet sand lense near base)	
7'												
8'												
9'												
	1											
10'		3								Fill		
			6						Moist		Dark gray fine Sand, Some - Silt, trace medium fine Gravel	reduced recovery due to coarse gravel and redbrick
11'				10	✓	0.7						
12'												
13'												

Sheet 3 of 3

Boring No. GW1
Project No. 576.002

Depth	BLOWS ON SAMPLER				Retained Sample	Recovery (feet)	Sample No.	Instrument Reading	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
	0" to 6"	6" to 12"	12" to 18"	18" to 24"								
32'											Dark gray coarse medium(+) fine SAND, trace Silt, little medium(+) fine Gravel	
	6											
33'		8										
			12						Wet			
34'				11	✓	1.6		14.16				
	9											
35'		6									Gray coarse(+) medium fine SAND, trace fine Gravel	
			10									
36'				10	✓	1.2		9.610	Wet			
	8										Ditto above for 1.4' thick	
37'		9										Sample 37.4'-38
			10						Wet		Dark gray medium fine(+) SAND, little Silt ; 0.6'	
38'				12	✓	2.0		46.29				
39'		AUGER DOWN										

LAWLER, MATUSKY & SKELLY ENGINEERS

Sheet 3 of 3

Boring No. GW1
Project No. 576-002

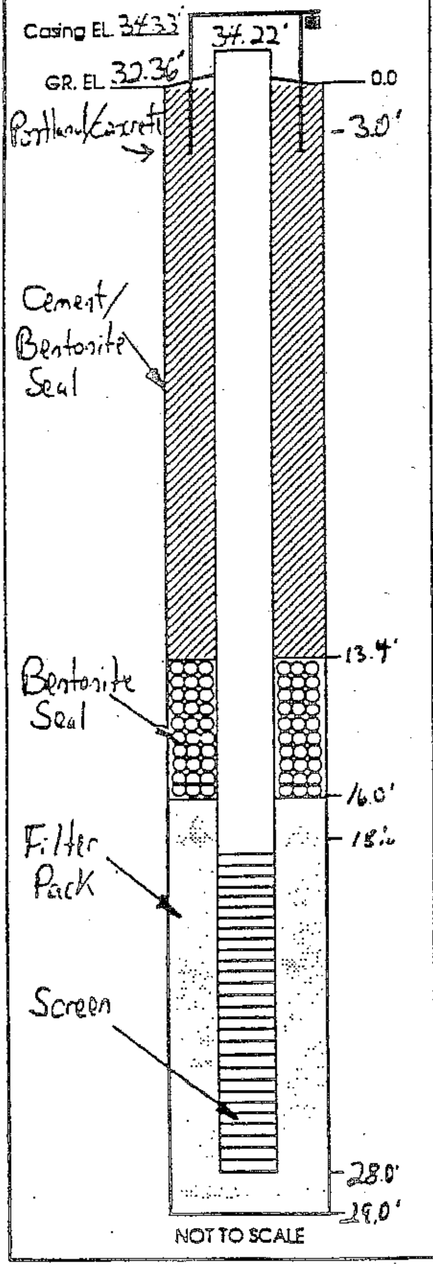
Depth	BLOWS ON SAMPLER				Retained Sample	Recovery (feet)	Sample No.	Instrument Reading	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
	0" to 6"	6" to 12"	12" to 18"	18" to 24"								
32'											Darkgray coarse medium(+) fine SAND, trace-Silt, little-medium(+) fine Gravel	
	6											
33'		8										
			12						Wet			
34'				11	✓	1.6		14.6				
	9											
35'		6									Gray Coarse(+) medium fine SAND, trace fine Gravel	
			10									
36'				10	✓	1.2		9.610	Wet			
	8										D.tto above for 1.4' thick	
37'		9										sampled 37.4'-38
			10						Wet		Dark gray medium fine(+) SAND, little-Silt ; 0.6'	
38'				12	✓	2.0		41.29				
39'		AUGER			DOWN							

LAWLER, MATUSKY & SKELLY ENGINEERS

Well No. GW2
Project No. 576-002
Project Name Quanta Resources
Client NYSDEC
Location Long Island City, NYC
Date Drilled 11-17-88
Date Developed Purged 12-6-88
Developing Method Purge/develop bailing
Well Construction Completed 11-18-88

MONITORING WELL COMPLETION LOG

WELL CONSTRUCTION DETAIL



NOT TO SCALE

Inspector Steven Miller, Anthony Magliocchino
Drilling Contractor Soil Testing
Type of Well Monitoring Well - Overburden
Static Water Level 21.39' below grade Date 2-22-90
Measuring Point (M.P.) PVC at 1.86 ft above grade
Total Depth of Well 30.20 ft below MP
Total Depth of boring 29 ft below grade

Drilling Method
Type Hollow Stem Auger Diameter 4 in ID
Casing H.S.A.

Sampling Method
Type Split Spoon Diameter 1 3/8" I.D.
Weight 140 # Fall 30 in
Interval 5 ft and continuous

Riser Pipe Left in Place
Material Sch 40 PVC Diameter 2" ID
Length Joint Type Threaded/Flush

Screen
Material Sch 40 PVC Diameter 2" ID
Slot Size 0.010" Length 10 ft
Stratigraphic Unit Screened Gravelly Sands

Filter Pack
Sand ✓ Gravel Natural
Grade #2
Amount Interval 28' to 16' below grade

Seal(s)
Type Bentonite Interval 16' to 13.4' below grade
Type Cement/bentonite Grout Interval 13.4 ft to 3' below grade
Type Port. concrete Interval 3 ft to grade

Locking Casing ☑ Yes ☐ No
Notes:
7.20' floating oil measured 2-21-90

LAWLER, MATUSKY SKELLY ENGINEERS

Data by S Miller/A Magliocchino

Sheet 1 of 2

SUBSURFACE EXPLORATION - TEST BORING LOG

Boring No. GW2
Project No. 576-002

Project Name Quanta Resources
Client NYSDEC
Driller Soil Testing
Monitoring Instrument(s) HNU (instrument readings above background)

SAMPLE HAMMER

Weight 140 lb
Fall 30 in.

Date 11-17-88 start 11-17-88 finish
Boring Location Rear of site - west & south
Total Depth 29 ft below grade
Depth to Water 21.39' below grade 2-22-90
Hole Diameter approx 8" boring
Ground Surface Elevation 32.36'
(relative to west side of Review Ave, assumed 40.00 ft elevation)
Beaver B 57 Mobil drill rig
Hollow Stem Auger 4 in ID

(7.20' floating oil measured 2-21-90)

Depth	BLOWS ON SAMPLER				Retained Sample	Recovery (feet)	Sample No.	Instrument Reading above background	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
	0" to 6"	6" to 12"	12" to 18"	18" to 24"								
0'											Blackbrown Silt some+, fine SAND,	2" moist
	2								Dry		little+ fine Gravel	Very
1'		24								Fill		Cohesive!
			36								fragments of plastic sheeting, coal,	HNu rises
2'				40	✓	2.0		up 40			and brick	within 3'
												of between
3'												0-2' &
												4-6' spoon
4'												
	5										Ditto, above for .5', plus 2" of red brick	Wood
5'		2									Black coarse medium(+) fine SAND,	fragments
			2						Wet			
6'				4	✓	1.3				brick frag.	little-Silt, trace fine Gravel	
7'												
8'												
9'												
	6											
10'		7							Wet/moist		Speckled Gray coarse(+) medium fine	
			6								SAND, little-medium fine Gravel	
11'				6	✓	1.4		up 6				
12'												
13'												

Sheet 2 of 2

Boring No. GU2
Project No. 576-002

Depth	BLOWS ON SAMPLER				Retained Sample	Recovery (feet)	Sample No.	Instrument Reading	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
	0" to 6"	6" to 12"	12" to 18"	18" to 24"								
14'												
	4										Brown Gray Coarse medium(+) fine SAND, little - fine Gravel; 1.0' thick.	
15'		7										
			8								Black medium fine SAND, some - medium fine Gravel; 0.5' thick	
16'				9	✓	1.5		1-14	Wet			
	8											
17'		9									Black brown coarse medium(+) fine SAND, trace - Silt, little - medium fine(+) Gravel	Product in Spoon
			10									
18'				11	✓	1.4		1-11	Wet			
	5											
19'		7									identical sample as above - but color change from Black to gray @ 19 ft	Product in Spoon
			7									
20'				8	✓	1.8		0-10	Wet			
	11											
21'		11									Black gray Coarse medium(+) fine SAND, some medium fine(+) Gravel; 0.5' thick	Product in Spoon
			17									
22'				15	✓	1.4		0-5	Wet		Black gray medium fine(+) SAND, little - Silt, little medium Gravel; 0.5' thick	
	8											
23'		12									Black gray coarse medium fine SAND, trace Silt, little - medium fine Gravel	
			17									
24'				18	✓	2.0		2-9	Wet			
	10											Color is more gray wate > prod.
25'		12										
			15						Wet		Gray Coarse to fine SAND	
26'				24	✓	2.0		1-10				
	13											
27'		17									Gray Coarse(+) to fine SAND, trace Silt	Dark bands yield highest Hnu readings near bottom of splitspoon
			17									
28'				19	✓	1.4		1-21	Wet			
29'	Augered Down											
											Boring abandoned after loss of weighted tape during installation of well - auger 5 ft offset without sampling	
30'												

Well No. GW3
Project No. 576-002

Project Name Quanta Resources

Client NYSDEC

MONITORING WELL COMPLETION LOG

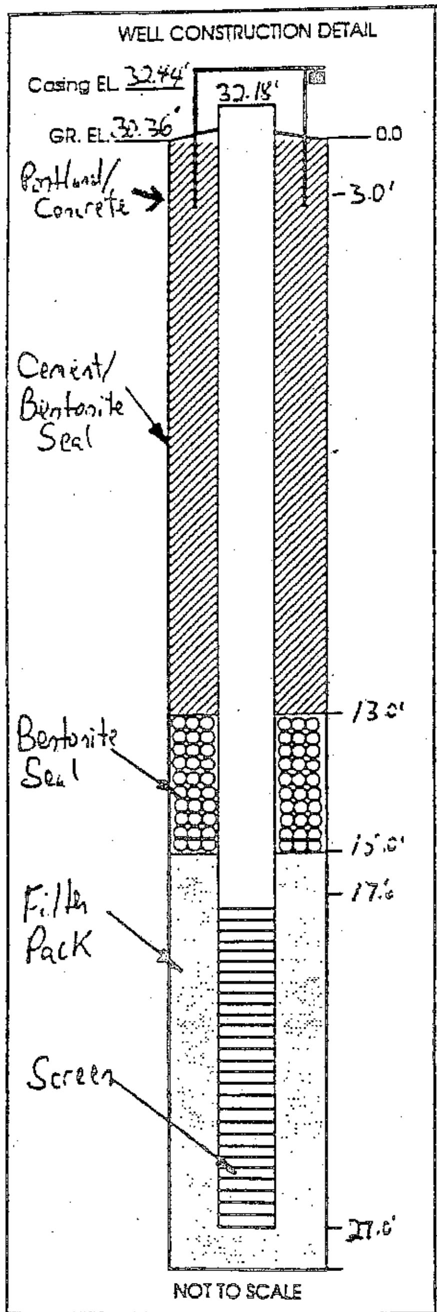
Location Long Island City, NYC

Date Drilled 11-21-88

Date Developed Purged 12-6-88

Developing Method Purge/Develop bailing

Well Construction Completed 11-22-88



Inspector S Miller, K McGuinness
Drilling Contractor Soil Testing

Type of Well Monitoring Well-overburden
Static Water Level 24.32' below grade Date 2-22-90
Measuring Point (M.P.) PVC @ 1.82 ft above grade
Total Depth of Well 28.81 ft below MP
Total Depth of boring 28 ft below grade

Drilling Method
Type Hollow Stem Auger Diameter 4 in ID
Casing H.S.A.

Sampling Method
Type Split Spoon Diameter 1 3/8" ID
Weight 140 # Fall 30 in
Interval 5 ft and continuous

Riser Pipe Left in Place
Material Sch 40 PVC Diameter 2" ID
Length Joint Type Threaded/Flush

Screen
Material Sch 40 PVC Diameter 2" ID
Slot Size 0.010 inch Length 10 ft
Stratigraphic Unit Screened Silty Sand

Filter Pack
Sand ✓ Gravel Natural
Grade #2
Amount Interval 28' to 15' below grade

Seal(s)
Type Bentonite Interval 15' to 13' below grade
Type Cement/bentonite Grout Interval 13' to 3' below grade
Type Port Concrete Interval 3' to grade

Locking Casing ☑ Yes ☐ No
Notes: 7.36' floating oil measured 2-21-90

Data by K. McGuinness / S. Miller

Sheet 1 of 2

SUBSURFACE EXPLORATION - TEST BORING LOG

Boring No. GW3
Project No. 576-002

Project Name Quanta Resources
Client NYSDEC
Driller Soil Testing
Monitoring Instrument(s) HNU (instrument readings above background)

SAMPLE HAMMER

Weight 140 lb
Fall 30 in.

Date 11-21-88 (start) 11-21-88 (finish)
Boring Location rear of site - west + north
Total Depth 28 ft below grade
Depth to Water 19.82' below grade 2-22-90
Hole Diameter approx 8" boring
Ground Surface Elevation 32.36'
(relative to west side of River Ave, assumed 40.00 ft elevation)
Beaver B-57 Mobil drill Rig
Hollow Stem Auger 4 in ID

(7.36' floating oil measured 2-21-90)

Depth	BLOWS ON SAMPLER				Retained Sample	Recovery (feet)	Sample No.	Instrument Reading (above backg.)	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
	0" to 6"	6" to 12"	12" to 18"	18" to 24"								
0'											Original boring moved to 5' offset of buried tank @ 1.5' b.g. - Sample taken from Auger Cuttings	Black gas; Cohesive
	REFUSAL								Moist	Fill		
1'												
2'					✓	See note						
3'												
											Black Clayey Silt Some fine Gravel ; .4' thick	Very Cohesive
4'												
	25									Fill		
5'		26							moist / wet		Gray coarse medium fine(+) SAND, trace Silt, little medium fine Gravel ; .35' thick	Less Cohesive (looser)
			32									
6'				34	✓	0.75		4.5				
7'												
8'												
										Fill		
9'												
	11											
10'		14									Brown Gray Coarse(+) medium SAND, some fine Gravel ; 0.7' thick	a red brick in end of spoon
			17						Dry			
11'				18	✓	1.20		5 to 15			Black coarse to fine SAND, trace+ Silt, trace Gravel ; 0.5' thick	
12'												
13'												

Sheet 2 of 2

Boring No. GL3
Project No. 526 002

Depth	BLOWS ON SAMPLER 0" to 6"	6" to 12"	12" to 18"	18" to 24"	Retained Sample	Recovery (feet)	Sample No.	Instrument Reading	Moisture Content	Stratigraphic Column	CLASSIFICATION OF MATERIAL f - fine m - medium c - coarse and - 35-50% some - 20-35% little - 10-20% trace - 0-10%	Remarks
14'												Odor
	9										Blackgray medium fine SAND, little Silt, trace + Gravel	product in spoon
15'		9										
			10						Wet			
16'				10	✓	1.1		8-130				
17'												
18'												
19'											Gray medium fine Gravel some, coarse to fine Sand; 0.9' thick	Spoon reeks product on spoon exterior also
	7											
20'		11										
			18						Wet		BrownGray coarse medium(+) fine SAND, trace -Silt, trace fine Gravel ; 1.1' thick	
21'				34	✓	2.0		51.26				
	11											
22'		18									Gray fine Gravel and, coarse(+) medium Sand, 1' thick	Sampled 22 to 23
			28									
23				35	✓	2.0		52.16	Wet		Blackgray coarse to fine SAND, trace fine Gravel	
	6										Blackgray fine Gravel and(+), coarse(+) medium fine Sand ; 0.8' thick	Spoon wet on outside
24'		17										
			35								Blackgray medium fine SAND, little + medium fine Gravel 1.2' thick	
25'				42	✓	2.0		14.52	Wet			
	11										Black gray fine Gravel and(+), coarse(+) to fine Sand, 1' thick	[illegible] to 23+25'
26'		22										
			4									
27'				42							Blackgray medium fine SAND, trace coarse to fine Gravel	
28'	AUGERED DOWN											

LAWLER, MATUSKY & SKELLY ENGINEERS

DRILLING LOG

Project Euram Management
Location Review Avenue, L.I.C. W.O. Number 596-003
Well Number MW-1 Total Depth 35 ft.
Water Level Init. 20 ft. 24-hrs.
Screen: Dia. 4" Length 20' Slot Size 0.020
Casing: Dia. 4" Length 15' Type Sch 40 PVC
Drilling Co. AD&T Drilling Method HSA
Driller R. Bauman Log By T. St. John Date 4/9/92

Sketch Map

Notes

Depth	Well Constr.	Sample Number	Description/Soil Classification (Color, Texture, Structures)
0'		SS-1	0-2' Split Spoon #1; BC 12-26-12-9; 24" recovery. FILL MATERIAL; Gravel, Coal, Macadem; black-dk. brown.
		SS-2	2'-4' Split Spoon #2; BC 12-30-20-Ref.; 6" recovery SAND, medium to fine; brown-multicolored. Chemical odor.
5'		SS-3	4'-6' Split Spoon #3; BC Refusal. Rock and Gravel zone.
		SS-4	6'-8' Split Spoon #4; BC 20-12-19-28; 6" recovery. SILT, and Sand, fine, trace Gravel, coarse, granitic; brown. Dry, No odor.
		SS-5	8'-10' Split Spoon #5; BC 76-68-55-66; 12" recovery. SAND, medium to fine, trace Silt; lt. grey-lt. brown. Dry, Slight petroleum odor.
10'		SS-6	10'-12' Split Spoon #6; BC 5-8-10-11; 12" recovery. Same as 8'-10'.
		SS-7	12'-14' Split Spoon #7; BC 4-5-10-11; 24" recovery. SAND, medium to fine; lt. grey - multicolored. Dry, Strong petroleum odor.
15'		SS-8	14'-16' Split Spoon #8; BC 9-8-8-12; 24" recovery. Same as 12'-14'.
		SS-9	16'-18' Split Spoon #9; BC 6-9-9-11; 24" recovery. Same as 12'-14'.
	∇	SS-10	18'-20' Split Spoon #10; BC 7-13-11-16; 18" recovery Same as 12'-14'. Basket was wet.
20'		SS-11	20'-22' Split Spoon #11 BC 6-8-7-16; 24" recovery. 0-12" SAND, medium to fine; lt. grey - multi. 12"-24" SAND, fine; lt. grey - multicolored. Spoon was totally covered with a light-amber petroleum product.
25'			
30'			22-35 From drill cuttings; Sand, meduim to fine; dk. grey stained. Wet, Strong petroleum odor.
35'			

WELL CONSTRUCTION

0-~~~~15' 4" PVC casing.
→ * 15'-35' 4" PVC screen.

35'-18' #2 Morie sand.
18'-16' Bentonite
16'-0' Grout.

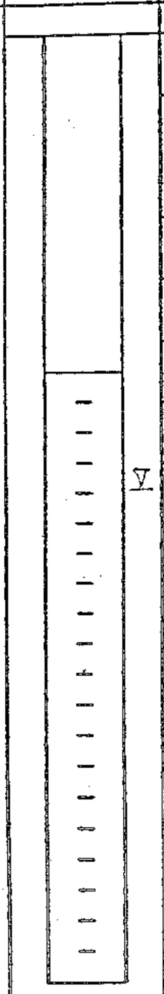
Flush-mount 6" manhole.
#0629 MasterLock.

DRILLING LOG

Project Euram Management
Location Review Avenue, L.I.C.
W.O. Number 596-003
Well Number MW-2
Total Depth 31 ft.
Water Level Init. 15 ft.
24-hrs.
Screen: Dia. 4" Length 20'
Slot Size 0.020
Casing: Dia. 4" Length 11'
Type Sch 40 PVC
Drilling Co. AD&T
Drilling Method HSA
Driller R. Bauman
Log By T. St. John
Date 4/10/92

Sketch Map

Notes



Depth	Sample Number	Description/Soil Classification (Color, Texture, Structures)
0'	SS-1	0-2' Split Spoon #1; BC 12-20-35-20; 6" recovery. FILL MATERIAL; Gravel, Coal, Macadem; black-dk. brown.
5'		
	SS-2	6'-8' Split Spoon #2; BC 43-52-7-5; 18" recovery. 0-12" Fill Material - Same as 0-2'. 12"-18" SAND, Medium to fine; lt. brown-multi. Dry, Slight petroleum odor.
	SS-3	8'-10' Split Spoon #3; BC 15-16-15-14; 2" recovery. SAND, medium to fine; lt. brown - multicolored. Dry, No odor.
10'	SS-4	10'-12' Split Spoon #4; BC 6-11-30-32; no recovery. Cobble zone.
	SS-5	12'-14' Split Spoon #5; BC 12-35-30-20; 12" recovery SAND, coarse to medium, with Gravel, medium to fine; lt.brown-grey. Dry, Moderate petroleum odor.
15'	SS-6	14'-16' Split Spoon #6; BC 11-13-15-16; 18" recovery SAND, coarse to fine; grey-brown-multicolored. Moist, Moderate petroleum odor.
	SS-7	16'-18' Split Spoon #7; BC 9-13-20-22; 24" recovery. Same as 14'-16'. Wet, Storng petroleum-chemical odor.
20'		
25'		
30'		18'-31' From drill cuttings; Sand, meduim to fine; dk. grey stained. Wet, Strong petroleum odor.
35'		

WELL CONSTRUCTION
0-11' 4" PVC casing.
11'-31' 4" PVC screen.

31'-9' #2 Morie sand.
9'-7' Bentonite
7'-0' Grout.

Flush-mount 6" manhole.
#0629 MasterLock.

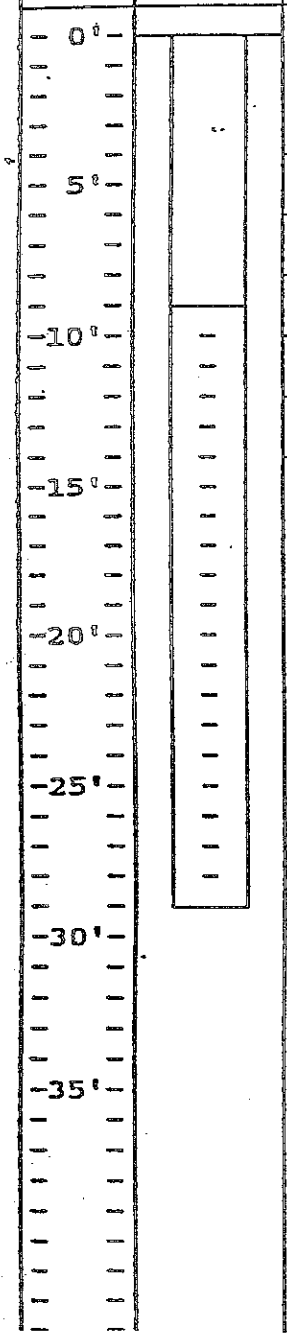
DRILLING LOG

Project Euram Management
Location Review Avenue, L.I.C. W.O. Number 596-003
Well Number MW-3 Total Depth 29 ft.
Water Level Init. 14 ft. 24-hrs.
Screen: Dia. 4" Length 20' Slot Size 0.020
Casing: Dia. 4" Length 9' Type Sch 40 PVC
Drilling Co. AD&T Drilling Method HSA
Driller R. Bauman Log By T. St. John Date 4/10/92

Sketch Map

Notes

Depth	Well Constr.	Sample Number	Description/Soil Classification (Color, Texture, Structures)



SS-1
SS-2
SS-3
SS-4
SS-5

0-2' FILL MATERIAL; Gravel, Coal, Macadem, Red Brick black-dk. brown.
2'-4'FILL MATERIAL.
4'-6' Split Spoon #1; BC 8-7-6-7 12" recovery. CLAY, olive green; and Fill Material, black.
6'-8' Split Spoon #2; BC 6-12-12-11; 6" recovery. Fill Material, same as 0-2'.
8'-10' Split Spoon #3; BC 13-7-13-12; 6" recovery. SILT, and Sand, fine; grey. Moist, No Odor.
10'-12' Split Spoon #4; BC 4-2-2-1; no recovery. Cobble zone.
12'-14' Split Spoon #5; BC 3-7-4-3; 6" recovery SILT, and Sand, fine; grey. Slight petroleum odor, Wet.
14'-29' From Cuttings, SILT, and Sand, fine, trace Clay; grey. No odor.

WELL CONSTRUCTION
0-9' 4" PVC casing.
9' 29' 4" PVC screen.

29'-7' #2 Morie sand.
7'-5' Bentonite
5'-0' Grout.

Flush-mount 6" manhole.
#0620 MasterLock.

TEST BORING REPORT

BORING NO. MW-3R
Page 1 of 1

PROJECT DMJ
LOCATION South Capasso Property, 37-98/38-20 Railroad Ave, LIC, NY
CLIENT DMJ
CONTRACTOR Summit Drilling Inc.
DRILLER John Vogt

H&A FILE NO. 26377-000
PROJECT MGR. WWD
FIELD REP. EJMi
DATE STARTED 9/12/2000
DATE FINISHED 9/12/2000

Elevation 13.8 ft. Datum
Boring Location Inside eastern side of gate at Capasso South

Item	Casing	Sampler	Core Barrel
Type		S	
Inside Diameter (in.)		13/8	
Hammer Weight (lb.)		140	
Hammer Fall (in.)		30	

Rig Make & Model

☑ Truck	☐ Tripod	☐ Cat-Head	
☐ ATV	☐ Geoprobe	☑ Winch	
☐ Track	☐ Air Track	☐ Roller Bit	
☐ Skid	☐	☑ Cutting Head	

Hammer Type	Drilling Mud	Casing Advance
☐ Safety	☐ Bentonite	Type Method Depth
☑ Doughnut	☐ Polymer	4" HSA to depth
☐ Automatic	☑ None	

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.5		CONCRETE SLAB										
						SP-SM	Cinders, poorly-graded SAND, concrete, traces of brick, dry, petroleum odor. FILL										
5	5.7,8.13	18	4-6				Same as above, PID = 11.4 ppm FILL										
	10.24,27,30	8	6-8				Same as above, moist, larger brick fragments, strong petroleum odor, PID = 21.3.ppm. FILL										
	26.43.46.100	14	8-10				Brick, petr./creosote saturated wood (appears to be a RR tie), PID = 37.9 ppm FILL										
10	50.100/4"	10	10-12				Same as above, spoon refusal on the wood, PID = 30.3 ppm FILL										
	18.12,WOR, WOR	8	12-14		12	SP-SM	Soil saturated at 12 ft. Gray-brown, poorly-graded SAND with silt, no odor, PID = 5.1 ppm.										
15	WOR.WOR, WOR.WOR,	2	14-16				Same as above, PID = 0 ppm, faint odor of burnt wood from drilling through RR tie.										
	3.2.1.2	22	16-18		17	CH	fat CLAY with trace organic material, no odor										
							BOTTOM OF EXPLORATION 18 FT										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Depth in feet to: Bottom of Hole	Depth in feet to: Water

Sample ID

O	Open End Rod
T	Thin Wall Tube
U	Undisturbed Sample
S	Split Spoon Sample
G	Geoprobe

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
Overburden (Linear ft.) ____
Rock Cored (Linear ft.) ____
Number of Samples ____
BORING NO.

Field Tests Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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Form #3000

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-3R
Boring No.

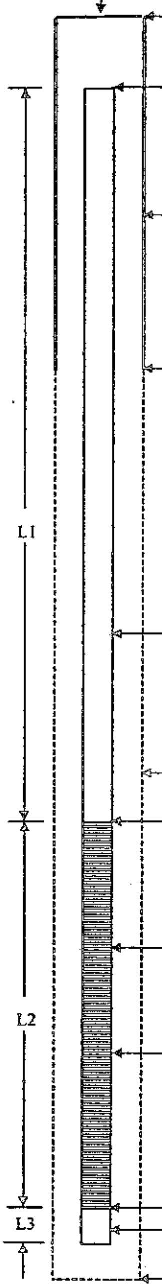
PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	37-98/38-20 Railroad Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ Associates	FIELD REP.	EJMi
CONTRACTOR	Summit Drilling Inc.	DATE INSTALLED	9/12/2000
DRILLER	John Vogt	WATER LEVEL	

Ground El. 13.0 ft
El. Datum 12.34

Location South of gate at Capasso South Property

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL



Type of protective cover/lock: 3-bolt roadway box cover

Height/Depth of top of guard pipe/roadway box above/below ground surface: 0.0 ft

Height/Depth of top of riser pipe above/below ground surface: 0.0 ft

Type of protective casing: Cast iron roadway box
Length: 0.8 ft
Inside Diameter: 8.000 in

Depth of bottom of guard pipe/roadway box: 0.8 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.5	0.5
Bentonite Seal	1.5	1.0

Type of riser pipe: PVC
Inside diameter of riser pipe: 2.0 in
Type of backfill around riser: Morie No. 2 Sand

Diameter of borehole: 8.0 in

Depth to top of well screen: 4.0 ft

Type of screen: PVC 10-slot
Screen gauge or size of openings: in
Diameter of screen: in
Type of backfill around screen: Morie No.2 Sand

Depth of bottom of well screen: 16.0 ft

Bottom of Silt trap: n/a ft

Depth of bottom of borehole: 18.0 ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

4 ft + 12 ft + 0 ft = 16 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

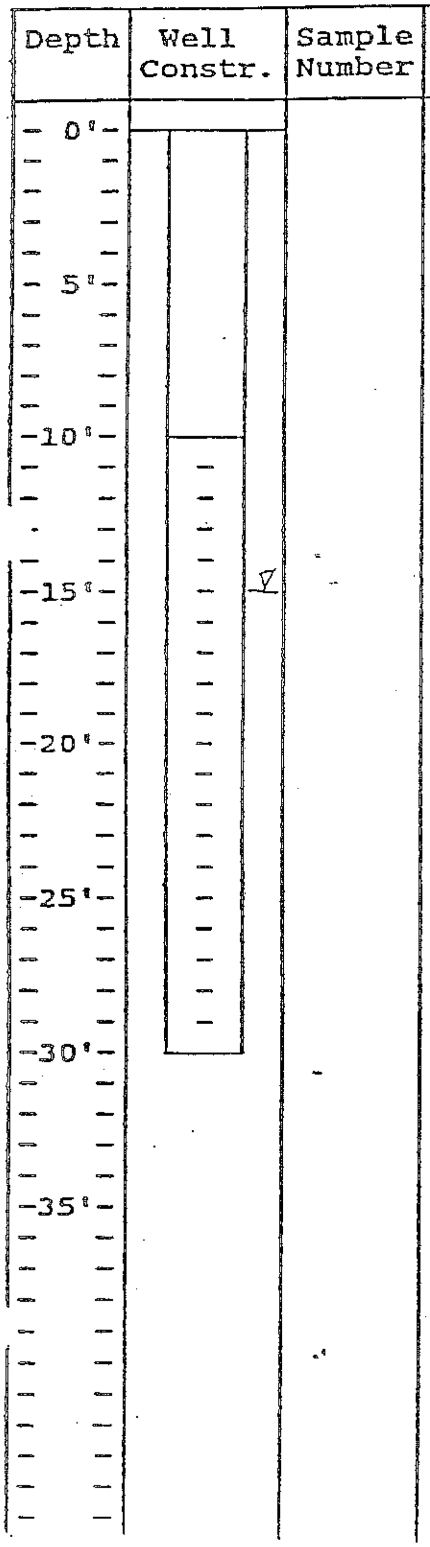
Form # 3010

DRILLING LOG

oject Euram Management
Location Review Avenue, L.I.C.
W.O. Number 596-003
Well Number MW-4
Total Depth 29 ft.
Water Level Init. 15 ft.
24-hrs.
Screen: Dia. 4" Length 20'
Slot Size 0.020
Casing: Dia. 4" Length 10'
Type Sch 40 PVC
Drilling Co. AD&T
Drilling Method HSA
Driller R. Bauman
Log By T. St. John
Date 4/13/92

Sketch Map

Notes



Description/Soil Classification
(Color, Texture, Structures)

0-2' FILL MATERIAL; Gravel, Coal, Macadem, Red Brick black-dk. brown.
2'-4' FILL MATERIAL.
4'-6' FILL MATERIAL.
6'-8' FILL MATERIAL.

8'-30' From Cuttings,
SAND, coarse to fine, and Gravel, medium to fine, sub-rounded, trace cobbles; dk. brown Ground water at 15 ft., very strong petrol. odor.

WELL CONSTRUCTION
0-10' 4" PVC casing.
10'-30' 4" PVC screen.

30'-8' #2 Morie sand.
8'-6' Bentonite
6'-0' Grout.

Flush-mount 6" manhole.
#0629 MasterLock.

HALEY & ALDRICH

TEST BORING REPORT

BORING NO.
MW-4R
Page 1 of 1

PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	Capasso Property North, 37-30/37-32 Review Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ	FIELD REP.	EJMi
CONTRACTOR	Summit Drilling Inc.	DATE STARTED	9/11/2000
DRILLER	John Vogt	DATE FINISHED	9/11/2000

Elevation 15.5 ft. Datum
Boring Location At southern fence of northern Capasso property, "70 ft from Quanta property

Item	Casing	Sampler	Core Barrel
Type		S	
Inside Diameter (in.)		13/8	
Hammer Weight (lb.)		140	
Hammer Fall (in.)		30	

Rig Make & Model
- ☑ Truck ☐ Tripod ☐ Cat-Head
- ☐ ATV ☐ Geoprobe ☑ Winch
- ☐ Track ☐ Air Track ☐ Roller Bit
- ☐ Skid ☐ ☑ Cutting Head

Hammer Type
- ☐ Safety
- ☑ Doughnut
- ☐ Automatic

Drilling Mud
- ☐ Bentonite
- ☐ Polymer
- ☑ None

Casing Advance
Type Method Depth
4" HSA to depth

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							From drill cuttings, 0-9 feet: intermittent layers of concrete and fill material.										
5																	
10	16,24,25,30	10	9-11		9	SM	Dark brown silty SAND with gravel. FILL										
	38,37,23,24	10	11-13			SP	Gray poorly-graded SAND with gravel. FILL										
	41,27,14,13	12	13-15				Same as above.										
15	14,27,35,21	12	15-17		15		Oil encountered at 15 ft. Oil is viscous and green. PID = 58.4 ppm, soil same as above.										
	13,13,14,17	10	17-19		17	SP-SM	Poorly-graded SAND with silt, saturated with oil, PID = 96.7 ppm.										
20	18,17,32,14	12	19-21				Same as above, PID = 63.1 ppm										
	9,11,19,18	12	21-23				Same as above, wet, less oil, PID = 245 ppm. BOTTOM OF EXPLORATION 23 FT										
25																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Depth in feet to: Bottom of Hole	Depth in feet to: Water

Sample ID
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (Linear ft.)
Rock Cored (Linear ft.)
Number of Samples
BORING NO.

Field Tests Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

OBSERVATION WELL
INSTALLATION REPORT

Well No. MW-4R
Boring No.

PROJECT DMJ
LOCATION 37-30/37-32 Review Avenue, LIC, NY
CLIENT DMJ Associates
CONTRACTOR Summit Drilling Inc.
DRILLER John Vogt

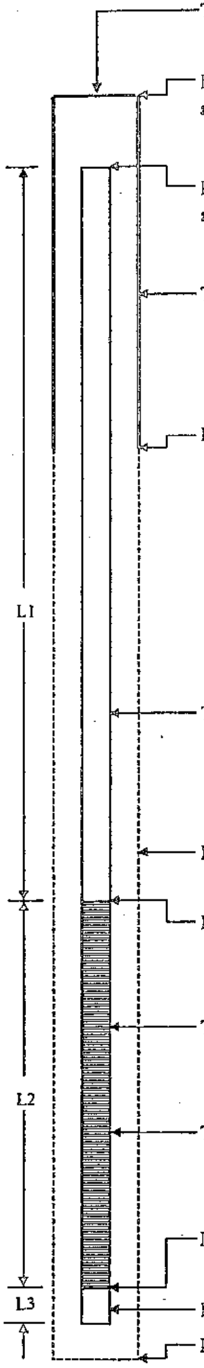
H&A FILE NO. 26377-000
PROJECT MGR. WWD
FIELD REP. EJMi
DATE INSTALLED 9/11/2000
WATER LEVEL

Ground El. 15.5 ft
El. Datum 15.05

Location Adjacent to south fence

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL



Type of protective cover/lock 3-bolt roadway box cover

Height/Depth of top of guard pipe/roadway box above/below ground surface 0.0 ft

Height/Depth of top of riser pipe above/below ground surface 0.0 ft

Type of protective casing: Cast iron roadway box
Length 0.8 ft
Inside Diameter 8.000 in

Depth of bottom of guard pipe/roadway box 0.8 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.5	0.5
Bentonite Seal	1.0	4.0

Type of riser pipe: PVC
Inside diameter of riser pipe 2.0 in
Type of backfill around riser Morie No. 2 Sand

Diameter of borehole 8.0 in

Depth to top of well screen 8.0 ft

Type of screen PVC 10-slot
Screen gauge or size of openings in
Diameter of screen in
Type of backfill around screen Morie No.2 Sand

Depth of bottom of well screen 23.0 ft

Bottom of Silt trap n/a ft

Depth of bottom of borehole 23.0 ft

(Bottom of Exlporation)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

8 ft + 15 ft + 0 ft = 23 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

TEST BORING REPORT

BORING NO. MW-5

Page 1 of 1

PROJECT DMJ
LOCATION Quanta Property, 37-80 Review Avenue, LIC, NY
CLIENT DMJ
CONTRACTOR Summit Drilling Inc.
DRILLER John Vogt

H&A FILE NO. 26377-000
PROJECT MGR. WWD
FIELD REP. EJMi
DATE STARTED 9/14/2000
DATE FINISHED 9/14/2000

Elevation 26.0 ft. Datum
Boring Location Adjacent to the fence at Review Avenue, approximately 100 ft from Canasso property line.

Item	Casing	Sampler	Core Barrel
Type		S	
Inside Diameter (in.)		13/8	
Hammer Weight (lb.)		140	
Hammer Fall (in.)		30	

Rig Make & Model
☑ Truck ☐ Tripod ☐ Cat-Head
☐ ATV ☐ Geoprobe ☑ Winch
☐ Track ☐ Air Track ☐ Roller Bit
☐ Skid ☐ ☑ Cutting Head

Hammer Type
☐ Safety
☑ Doughnut
☐ Automatic

Drilling Mud
☐ Bentonite
☐ Polymer
☑ None

Casing Advance
Type Method Depth
4" HSA to depth

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							0"-4": asphalt, black cinder fill to 4 ft. FILL										
5	7,8,10,12	5	4-6			SP-SM	Poorly-graded SAND with silt, brick, glass, some gravel, odor, PID = 83 ppm. FILL										
	1.3.2.1	10	6-8				Same as above, moist, PID = 12.5 ppm.										
	2.2.2.3	5	8-10				Same as above, PID = 5.5 ppm.										
10	3.3.3.3	4	10-12				Same as above, PID = 31.9 ppm.										
	1.1.2.3	10	12-14				Same as above, PID = 70.3 ppm.										
15	3.7.10.9	1	14-16			ML	Low recovery, some brown SILT with sand.										
	6.6.5.5	10	16-18			SP-SM	Black, oily, poorly-graded SAND with silt, odor, PID = 50.5 ppm. FILL										
	4.3.3.18	8	18-20				Some SAND, wood and brick. PID = 18.5 ppm. FILL										
20	39.35.49.50	15	20-22				Brick. FILL										
	12.15.19.21	18	22-24			SP	Brick, wood. Gray, poorly graded SAND at 24 ft, wet, PID = 141 ppm.										
25	7.5.4.5	15	24-26		24		Same as above, PID = 67.5 ppm.										
					26	CH	fat CLAY with some organic material at 26 ft BOTTOM OF EXPLORATION AT 26 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Depth in feet to: Bottom of Hole	Depth in feet to: Water

Sample ID
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe

Well Diagram
▯ Riser Pipe
▤ Screen
▭ Filter Sand
▨ Cuttings
▦ Grout
▧ Concrete
▨ Bentonite Seal

Summary
Overburden (Linear ft.) ______
Rock Cored (Linear ft.) ______
Number of Samples ______

BORING NO.

Field Tests
Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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Form #3000

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-5
Boring No.

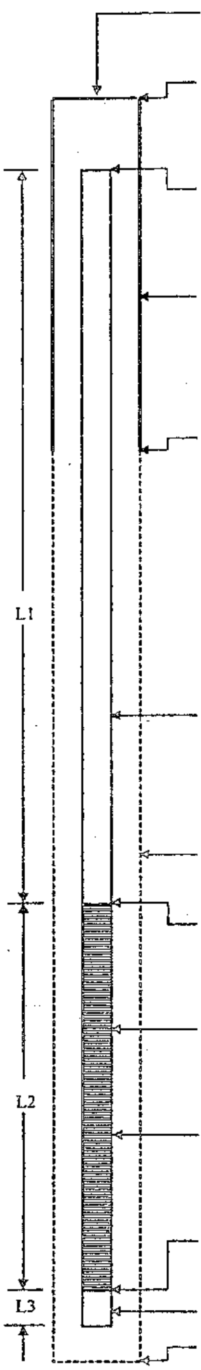
PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	37-80 Review Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ Associates	FIELD REP.	EJMi
CONTRACTOR	Summit Drilling Inc.	DATE INSTALLED	9/14/2000
DRILLER	John Vogt	WATER LEVEL	

Ground El. 26.0 ft
El. Datum 25.79

Location Adjacent to fence at Review Avenue inside Quanta Property.

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL



Type of protective cover/lock: 3-bolt roadway box cover

Height/Depth of top of guard pipe/roadway box above/below ground surface: 0.0 ft

Height/Depth of top of riser pipe above/below ground surface: 0.0 ft

Type of protective casing: Cast iron roadway box
Length: 0.8 ft
Inside Diameter: 8.000 in

Depth of bottom of guard pipe/roadway box: 0.8 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.5	0.5
Bentonite Seal	1.5	2.0

Type of riser pipe: PVC
Inside diameter of riser pipe: 2.0 in
Type of backfill around riser: Morie No. 2 Sand

Diameter of borehole: 8.0 in

Depth to top of well screen: 6.0 ft

Type of screen: PVC 10-slot
Screen gauge or size of openings: in
Diameter of screen: in
Type of backfill around screen: Morie No.2 Sand

Depth of bottom of well screen: 26.0 ft

Bottom of Silt trap: n/a ft

Depth of bottom of borehole: 26.0 ft

(Bottom of Exlporation)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

6 ft + 20 ft + 0 ft = 26 ft
Riser Pay Length (L1) + Length of screen (L2) + Length of silt trap (L3) = Pay length

COMMENTS:

Form # 3010

TEST BORING REPORT

BORING NO. MW-6
Page 1 of 1

PROJECT: DMJ
LOCATION: Quanta Property, 37-80 Review Avenue, LIC, NY
CLIENT: DMJ
CONTRACTOR: Summit Drilling Inc.
DRILLER: John Vogt

H&A FILE NO.: 26377-000
PROJECT MGR.: WWD
FIELD REP.: EJMi
DATE STARTED: 9/13/2000
DATE FINISHED: 9/14/2000

Elevation 17.8 ft. Datum
Boring Location: At the southern end of the Quanta property, 32' from the south fence and 110' from Phoenix Inc.

Item	Casing	Sampler	Core Barrel
Type		S	
Inside Diameter (in.)		13/8	
Hammer Weight (lb.)		140	
Hammer Fall (in.)		30	

Rig Make & Model
☑ Truck ☐ Tripod ☐ Cat-Head
☐ ATV ☐ Geoprobe ☑ Winch
☐ Track ☐ Air Track ☐ Roller Bit
☐ Skid ☐ ☑ Cutting Head

Hammer Type
☐ Safety
☑ Doughnut
☐ Automatic

Drilling Mud
☐ Bentonite
☐ Polymer
☑ None

Casing Advance
Type Method Depth
4" HSA to depth

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel		Sand				Field Test			
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0							0'-4': crushed cement, brick, glass. FILL										
5	9.7.2.9	6	4-6			SP-SM	Cinders, glass, poorly-graded SAND, odor, PID = 13 ppm.										
	10.8.7.8	12	6-8				Dark brown, poorly-graded SAND with silt, odor, PID = 26.4 ppm.										
	9.9.10.10	10	8-10				Same as above, moist, PID = 33.7 ppm.										
10	14.14.15.16	6	10-12				Same as above, with gravel, PID = 33.2 ppm.										
	12.14.13.10	10	12-14				Same as above, very oily, black, PID = 18.3 ppm.										
15	8.13.17.18	2	14-16				Same as above, PID = 21.9 ppm.										
	13.16.21.27	15	16-18		17	SP	At 17 feet: poorly-graded SAND, no fill material, WET, PID = 47 ppm.										
			18-20														
20			20-22														
			22-24														
25			24-26				BOTTOM OF EXPLORATION AT 26 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water

Sample ID
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe

Well Diagram
▭ Riser Pipe
▤ Screen
▭ Filter Sand
▭ Cuttings
▦ Grout
▭ Concrete
▨ Bentonite Seal

Summary
Overburden (Linear ft.)
Rock Cored (Linear ft.)
Number of Samples
BORING NO.

Field Tests
Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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Form #3000

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-6

Boring No.

PROJECT DMJ

LOCATION 37-80 Review Avenue, LIC, NY

CLIENT DMJ Associates

CONTRACTOR Summit Drilling Inc.

DRILLER John Vogt

H&A FILE NO. 26377-000

PROJECT MGR. WWD

FIELD REP. EJMi

DATE INSTALLED 9/14/2000

WATER LEVEL

Ground El. 17.8 ft

El. Datum 17.36

Location At rear of Quanta property

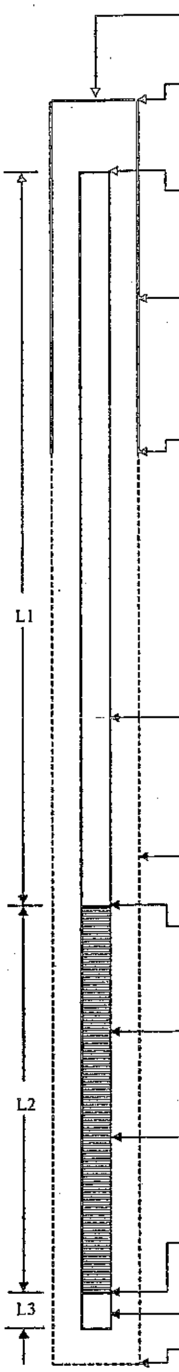
☐ Guard Pipe

☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL

(Bottom of Exlporation)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock 3-bolt roadway box cover

Height/Depth of top of guard pipe/roadway box above/below ground surface 0.0 ft

Height/Depth of top of riser pipe above/below ground surface 0.0 ft

Type of protective casing: Cast iron roadway box

Length 0.8 ft

Inside Diameter 8.000 in

Depth of bottom of guard pipe/roadway box 0.8 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.5	0.5
Bentonite Seal	1.5	2.0

Type of riser pipe: PVC

Inside diameter of riser pipe 2.0 in

Type of backfill around riser Morie No. 2 Sand

Diameter of borehole 8.0 in

Depth to top of well screen 6.0 ft

Type of screen PVC 10-slot

Screen gauge or size of openings in

Diameter of screen in

Type of backfill around screen Morie No.2 Sand

Depth of bottom of well screen 26.0 ft

Bottom of Silt trap n/a ft

Depth of bottom of borehole 26.0 ft

6 ft	+	20 ft	+	0 ft	=	26 ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

TEST BORING REPORT

BORING NO. MW-7
Page 1 of 1

PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	South Capasso Property, 37-98/38-20 Railroad Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ	FIELD REP.	EJMi
CONTRACTOR	Summit Drilling Inc.	DATE STARTED	9/13/2000
DRILLER	John Vogt	DATE FINISHED	9/14/2000

Elevation 11.7 ft. Datum
Boring Location Southwest corner of the South Capasso property.

Item	Casing	Sampler	Core Barrel
Type		S	
Inside Diameter (in.)		13/8	
Hammer Weight (lb.)		140	
Hammer Fall (in.)		30	

Rig Make & Model
☑ Truck ☐ Tripod ☐ Cat-Head
☐ ATV ☐ Geoprobe ☑ Winch
☐ Track ☐ Air Track ☐ Roller Bit
☐ Skid ☐ ☑ Cutting Head

Hammer Type
☐ Safety
☑ Doughnut
☐ Automatic

Drilling Mud
☐ Bentonite
☐ Polymer
☑ None

Casing Advance
Type Method Depth
4" HSA to depth

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Spoon refusal from 0 - 12 feet. Drill action and cuttings indicate alternating layers of brick/cinder fill and concrete. FILL										
5	35.36.100/4"		4-6														
			6-8														
			8-10														
10																	
			10-12														
	10.12.10.13		12-14				Fill material, cinders, shale, brick, wet, no odor, PID = 0 ppm.										
15	5.7.1.2		14-16		15	CH	fat CLAY at 15 feet. BOTTOM OF EXPLORATION AT 15 FT										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Depth in feet to: Bottom of Hole	Depth in feet to: Water

Sample ID
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (Linear ft.)
Rock Cored (Linear ft.)
Number of Samples
BORING NO.

Field Tests Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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Form #3000

HALEY & ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. MW-7

Boring No.

PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	37-98/38-20 Railroad Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ Associates	FIELD REP.	EJMi
CONTRACTOR	Summit Drilling Inc.	DATE INSTALLED	9/13/2000
DRILLER	John Vogt	WATER LEVEL	

Ground El. 11.7 ft

El. Datum 11.12

Location At rear of south Capasso property

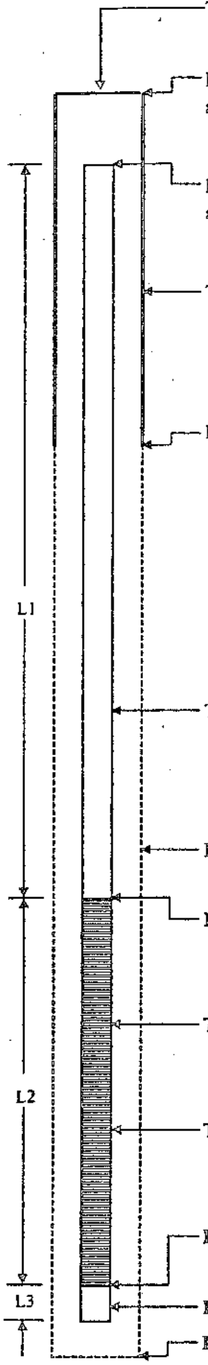
☐ Guard Pipe

☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL

(Bottom of Exlporation)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock 3-bolt roadway box cover

Height/Depth of top of guard pipe/roadway box above/below ground surface 0.0 ft

Height/Depth of top of riser pipe above/below ground surface 0.0 ft

Type of protective casing: Cast iron roadway box

Length 0.8 ft

Inside Diameter 8.000 in

Depth of bottom of guard pipe/roadway box 0.8 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.5	0.5
Bentonite Seal	1.5	3.0

Type of riser pipe: PVC

Inside diameter of riser pipe 2.0 in

Type of backfill around riser Morie No. 2 Sand

Diameter of borehole 8.0 in

Depth to top of well screen 6.0 ft

Type of screen PVC 10-slot

Screen gauge or size of openings in

Diameter of screen in

Type of backfill around screen Morie No.2 Sand

Depth of bottom of well screen 16.0 ft

Bottom of Silt trap n/a ft

Depth of bottom of borehole 16.0 ft

(Not to Scale)

6 ft	+	10 ft	+	0 ft	=	16 ft
Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length

COMMENTS:

Form # 3010

HALEY & ALDRICH

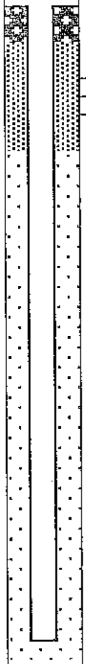
TEST BORING REPORT

BORING NO.
MW-7R
Page 1 of 1

PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	South Capasso Property, 37-98/38-20 Railroad Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ Assoc.	FIELD REP.	TWM
CONTRACTOR	Summit Drilling Inc.	DATE STARTED	9/12/2002
DRILLER	John Vogt	DATE FINISHED	9/17/2002

Elevation 11.7 ft. Datum
Boring Location Southwest corner of the South Capasso property.

Item	Casing	Sampler	Core Barrel	Rig Make & Model			Hammer Type	Drilling Mud	Casing Advance
									Type Method Depth
Type		S		☑ Truck	☐ Tripod	☐ Cat-Head	☐ Safety	☐ Bentonite	
Inside Diameter (in.)		13/8		☐ ATV	☐ Geoprobe	☑ Winch	☑ Doughnut	☐ Polymer	Auger to 4 FT
Hammer Weight (lb.)		140		☐ Track	☐ Air Track	☐ Roller Bit	☐ Automatic	☑ None	mud below 4 ft
Hammer Fall (in.)		30		☐ Skid	☐	☑ Cutting Head	Drilling Notes:		

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							0-26": Concrete										
	49	S-1	1														
	38				26"												
	24	12"			28"	ML	Medium dense black silt w/ rock pieces.					5	95	R			
	16		3		30"	SP	Medium dense brown poorly graded sand.					100					
	16	S-2	3			ML	Medium dense black silt.					5	95	R			
	100/4						Note: Spoon refusal at 48", auger refusal at 52" rig switched to mud rotary, boring drilled past obstruction, 7.5'.										
		2"															
5			5														
	2	S-3	7.5			ML	7.5'-7.7': Loose balck silt w/ rock pieces.					5	95	R			
	4						7.7'-9.5': Rock pieces										
	4	18"															
	6		9.5														
10	2	S-4	9.5														
	3																
WT	2	0															
	4		11.5														
	2	S-5	11.5			ML	Loose black silt w/ rock pieces.					5	95	R			
	3																
	3	2"															
	2		13.5														
	2	S-6	13.5			ML	Loose black silt w/ rock pieces and fiber. Note: heavy sheen on water in spoon.					5	95	R			
	2																
15	1	2"															
	2		15.5														
	3	S-7	15.5														
	2																
	2	12"				ML	soft gray silt						100	R			
	2		17.5														
							Boring terminated at 17.5'.										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Depth in feet to: Bottom of Hole	Depth in feet to: Water

Sample ID
O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe

Well Diagram
▭ Riser Pipe
▤ Screen
▭ Filter Sand
▨ Cuttings
▭ Grout
▨ Concrete
▧ Bentonite Seal

Summary
Overburden (Linear ft.) 17.5
Rock Cored (Linear ft.)
Number of Samples
BORING NO. MW-7R

Field Tests Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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Form #3000

HALEY & ALDRICH

TEST BORING REPORT

BORING NO.
MW-8
Page 1 of 1

PROJECT	DMJ	H&A FILE NO.	26377-000
LOCATION	Phoenix Beverage, 37-88 Review Avenue, LIC, NY	PROJECT MGR.	WWD
CLIENT	DMJ	FIELD REP.	EJMi
CONTRACTOR	Summit Drilling Inc.	DATE STARTED	9/12/2000
DRILLER	John Vogt	DATE FINISHED	9/12/2000

Elevation 17.2 ft. Datum

Boring Location Phoenix Beverage Property, abutting Quanta property.

Item	Casing	Sampler	Core Barrel
Type		S	
Inside Diameter in.)		13/8	
Hammer Weight (lb.)		140	
Hammer Fall (in.		30	

Rig Make & Model
- ☑ Truck
- ☐ ATV
- ☐ Track
- ☑ Skid
- ☐ Tripod
- ☐ Geoprobe
- ☐ Air Track
- ☐
- ☐ Cat-Head
- ☑ Winch
- ☐ Roller Bit
- ☑ Cutting Head

Hammer Type
- ☐ Safety
- ☑ Doughnut
- ☐ Automatic

Drilling Mud
- ☐ Bentonite
- ☐ Polymer
- ☑ None

Casing Advance
Type Method Depth
4" HSA to depth

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel		Sand				Field Test			
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0							0-0.5 feet: asphalt. 0.5-4 feet: crushed stone roadbase, brick. FILL										
5	14,16,12,20	18	4-6		4	SP	Dark brown poorly-graded SAND with gravel.										
	14,21,28,30	8	6-8			SP	Same as above with some brick fragments.										
	15,20,15,11	5	8-10			SP	Same as above, slight petroleum odor.										
10	13,13,14,36	6	10-12		10	SP	Gray poorly-graded SAND, slight odor, PID = 6.4 ppm.										
	15,28,30,35	10	12-14			SP	Same as above, dark gray, strong petroleum odor. PID = 6.4 ppm.										
15	20,24,27,20	12	14-16			SP	Same as above, wet, saturated with amber colored oil, PID = 31.1 ppm.										
	16,18,24,23	12	16-18			SP	Same as above, PID = 38.4 ppm:										
	30,35,37,32	18	18-20			SP	Same as above, less oily, PID = 27.1 ppm.										
20	6,4,14,13	18	20-22			SP	Same as above, slight odor, slight sheen, PID = 6.7 ppm.										
	10,15,18,21	24	22-24			SP	Same as above, no sheen, slight odor. PID = 13.9 ppm. BOTTOM OF EXPLORATION 24 FT										
25																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Depth in feet to: Bottom of Hole	Depth in feet to: Water

Sample ID
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe

Well Diagram
- ▯ Riser Pipe
- ▤ Screen
- ▢ Filter Sand
- ▣ Cuttings
- ▦ Grout
- ▨ Concrete
- ▧ Bentonite Seal

Summary

Overburden (Linear ft.)
Rock Cored (Linear ft.)
Number of Samples

BORING NO.

Field Tests Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Meduim H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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Form #3000

HALEY & ALDRICH

BSERVATION WELL INSTALLATION REPORT

Well No. MW-8
Boring No.

PROJECT DMJ
LOCATION 37-88 Reveiw Avenue, LIC, NY
CLIENT DMJ Associates
CONTRACTOR Summit Drilling Inc.
DRILLER John Vogt

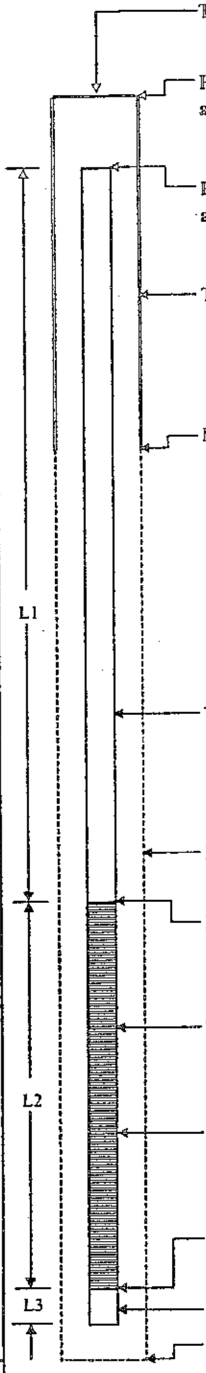
H&A FILE NO. 26377-000
PROJECT MGR. WWD
FIELD REP. EJMi
DATE INSTALLED 9/13/2000
WATER LEVEL

Ground El. 17.2 ft
El. Datum 16.92

Location SW corner of Phoenix Beverages property, north of dumpster pad.

☐ Guard Pipe
☑ Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL



Type of protective cover/lock 3-bolt roadway box cover

Height/Depth of top of guard pipe/roadway box above/below ground surface 0.0 ft

Height/Depth of top of riser pipe above/below ground surface 0.0 ft

Type of protective casing: Cast iron roadway box
Length 0.8 ft
Inside Diameter 8.000 in

Depth of bottom of guard pipe/roadway box 0.8 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.5	0.5
Bentonite Seal	1.5	2.0

Type of riser pipe: PVC
Inside diameter of riser pipe 2.0 in
Type of backfill around riser Morie No. 2 Sand

Diameter of borehole 8.0 in

Depth to top of well screen 9.0 ft

Type of screen PVC 10-slot
Screen gauge or size of openings in
Diameter of screen in
Type of backfill around screen Morie No.2 Sand

Depth of bottom of well screen 24.0 ft

Bottom of Silt trap n/a ft

Depth of bottom of borehole 24.0 ft

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
9 ft	+	15 ft	+	0 ft	=	24 ft

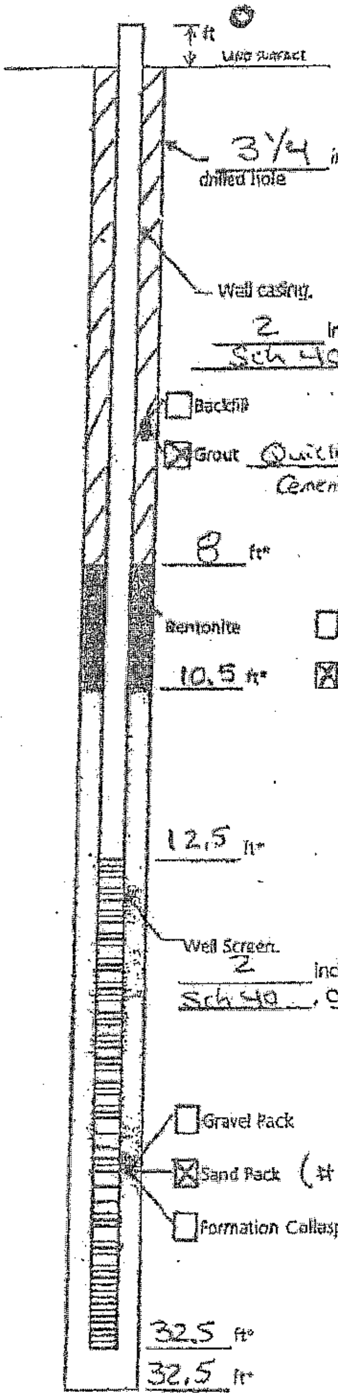
COMMENTS:

Form # 3010

ARCADIS GERAGHTY & MILLER

Well Construction Log

(Uncolsolidated)



3/4 inch diameter drilled hole

Well casing,
2 inch diameter,
Sch 40 PVC

☐ Backfill

☒ Grout Quick Gel / PORTLAND Cement Type 1 mix

8 ft*

Bentonite ☐ slurry

10.5 ft* ☒ pellets

12.5 ft*

Well Screen.
2 inch diameter
Sch 40 , .020 slot

☐ Gravel Pack

☒ Sand Pack (#2 morie)

☐ Formation Collaspse

32.5 ft*

32.5 ft*

Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project NY001309. 0001.00002 Well MW-11

Town/City LI City, New YORK CITY

County Queens State NY

Permit No.

Land-Surface Elevation and Datum:

feet ☐ Surveyed

☐ Estimated

Installation Date(s) 9/30/2002

Drilling Method HSA

Drilling Contractor SRI Bloomingdale

Drilling Fluid NONE

Development Technique(s) and Date(s)

10/21/02: well developed using VAC-TRUCK AND 30' Tremmie pipe FOR Removal of H2O and CNAPL

Fluid Loss During Drilling gallons

Water Removed During Development 40 gallons

Static Depth to Water ~21' feet below M.P.

Pumping Depth to Water feet below M.P.

Pumping Duration hours

Yield gpm Date

Specific Capacity gpm/ft

Well Purpose Monitoring well
Screen Straddles water table to observe for CNAPL.

Remarks. well is complete with a manhole (flush-mount).
well DRILLED and installed with representatives from HALEY-ALDRICH (Tim McDonald) and Environ (Tim Knapp)

Prepared by K. Schmitt

Wellcstr.xls
10/2/00

ARCADIS GERAGHTY & MILLER

Sample/Core Log

Boring/Well MW-11 Project/No. NY001309.0001.00002 Page 1 of 1

Site Quanta

Location Review Avenue, LIC, NY

Drilling Started 9/30/02 Drilling Completed 9/30/02

Total Depth Drilled 33' Feet Hole Diameter 4 1/4 inches Type of Sample/Coring Device NONE

Length and Diameter of Coring Device NONE Sampling Interval NONE feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SRI - Bloomingdale Driller Steve Helper Duane

Prepared By K. Schmitt Hammer Weight — Hammer Drop — ins.

Sample/Core Depth (feet below land surface) From	To	PID READING ~~Core~~ (PPM) ~~Recovery~~ (feet)	~~Time/Hydraulic Pressure or Blows per 6 inches~~	Sample/Core Description
0	9	—	—	all descriptions based on drill cuttings
				BLACK ash and gravelly material below
				~ 3" asphalt.
				strong petroleum-like odor @ ~ 4' bls.
9	17			dark grey, silty clay, extremely cohesive, moist
17	18	@18' bls	24 ppm	very cohesive silty dark red-grey
				clay, saturated
18	~23	@20' bls	200 ppm	very cohesive silty and sandy grey clay
~23	31	@24' bls	19 ppm	fine to medium grey silty and clayey
				sand w/ minor petroleum-like odor,
				no obvious staining
31	32.5'	@32' bls	18 ppm	fine to coarse, loose, dark and light grey sands
				with little silt, trace clay, no gravel, minor
				odor.

APPENDIX D

SITE HEALTH AND SAFETY PLAN REVISION

MEMORANDUM

TO: File **Date:** July 1, 2004

FROM: Randy S. White, Stuart Mitchell and Charlie Haury **Project No.:** 023-6151

RE: Revision to HASP - Procedures for Monitoring LNAPL Wells and Drilling
Quanta Resource Site

The following revised procedures are presented to assess explosion/fire safety when opening and monitoring light, non-aqueous phase liquid (LNAPL) wells and drilling for work associated with the Remedial Investigation of the Quanta Resource Site. Worker inhalation safety monitoring and procedures, as specified in the project Health & Safety Plan (HASP), shall continue to be followed as stated in addition to following the procedures outlined below using a flame ionization detector (FID) meter.

PROCEDURES FOR MONITORING LNAPL WELLS

Required Monitoring Equipment: MultiRAE PLUS Gas Monitor, or equivalent, which measures LEL, oxygen (O_2), hydrogen sulfide (H_2S) and volatile organic compounds (VOCs) and a flame ionization detector (FID). The "LEL and FID meter" should be in good working condition, and should be calibrated according to the manufacturer's instructions, or as otherwise required by the HASP. Please remember that the LEL meter requires oxygen to work properly (see specific requirements of the manufacturer) and oxygen should be assessed during each reading. Both meters must be intrinsically safe.

Revised Monitoring Procedures:

1. Approach closed well from upwind side;
2. Use LEL and FID meter to monitor air in the breathing zone and near surface of closed well.
   - If LEL readings are less than or equal to 10% and FID readings are less than 1 ppm above background, then loosen well lid bolts with standard wrench and use spark proof pry bar to remove well lid for access to flush mount housing.
   - If LEL readings exceed 10% or the FID exceed 1 ppm above the background, then go to Step 5.
3. Use LEL meter to monitor air inside of flush mount housing (above well cap).
   - If LEL readings are less than or equal to 10%, then loosen expandable well cap wing nut by hand and remove cap for access to well casing.
   - If LEL readings exceed 10%, then go to Step 5.
   - Breathing zone must be continuously monitored with the FID. If any FID readings exceed 1 ppm above background, then go to Step 5.
4. Use LEL meter to monitor air inside of well casing.
   - If LEL readings are less than or equal to 10%, then proceed with normal monitoring procedures (see HASP) in addition to continuously monitoring the breathing zone with an FID meter.
   - If LEL readings inside well casing exceed 10%, then go to Step 5.

5. If at any time LEL levels are not acceptable (i.e., greater than or equal to 10%) or FID levels are not acceptable (i.e., greater than 1 ppm than background in the breathing zone), then do not attempt to monitor well. Allow area being monitored to vent for five (5) minutes, or if monitoring flush mount housing or well casing, alternatively purge with nitrogen. The well should be flushed with nitrogen until the LEL level is below 10%. Repeat LEL readings and venting/purging as necessary to see if LEL readings drop to, and maintain, an acceptable level. If LEL levels do not drop and stay at an acceptable level, close well (if opened and closing it is deemed safe), and leave area immediately. Contact the Site Health and Safety Officer (HSO) and/or the Project Manager for further instructions and/or alternate plans.

PROCEDURES FOR DRILLING AND WELL INSTALLATION

Required Monitoring Equipment: MultiRAE PLUS Gas Monitor, or equivalent, which measures LEL, oxygen (O_2), hydrogen sulfide (H_2S) and volatile organic compounds (VOCs) and a flame ionization detector (FID). The "LEL and FID meter" should be in good working condition, and should be calibrated according to the manufacturer's instructions, or as otherwise required by the HASP. Please remember that the LEL meter requires oxygen to work properly (see specific requirements of the manufacturer) and oxygen should be assessed during each reading. Both meters must be intrinsically safe.

During drilling operations, LEL readings must be continuously monitored at the top of the borehole and around the borehole. In addition, at least every five feet of drilling, the LEL probe must be lowered in the borehole or casing. Do not lower probe into water. Use the in-line water trap when working around liquids.

No open flames, matches, cigarette lighters, or fires of any kind shall be allowed in the vicinity of the drilling operations. If the elevated levels are due to localized pocket of gas, levels may drop and drilling can proceed, with caution and vigilant monitoring. If levels increase, the hole may be purged with nitrogen. If subsequent combustible gas levels at the surface and combustible gas/oxygen level at depth no longer indicate the presence of an explosion hazard, work may continue with frequent monitoring and extreme caution. **If explosive gas levels exceed 10% LEL beyond the mouth of the hole, work should be halted pending discussion with the health and safety coordinator.**

Combustible gas levels **must** always be determined prior to any welding on casing or in the vicinity of the borehole. Readings must be taken at depth, at the mouth of the casing, and around the outside of the casing at ground level. Readings in excess of 10% LEL indicate the need purge the borehole/casing with nitrogen or use an inflatable bladder to isolate the borehole atmosphere from any potential ignition sources. Should explosive gas in excess of 10% LEL be detected in the casing annulus, work will temporarily cease, ignition sources will be secured and the Site Health and Safety Officer and Golder Project Manager will be immediately contacted. If the condition does not subside, engineering controls will be established. These controls will be situation dependent and will be tested for effectiveness before any welding occurs.

During drilling operations, continuous VOC air monitoring must be performed in the breathing zone with a PID (as discussed in the Site HASP) and FID as discussed above under Procedures for Monitoring LNAPL Wells.

APPENDIX E

WELL DEVELOPMENT FORMS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Quanta
JOB NO. 023-6151 WELL NO. GAGW-01
DEVELOPED BY TIR
DATE OF INSTALL. 11/15/03 SHEET 1 OF 1
STARTED DEVEL. 12/23/03 / 0845 (DATE / TIME)
COMPLETED DEVEL. 12/29/03 / 1250 (DATE / TIME)
W.L. BEFORE DEVEL. 18.86 / / 10845 (DEPTH / DATE / TIME)
AFTER DEVEL. 18.91 11/23/03 / 1230 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 75,98
AFTER DEVEL. 76.60 WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 57.12
STANDING WELL VOLUME 9.3 gal.
SCREEN LENGTH 10
DRILLING WATER LOSS 150 gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS				REMARKS
		SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	Turbidity ~~OTHER~~	
12/23/03	100					Water turbid - Need to continue
						w/ development
12/29/03 0845	0	2.59	13.96	6.94	22.9	Initial Reading
0850	5	2.69	14.00	7.0	37.8	
0910	25	2.65	14.01	7.07	95.6	
0920	50	2.62	13.99	7.10	139	
0931	60	2.66	14.00	7.1	112	
0945	85	2.59	14.00	7.11	119	
0955	100	2.54	14.01	7.11	205	
1005	115	2.52	14.02	7.12	117	
1015	130	2.77	14.02	7.12	140	
1025	140	2.76	14.05	7.11	153	
1035	150	2.34	14.02	7.12	190	
1045	160	2.80	14.02	7.10	141	
1115	195	2.83	14.15	7.12	101	
1125	205	2.81	14.13	7.12	94.1	
1135	215	2.80	14.12	7.12	92.4	
1225	230	2.78	14.12	7.19	45.8	
1250	255	2.75	14.13	7.24	151	
		= TOTAL VOLUME REMOVED (gal.) 355				

DEVELOPMENT METHOD: Water Pump / Mechanical Surge. Water Pumped into Drums as labeled

NOTES:

Golder Associates

GAGW-02

WELL DEVELOPMENT FIELD RECORD

JOB NAME: Quanta
DEVELOPED BY: JLH
STARTED DEVEL.: 12/19/03 / 0930 (DATE / TIME)
W.L. BEFORE DEVEL.: 17.06 / 12/19/03 / 0925 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL.: 74.86
STANDING WATER COLUMN (FT.): 57.86
SCREEN LENGTH: 10 FT

JOB NO.: 023-6151
WELL NO.: GAGW-02
DATE OF INSTALL.: 11/24/03
SHEET 1 OF 1
COMPLETED DEVEL.: 12/19/03 / 1400 (DATE / TIME)
AFTER DEVEL.: 17.15 / 12/19/03 / 1405 (DEPTH / DATE / TIME)
AFTER DEVEL.: 75.31
WELL DIA. (In): 2
STANDING WELL VOLUME: 9.4 gal.
DRILLING WATER LOSS: 35 gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	ORP ~~OTHER~~	REMARKS Turbidity
1110		1.52	9.91	7.11	+48	over
1125		1.82	10.92	7.38	+43	760
1135		1.83	10.65	7.36	+55	292
1140		1.90	10.48	7.35	+42	90.8
1340		1.94	9.41	7.22	+83	7.4
1400		1.92	9.82	7.28	+87	0
		= TOTAL VOLUME REMOVED (gal.) 220				

DEVELOPMENT METHOD: Waterra Pump | Mechanical Surge. Water Pumped into Drums and labeled

A total of 220 gallons of water was removed during development.

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Quanta
JOB NO: 023-6151 WELL NO. GAGW-03
DEVELOPED BY TJR
DATE OF INSTALL. 11/13/03 SHEET 1 OF 1
STARTED DEVEL. 12/23/03 / 0930 (DATE / TIME)
COMPLETED DEVEL. 1/2/04 / 1435 (DATE / TIME)
W.L. BEFORE DEVEL. 22.94 / 12/23/03 / 0925 (DEPTH / DATE / TIME)
AFTER DEVEL. 23.18 1/2/04 / 1450 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 77.12
AFTER DEVEL. 77.90 WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 54.18
STANDING WELL VOLUME 8.8 gal.
SCREEN LENGTH 10
DRILLING WATER LOSS 150 gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS				REMARKS
		SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	Turb ~~OTHER~~	
12/23/03	50					
1/2/04 1215	0	0.702	13.6	9.67	Over	Initial Reading
1220	5	0.704	13.58	9.62	over	
1225	10	0.722	13.56	8.30	over	
1230	15	0.741	13.60	8.2	939	
1235	20	0.745	13.60	8.01	over	
1240	25	0.755	13.62	7.85	656	
1245	30	0.759	13.61	7.74	638	
1250	35	0.780	13.58	7.73	441	
1310	55	0.799	13.57	7.61	209	
1320	65	0.799	13.56	7.57	595	
1330	75	0.800	13.55	7.54	483	
1340	85	0.830	13.57	7.51	75	
1350	95	0.830	13.56	7.49	164	
1355	100	0.830	13.56	7.48	296	
1405	110	0.830	13.56	7.47	220	
1410	115	0.830	13.55	7.46	142	
1420	125	0.830	13.57	7.46	200	
1450	135	0.841	13.56	7.45	200	
		= TOTAL VOLUME REMOVED (gal.)				185

DEVELOPMENT METHOD: Waterra Pump/Mechanical Surge. Water Pumped into Drums and labeled

NOTES:

Golder Associates

GAGW-04D

WELL DEVELOPMENT FIELD RECORD

JOB NAME Quanta
JOB NO. 023-6151 WELL NO. GAGW-04D
DEVELOPED BY JCH
DATE OF INSTALL. 8/3/04 SHEET 1 OF 1
STARTED DEVEL. 8/4/04 / 1315 (DATE TIME)
COMPLETED DEVEL. 8/4/04 / 1430 (DATE TIME)
W.L. BEFORE DEVEL. 21.30 / 8/4/04 / 1310 (DEPTH DATE TIME)
AFTER DEVEL. 21.50 / 8/4/04 / 1435 (DEPTH DATE TIME)
WELL DEPTH: BEFORE DEVEL. 67.83
AFTER DEVEL. 68.93 WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 46.53
STANDING WELL VOLUME 7.6 gal.
SCREEN LENGTH 10 FT
DRILLING WATER LOSS NA gal.

DATE/TIME	VOLUME REMOVED (GALS) estimated	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	Turb ~~OTHER~~	DTW REMARKS
8/4/04 1318	5	0.064	16.72	8.40	999.0	23.30 "Continuously Surge"
1328	10	0.068	16.85	7.52	999.0	23.36
1338	20	0.089	17.12	7.31	452.0	23.49
1348	30	1.42	17.21	7.33	119.0	22.69
1358	35	1.68	17.18	7.42	44.8	22.67
1405	45	2.01	17.15	7.17	21.0	22.65
1415	50	2.02	17.21	7.11	≈ 0	22.59
1420	55	2.04	17.30	7.10	≈ 0	22.57
		= TOTAL VOLUME REMOVED (gal.)				

DEVELOPMENT METHOD: Whaler pump /

NOTES: ≈ 55 gallons Removed / Turb ≈ 0.0 ntu

Golder Associates

GAGW-05

WELL DEVELOPMENT FIELD RECORD

JOB NAME Quanta
JOB NO. 023-6151 WELL NO. GAGW-05
DEVELOPED BY JLH
DATE OF INSTALL. 11/21/03 SHEET 1 OF 1
STARTED DEVEL. 12/18/03 / 0930 (DATE / TIME)
COMPLETED DEVEL. 12/22/03 / 1030 (DATE / TIME)
W.L. BEFORE DEVEL. 15.41 12/19/03 / 0925 (DEPTH / DATE / TIME)
AFTER DEVEL. 15.50 12/22/03 1035 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. ≈75.4 toc ?
AFTER DEVEL. –
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) –
STANDING WELL VOLUME – gal.
SCREEN LENGTH 10'
DRILLING WATER LOSS N/A gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	Turb ~~OTHER~~	REMARKS
12/19/03	10	0.070	9.9	5.21	999.0	
12/19/03	20	0.099	10.7	5.33	999.0	
12/22/03	25	1.02	12.3	5.47	999.0	Surge
	35	1.62	12.6	5.66	875.0	
	50	1.78	12.9	5.81	762.0	
	60	1.83	13.4	5.97	4,25.0	
	70	1.85	13.8	6.02	4.16.0	Surge
	80	1.99	13.4	6.12	380.0	
	90	2.01	13.2	6.48	330.0	
	100	2.03	13.6	6.67	316.0	
	110	2.06	13.1	6.99	275.0	Surge
	120	2.06	13.3	7.01	200.0	
	130	2.09	13.3	7.04	180.0	
	140	2.15	13.7	7.08	100.0	
	150	2.22	13.6	7.12	70.7	Surge
	160	2.36	13.6	7.13	42.1	
	170	2.37	13.6	7.09	16.3	
	180	2 36	13.5	7.10	1.7	
	180	= TOTAL VOLUME REMOVED (gal.)				

DEVELOPMENT METHOD: Whaler pump / Continuous Surging / Development H2O pumped into / 4-55 gallon steel Drums / labeled

NOTES:

Golder Associates

GAGW-06I

WELL DEVELOPMENT FIELD RECORD

JOB NAME Quanta
JOB NO. 023-6151 WELL NO. GAGW-06I
DEVELOPED BY JCH
DATE OF INSTALL. 6/28/04 SHEET 1 OF 1
STARTED DEVEL. 7/12/04 1245 (DATE, TIME)
COMPLETED DEVEL. 7/12/04 1500 (DATE, TIME)
W.L. BEFORE DEVEL. 17.92 7/12/04 12.45 (DEPTH, DATE, TIME)
AFTER DEVEL. 18.47 7/14/04 1300 (DEPTH, DATE, TIME)
WELL DEPTH: BEFORE DEVEL. 43.48
AFTER DEVEL. 43.70
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 25.56
STANDING WELL VOLUME 4.2 gal.
SCREEN LENGTH 10 Ft
DRILLING WATER LOSS NA gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS				REMARKS
		SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	OTHER	
	100 gal	= TOTAL VOLUME REMOVED (gal.)				

DEVELOPMENT METHOD: Whaler pump / Purged water was pumped into 2-55 gallon Drums

NOTES: 100 gallons (H2O) purged from GAGW-06I, with continuous Surging performed by Amerotill.
u-22 / Horiba was not Available on 7/12/04

023-6151
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Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Quanta
JOB NO. 023-6151 WELL NO. SAGW-07
DEVELOPED BY JLH / WC
DATE OF INSTALL.
SHEET 1 OF 1
STARTED DEVEL. 7-12-04 / 0845 (DATE / TIME)
COMPLETED DEVEL. 7/13/04 / 1036 (DATE / TIME)
W.L. BEFORE DEVEL. 18,26 / 7-12-04 / 0845 (DEPTH / DATE / TIME)
AFTER DEVEL. 18,26 / 7/13/04 / 1030 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 72.55
AFTER DEVEL. 72.55
WELL DIA. (In) 2"
STANDING WATER COLUMN (FT.) 54.29 Ft
STANDING WELL VOLUME 8.86 (g) gal.
SCREEN LENGTH 10
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	Orp ~~OTHER~~	* Turbidity	REMARKS Water Depth TOC
8:55 7-13-04	10	0.742	15.0	5.41	+253	279.0	18.95
9:05 905	10-15	1.76	15.6	5.79	+211	129.0	18.95
9:15 915	35	1.84	15.3	5.81	+196	401.0	18.95
925	45	1.87	16.5	5.97	+154	44.1	18.95
935	52	1.92	15.3	5.96	+165	0.0	18.95
940	60	1.92	15.4	5.98	+160	114.0	Surged Well
10:00	75	2.01	15.9	5.99	+169	1.1	18.75
10:10	85	2.04	16.2	5.99	+160	0.0	18.75
10:20	100	2.05	15.7	6.01	+161	0.0	18.75
10:30	110	2.08	16.0	5.99	+159	0.0	18.75
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: Whaler pump / purged into Tank on truck bed / - Drained Develop. H2O into 55 gallon drums on Quanta site (Drums labeled) Develop H2O SAGW-07

NOTES:

18.26 ft = final depth to water, 72.55 - final sounded depth

Golder Associates

WELL DEVELOPMENT FIELD RECORD /

GAGW-08

JOB NAME Quanta

DEVELOPED BY Amerdrill / KD-SM

STARTED DEVEL 0955 / 7-14-04

Time ~~DATE~~ ~~TIME~~ Date

W.L. BEFORE DEVEL. 15.07 / 7-14-04 / 0950

DEPTH DATE TIME

WELL DEPTH: BEFORE DEVEL. 70.76

STANDING WATER COLUMN (FT.) 55.69

SCREEN LENGTH 10'

JOB NO. 023-6151

WELL NO. [redacted]

DATE OF INSTALL. -

SHEET 1 OF 1

COMPLETED DEVEL. 7.14.04 / 1200

DATE TIME

AFTER DEVEL. 16.98 7/14/04 / 1200

DEPTH DATE TIME

AFTER DEVEL. 70.76

WELL DIA. (In) 2"

STANDING WELL VOLUME ~~54.24~~ 9 gal.

DRILLING WATER LOSS NA gal.

DATE/TIME	VOLUME REMOVED ≈ (GALS)	FIELD PARAMETERS SPEC. COND. ~~(umhos/cm)~~ mS/cm	TEMP. (C)	pH (s.u.)	Turb ~~OTHER~~ ntu	ORP	REMARKS D.T.W., Top of inner casing/pvc
7-14-04 / 1110	≈ 45	2.94	17.8	6.08	149.0	+185	16.99
7-14-04 1118	≈ 55	2.89	16.4	6.61	78.1	+ 88	17.01
7-14-04 1127	≈ 65	2.88	16.4	6.70	44.9	+ 80	16.99
7-14-04 1134	≈ 72	2.87	16.2	6.76	30.4	+ 106	17.0
7/14/04 1143	≈ 81	2.88	16.5	6.76	16.6	+ 72	17.01
7/14/04 1150	≈ 88	2.88	16.1	6.78	0	+ 68	16.97
7/14/04 12:00	≈ 98	2.91	16.6	6.77	0	+ 64	16.98
	98 gal	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: whaler pump / surge pump intermittently

DTW 15.08 (3-4 minutes After stopping pump)

NOTES:

APPENDIX F

GROUNDWATER SAMPLING PURGE FORMS

RI GROUNDWATER SAMPLING PURGE FORMS

Project Title: QUANTA RESOURCE SITE
Project Number: 023-6151
Sampling Date: 1/9/04
Monitoring Well ID: GAGW-01
Weather Conditions:

Golder Associates

Casing Diameter (in): 2 | Stick-up ~ 3.5'
Well Depth (ft): 76.61 (sounded)
Screen Mid-point (ft): 69
Depth to Water prior to purging: 19.01 TOSC
Start Time (purging): 0916
Finish Time (purging): 0959

Sampling Device: Submersible pump
Sampler(s): S. Anderson / J. Ford
Sample Parameters: VOC, MEK, PCB, SVOC, Alk, TOC, DOC, CO2, Cl, Sulfate, TDS, Nitrate, CN, TAL metals
Sample Time: 1000
Sample Characteristics: Clear, No odor
Notes:

Time (HH:MM)	Temperature (°C)	pH (std)	Specific Conductance (mS)/cm	Turbidity (NTU)	Dissolved Oxygen (mg/l)	eH (mv)	Depth To Water (ft. btc)	Approximate Purge Rate (ml/min)	Volume Purged (Liters)
09:19	10.3	6.69	2.59	3.8	0	-31	19.06	320	1.0
09:24	11.4	6.94	2.73	268	0	-112	19.07	400	3.0
09:29	13.0	7.06	2.86	213	0	-121	19.07	400	5.0
09:44	13.8	7.19	2.82	11.7	0	-128	19.09	400	11.0
09:49	13.5	7.22	2.79	0	0	-127	19.09	400	13.0
09:54	13.4	7.23	2.78	0	0	-127	19.09	400	16.0
09:59	13.6	7.22	2.77	0	0	-126	19.09	400	17.0

MS/MSD Collected
Ferrous Iron - 3.0 ppm

Golder Associates

Pr, ,t Title:	QUANTA RESOURCE SITE
Project Number:	023-6151
Sampling Date:	1/9/04
Monitoring Well ID:	GAGW-02
Weather Conditions:	

Casing Diameter (in): 2 Stick-up ~ 2.8'

Well Depth (ft): 75.31 (Sounded)

Screen Mid-point (ft): 68.5

Depth to Water prior to purging: 17.16

Start Time (purging): 1336

Finish Time (purging): 1500

Sampling Device: Submersible pump

Sampler(s): S. Anderson / J. Ford

Sample Parameters: Voc, MEE, PCB, Svoc, Alk, TOC, DOC, CO_2, Cl, Sulfate, TDS, Nitrate, CN, TAL Metals

Sample Time: 1505

Sample Characteristics: Clear, No odor

Notes:

Time (HH:MM)	Temperature (°C)	pH (std)	Specific Conductance (mS)/cm	Turbidity (NTU)	Dissolved Oxygen (mg/l)	eH (mv)	Depth To Water (ft. btc)	Approximate Purge Rate (ml/min)	Volume Purged (Liters)
13:40	10.1	7.30	1.11	48.2	2.54	-6	17.17	250	1.0
13:45	11.9	6.89	1.22	7999	0	+1	17.19	400	3.0
13:50	12.8	6.88	1.32	557	0	+4	17.19	400	5.0
13:55	12.9	6.89	1.48	762	0	+6	17.19	400	7.0
14:00	12.8	6.90	1.53	710	0	+8	17.19	400	9.0
14:05	13.1	6.90	1.58	558	0	+10	17.19	400	11.0
14:10	13.1	6.90	1.62	447	0	+8	17.19	400	13.0
14:15	13.1	6.90	1.64	357	0	+3	17.19	400	15.0
14:25	13.1	6.90	1.67	262	0	-5	17.19	400	19.0
14:35	13.1	6.90	1.71	202	0	-9	17.19	400	23.0
14:40	13.2	6.89	1.73	80.6	0	-10	17.19	400	25.0
14:50	13.1	6.89	1.74	35.2	0	-18	17.20	400	27.0
14:55	13.1	6.90	1.74	27.7	0	-21	17.20	400	29.0
15:00	13.0	6.90	1.75	20.2	0	-20	17.20	400	31.0

Clean out flow cell

Field Duplicate Collected

Ferrous Iron - 0.0 PPM.

Golder Associates

Project Title:	QUANTA RESOURCE SITE
Project Number:	023-6151
Sampling Date:	1/9/04
Monitoring Well ID:	GAGW-03
Weather Conditions:	

Casing Diameter (in): 2 Stick-up ~ 2.30'

Well Depth (ft): 77.9

Screen Mid-point (ft):

Depth to Water prior to purging: 23.19 TOIC

Start Time (purging): 0933

Finish Time (purging): 1125

Sampling Device: Submersible pump

Sampler(s): S. Anderson / J. Ford

Sample Parameters: Voc, MEE, PCB, Svoc, Alk, Toc, Doc, CO2, Cl, Sulfate, TDS, Nitrate, CN, TAL Metals

Sample Time: 1125

Sample Characteristics: Clear

Notes:

Time (HH:MM)	Temperature (°C)	pH (std)	Specific Conductance (mS)/cm	Turbidity (NTU)	Dissolved Oxygen (mg/l)	eH (mv)	Depth To Water (ft. btc)	Approximate Purge Rate (ml/min)	Volume Purged (Liters)
09:35	11.6	7.08	1.31	175		+3	23.78	500	1.0
09:40	12.6	7.09	1.15	7999	0	+4	23.78	320	2.6
09:45	13.5	7.15	1.14	7999	0	+2	23.78	320	4.2
09:50	13.9	7.19	1.14	>999	0	-1	23.79	320	5.8
09:55	13.9	7.20	1.14	>999	0	-2	23.79	320	7.4
10:00	13.9	7.21	1.13	803	0	-5	23.78	320	9.0
10:05	14.0	7.22	1.12	583	0	-9	23.78	320	10.6
10:15	14.3	7.23	1.11	437	0	-11	23.78	320	12.2
10:20	14.4	7.23	1.11	336	0	-12	23.78	320	13.8
10:25	14.2	7.23	1.11	230	0	-13	23.78	320	15.4
10:30	13.9	7.22	1.10	175	0	-13	23.78	320	17.0
10:35	14.1	7.22	1.10	88	0	-14	23.78	320	18.6
10:40	13.9	7.22	1.09	70	0	-16	23.78	320	20.2
10:45	13.9	7.23	1.08	57	0	-18	23.78	320	21.8
10:50	13.9	7.23	1.08	49	0	-18	23.78	320	23.4
10:55	14.1	7.23	1.08	48	0	-18	23.78	320	26.0
11:05	14.2	7.21	1.09	42	0	-13	23.78	320	29.2
11:10	14.2	7.21	1.08	37	0	-17	23.78	320	30.8
11:15	14.2	7.21	1.09	37	0	-17	23.78	320	32.4
11:20	14.2	7.21	1.08	35	0	-19	23.78	320	34.0

- Clean out Flow Cell

Ferrous Iron 0.0 PPm

W FLOW GROUNDWATER PURGE/SAMPLE FIELD IN RMATION FORM

Golder Associates

Site: Quanta

Location: Queens, NY

Project Number: **023-6151**

Meter/Type/Serial #: **Horiba U-22 serial # 00853**

Meter Calibrated @: **7:30 AM**

MONITORING WELL ID: **GAGW-04D**

Sampling Date/Time: **8/12/2004 / 1215**

Depth to Water Prior to Purging [ft-bmp]: **17.98**

Sampler(s): **Joe Huffman and Rick Smith**

Well Casing Diameter [in]: **2"**

Sampling Device: **Grundfos and Teflon lined tubing**

Start Time (purging): **11:10 AM**

Sample Characteristics: **Clear, No odor**

Purging Device: **Grundfos submersible pump**

PID Measurement of Well Headspace (ppm): **NM**

As-Built Construction Well Depth [ft-bmp]: **69.00**

Analytical Parameters: **PCB, VOC, TOC, DOC, ALK, SVOC, MEE, CO2, TDS, Cl, Sulfate, Nitrite, Total Cyanide, TAL Metals**

Sounded Well Depth [ft-bmp]: **68.93**

Weather Conditions: **Overcast 70's**

Fe+2 result (field measurement): N/A PPM

Time [hh:mm]	Temperature [°C]	pH [std]	Specific Conductance Circle One [S/m] or [mS/cm]	Turbidity [ntu]	Dissolved Oxygen [mg/l]	Redox Potential Note - Indicate if (+) or (-) [mV]	Depth To Water [ft-bmp]	Volume Purged [liters]	Approximate Purge Rate [ml/min]	Observations (PID readings, sample characteristics, equipment problems, etc.)
11:12	16.51	7.71	0.610	999.0	3.87	146	22.41	0.5	320	Tubing in Flow Cell clogged / Drained Flow Cell
11:17	17.17	8.16	0.654	999.0	4.80	119	22.15	2.5	400	
11:22	16.93	7.43	1.62	999.0	1.04	136	22.25	4.6	440	
11:27	17.29	7.33	1.75	999.0	0.83	124	22.02	6.6	400	Emptied Flow Cell
11:32	17.23	7.34	1.83	974.0	0.62	120	22.11	8.6	400	
11:37	17.16	7.30	1.92	432.0	0.83	109	22.10	10.8	440	Emptied Flow Cell
11:42	17.35	7.20	1.96	219.0	0.82	98	22.13	13.0	440	
11:47	17.19	7.19	2.01	120.0	0.87	95	22.12	15.2	440	
11:52	17.09	7.17	2.05	62.0	0.85	92	22.11	17.4	440	
11:57	17.08	7.15	2.06	44.2	0.88	89	22.11	19.6	440	
12:02	17.14	7.14	2.09	21.0	0.88	84	22.10	21.8	440	
12:07	17.17	7.14	2.09	19.7	0.89	83	22.10	24.0	440	Clear, No Odor

Comments:

Pump set @ 63.71
DTW = 21.30 ft BGS

Project Title: QUANTA RESOURCE SITE
Project Number: 023-6151
Sampling Date: 1/9/04
Monitoring Well ID: GAGW-05
Weather Conditions:

Casing Diameter (in): 2
Well Depth (ft):
Screen Mid-point (ft):
Depth to Water prior to purging: 15.31
Start Time (purging): 1320
Finish Time (purging): 1415

Sampling Device: Submersible pump
Sampler(s): S. Anderson / J. Ford
Sample Parameters: Voc, MAE, PCB, Svoc, Alk, Toc, Doc, Co2
Cl, Sulfate, TDS, Nitrate, CN, TAL Metals
Sample Time: 1425
Sample Characteristics:
Notes:

Time (HH:MM)	Temperature (°C)	pH (std)	Specific Conductance (mS)/Cm	Turbidity (NTU)	Dissolved Oxygen (mg/l)	eH (mv)	Depth To Water (ft. btc)	Approximate Purge Rate (ml/min)	Volume Purged (Liters)
13:25	10.2	6.63	2.02	475	3.64	-43	15.35	480	2.4
13:30	12.4	6.96	2.21	10.5	0	-104	15.35	480	
13:35	13.1	7.05	2.27	0	0	-111	15.35	480	6.4
13:40	13.2	7.07	2.28	0	0	-112	15.38	480	8.0
13:45	13.3	7.10	2.32	0	0	-112	15.38	480	10.4
13:50	13.3	7.11	2.33	0	0	-111	15.38	480	12.0
13:55	13.4	7.11	2.33	0	0	-112	15.38	480	14.4
14:00	13.3	7.11	2.33	0	0	-111	15.38	480	17.0
14:05	13.4	7.12	2.34	0	0	-112	15.38	480	19.4
14:10	13.4	7.12	2.34	0	0	-112	15.38	480	22.0
14:15	13.4	7.12	2.34	0	0	-112	15.38	480	24.4

Ferrous Iron - 3.2 ppm

N FLOW GROUNDWATER PURGE/SAMPLE FIELD I RMATION FORM

Golder Associates

Site Quanta

Location: Queens, NY

Project Number: 023-6151

Meter/Type/Serial #: Horiba U-22 serial # 00853

Meter Calibrated @: 7:30 AM

MONITORING WELL ID: GAGW-06I

Sampling Date/Time: 8/12/2004 / 0900

Depth to Water Prior to Purging [ft-bmp]: 17.98

Sampler(s): Joe Huffman and Rick Smith

Well Casing Diameter [in]: 2"

Sampling Device: Grundfos and Teflon lined tubing

Start Time (purging): 0755 AM

Sample Characteristics: Clear with HC odor / sheen on top of samples

Purging Device: Grundfos submersible pump

PID Measurement of Well Headspace (ppm): NM

As-Built Construction Well Depth [ft-bmp]: 48

Analytical Parameters: PCB, VOC, TOC, DOC, ALK, SVOC, MEE, CO2, TDS, Cl, Sulfate, Nitrite, Total Cyanide, TAL Metals

Sounded Well Depth [ft-bmp]: 43.38

Weather Conditions: **Overcast 70's**

Fe+2 result (field measurement): N/A PPM

Time [hh:mm]	Temperature [°C]	pH [std]	Specific Conductance Circle One [S/m] or [mS/cm]	Turbidity [ntu]	Dissolved Oxygen [mg/l]	Redox Potential Note - Indicate if (+) or (-) [mV]	Depth To Water [ft-bmp]	Volume Purged [liters]	Approximate Purge Rate [ml/min]	Observations (PID readings, sample characteristics, equipment problems, etc.)
07:57	15.56	6.85	0.777	319.0	3.05	-162	18.90	0.5	240	
08:02	16.00	7.72	0.738	307.0	1.01	-157	18.89	2.5	400	
08:07	16.36	7.02	0.715	407.0	0.77	-128	18.89	4.5	400	Cleaned out Flow Cell
08:12	16.39	6.90	0.697	267.0	0.51	-121	18.89	6.5	400	
08:17	16.46	6.80	0.673	226.0	0.47	-113	18.89	8.5	400	
08:22	16.37	6.78	0.661	101.0	0.39	-102	18.97	10.5	400	
08:27	16.39	6.80	0.657	75.0	0.31	-96	18.94	12.5	400	Cleaned out Flow Cell
08:32	16.42	6.79	0.655	71.2	0.30	-97	18.93	14.5	400	
08:37	16.44	6.79	0.652	57.1	0.31	-100	18.90	16.5	400	
08:42	16.49	6.79	0.650	39.7	0.33	-103	18.93	18.5	400	
08:47	16.51	6.79	0.647	32.6	0.29	-105	18.80	20.5	400	
08:52	16.55	6.79	0.642	31.7	0.28	-107	18.78	22.5	400	

Comments:

DTW 17.88 WITH PUMP SET @ 38.25 ft BGS
FIELD DUPLICATE SAMPLE

W FLOW GROUNDWATER PURGE/SAMPLE FIELD I ORMATION FORM

Golder Associates

Site Quanta

Location: Queens, NY

Project Number: 023-6151

Meter/Type/Serial #: Horiba U-22 serial # 00853

Meter Calibrated @: 2:00 PM

MONITORING WELL ID: GAGW-07

Sampling Date/Time: 8/12/2004 / 1645

Depth to Water Prior to Purging [ft-bmp]: 18.21

Sampler(s): Joe Huffman and Rick Smith

Well Casing Diameter [in]: 2"

Sampling Device: Grundfos and Teflon lined tubing

Start Time (purging): 3:50 PM

Sample Characteristics: Clear, No Odor

Purging Device: Grundfos submersible pump

PID Measurement of Well Headspace (ppm): NM

As-Built Construction Well Depth [ft-bmp]: 73

Analytical Parameters: PCB, VOC, TOC, DOC, ALK, SVOC, MEE, CO2, TDS, Cl, Sulfate, Nitrite, Total Cyanide, TAL Metals

Sounded Well Depth [ft-bmp]: 72.54

Weather Conditions: Overcast 70's

Fe+2 result (field measurement): N/A PPM

Time [hh:mm]	Temperature [°C]	pH [std]	Specific Conductance Circle One [S/m] or [mS/cm]	Turbidity [ntu]	Dissolved Oxygen [mg/l]	Redox Potential Note - Indicate if (+) or (-) [mV]	Depth To Water [ft-bmp]	Volume Purged [liters]	Approximate Purge Rate [ml/min]	Observations (PID readings, sample characteristics, equipment problems, etc.)
15:52	16.65	7.30	1.82	370.0	2.18	172	18.21	0.5	400	
15:57	17.02	7.23	1.81	125.0	1.00	139	18.21	2.5	400	
16:02	17.09	7.20	1.78	123.0	0.83	122	18.21	4.5	400	
16:07	17.03	7.18	1.78	120.0	0.78	115	18.21	6.5	400	
16:12	16.98	7.17	1.78	118.0	0.75	112	18.21	8.5	400	
16:17	16.99	7.16	1.79	118.0	0.74	109	18.21	10.5	400	
16:22	16.92	7.12	1.79	41.0	0.69	105	18.21	12.5	400	
16:27	16.99	7.10	1.80	48.7	0.71	101	18.21	14.5	400	
16:32	17.06	7.10	1.79	49.7	0.67	98	18.21	16.5	400	
16:37	17.10	7.10	1.81	41.6	0.65	92	18.21	18.3	360	
16:42	17.12	7.09	1.80	39.7	0.63	90	18.21	20.1	360	

Comments:

Pump @ 67.37
DTW = 18.21ft BGS

W FLOW GROUNDWATER PURGE/SAMPLE FIELD I RMATION FORM

Golder Associates

Site Quanta

Location: Queens, NY

Project Number: 023-6151

Meter/Type/Serial #: Horiba U-22 serial # 00853

Meter Calibrated @: 7:30 AM

MONITORING WELL ID: GAGW-08

Sampling Date/Time: 8/12/2004 / 1500

Depth to Water Prior to Purging [ft-bmp]: 15.10

Sampler(s): Joe Huffman and Rick Smith

Well Casing Diameter [in]: 2"

Sampling Device: Grundfos and Teflon lined tubing

Start Time (purging): 2:23 PM

Sample Characteristics: Clear, No Odor

Purging Device: Grundfos submersible pump

PID Measurement of Well Headspace (ppm): NM

As-Built Construction Well Depth [ft-bmp]: 72

Analytical Parameters: PCB, VOC, TOC, DOC, ALK, SVOC, MEE, CO2, TDS, Cl, Sulfate, Nitrite, Total Cyanide, TAL Metals

Sounded Well Depth [ft-bmp]: 70.69

Weather Conditions: Overcast 70's

Fe+2 result (field measurement): N/A PPM

Time [hh:mm]	Temperature [°C]	pH [std]	Specific Conductance Circle One [S/m] or [mS/cm]	Turbidity [ntu]	Dissolved Oxygen [mg/l]	Redox Potential Note - Indicate if (+) or (-) [mV]	Depth To Water [ft-bmp]	Volume Purged [liters]	Approximate Purge Rate [ml/min]	Observations (PID readings, sample characteristics, equipment problems, etc.)
14:25	16.49	7.89	1.80	450.0	1.61	147	15.15	0.5	400	
14:30	16.94	7.23	2.19	275.0	0.97	113	15.15	2.5	400	
14:35	17.06	7.16	2.27	150.0	0.87	100	15.15	4.5	400	
14:40	17.02	7.12	2.29	77.5	0.80	97	15.15	6.5	400	
14:45	17.08	7.09	2.30	42.6	0.08	95	15.15	8.5	400	
14:50	17.00	7.06	2.33	37.2	0.77	90	15.15	10.5	400	
14:55	16.99	7.03	2.36	35.6	0.75	88	15.15	12.5	400	

Comments:

Pump @ 66.10
DTW = 15.15

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PRE-RI GROUNDWATER SAMPLING PURGE FORMS

Date: 12.6.88
Crew: SM/KPM
Job No: 576-002
Project: Oneonta/DEC

pH Meter: 4776
Turb Met.: 43324
Cond. Meter: 560
HNU #: 801446
:

WELL SAMPLING LOG

WELL No: GW1
LOCATION: Northeast, upgradient
WELL TYPE: Overburden
WELL DIAMETER: 2" ID
WELL DEPTH: 40.34 ft
SCREENED INTERVAL: 30.3 to 40.3 ft
CASING HT: PVC 2.36 ft above grade
DEPTH TO WATER: (Static Water Level) 25.61 ft
REFERENCE POINT: Top of PVC
DATE/TIME PURGED: 12-6-88, 0924 hr
PURGING METHOD: PVC Bailer
PURGING DEPTH(s): Top to Bottom
PURGE RATES (gpm): approx. 2± gpm
PURGED VOLUME: 45 gals
DTW AFTER PURGING: no difference
EST. YIELD RATE: 2 gpm +
SEAL No:
CHAIN OF CUSTODY No:

TYPE OF SCREENING CASING: PVC Sch 40
WATER BEARING FORMATION(s): SAND and Gravel
SAMPLE DATE/TIME: 12.6.88 @ 1130-1200
SAMPLING METHOD: Clear Bailer
DTW BEFORE SAMPLING: Same as Static
WELL CONDITIONS: Good
SAMPLING DEPTHS: Top to mid water co
SAMPLING OBSERVATIONS: Tiny oil droplets - water fairly clear moderate oil type odor

WET CHEMISTRIES

SAMPLE TEMP: 13.5°C
SAMPLE pH:
SAMPLE SP. COND:
~~SAMPLE SULFITE~~:
~~SAMPLE REDOX: Rel. mV: mV~~
~~SAMPLE D.O.~~:

PURGE CHEMISTRIES

~~TIME~~/VOL	TEMP (°C)	pH	SP. COND.	NTU
17 gal	13.5	↑	665	72
30 gal	13.5	↓	883	70
40 gal	12.5	6.27	805	64 ← Sample chem

SAMPLE ANALYSES (List Sample Jar Parameters) INV. No.
3-1l amber ABNs, Pest + PCBs
1-1l clear oil + grease
2-40ml VOA VOCs + Xylene
2-.5l plast. Metals + Cyanide

COMMENTS: 14.73' Column of H_2O @ 3 (5in) Casing Volumes ± 35 gals. Thin veneer golden Brown floating HC - Cutting oil type odor

Crew Chief Signature: Steve J. Miller

Date: 12.6.88

Lawler, Matusky & Skelly Engineers

WELL SAMPLING LOG

Date: 2-22-90

Crew: JMG SM CSH

Job No: 576-002

Project: NYSDEC Resample

Project Site: Quanta Resources

METERS USED

Temp: DEC TLC 560

pH: pH Paper

Cond: DEC TLC 560

Turb: DEC DRT 15C

Well ID No: GW-1

Well Condition: Not Good (There was frost damage @ top of PVC, PVC casing very warped. We cut protective casing down .88', then cut PVC flush & put a new cap on protective casing

Well Depth/Diameter: 39.60' / 2"

Well Casing Type: PVC sch 40

Screened Interval: Bottom 10'

Casing Ht/Lock No: PVC + steel 1.57' / #2246

Reference Pt: Top of PVC

Depth to Water (DTW): 24.18' (appears to be thin layer of golden yellow viscous product on surf. but no registered interface)

Water Column; Ht/Vol: 15.42' / 2.5 gal (2" well) (5" Borehole)

Purge Est: 15.42 x 1.05 = 16.2 gal
16.2 gal x 4 = 64.8 gal.

Purge Date/Time(s): 2-22-90 / 1220-1250

Purge Method: Cent. Pump w/ Dedicated Tubing (we had to hand surge tubing due to silt)

Purge Depth(s): Bottom → Surface

Purge Rates (gpm): 3-5 gpm

Purged Volume: 100 gal.

DTW After Purging: 24.20' (no registered interface)

Yield Rate: L M [✓ H]

Purge Observations: Turbid, lt brown, petroleum odor

PURGE CHEMISTRIES

VOL.	TEMP. (C)	pH	SP. COND.	TURB.
90 gal	14.7°	6.5	270	— (product interference)

DTW Before Sampling: 24.20'

Sample Date/Time(s): 2-22-90 / 1400-1420

Sampling Method: Teflon Bailer (#05)

Sampling Depth(s): Mid Water Column

DTW After Sampling: —

Sampling Observations: slightly Turbid, lt gray some sheening, small black particulate matter settled out

Chain-of-Custody No(s): #3956

Analytical Lab(s): CompuChem

WET SAMPLE CHEMISTRIES

	Temp. (C)	pH	Sp. Cond.	Turb.
Before				
After	14.2°	6.5	314	95

SAMPLE ANALYSES

Parameters	Inv. No.	Pres. Meth.	Filt. (Y/N)
VOCs TCL	04	4°C	N
BNAs TCL	02	↓	↓
Pest/PCBs TCL	02		
Metals TCL	01	NaO	
Cyanide TCL	01	NaOH	

Comments:
Light product odor w/ slight sheen on purge water
Field Blank performed on this bailer. CompuChem FB water poured through bailer into set of bottles. Bailer then used to sample GW-1

Air Temp: 50-60°F

Weather Conditions: Overcast intermittent lt rain

Crew Chief Signature: John M. Gaynard

Date: 2-22-90

Date: 12-6-88
Crew: SM/KPM
Job No: 576.002
Project: Quanta, DEC

pH Meter: 4776
Turb Met: L3324
Cond. Meter: <560
HNU #: 801446
:

WELL SAMPLING LOG

WELL No: GW2
LOCATION: Southwest-downgradient
WELL TYPE: Overburden
WELL DIAMETER: 2" I.D.
WELL DEPTH: 30.20 ft
SCREENED INTERVAL: 19.96' to 29.86'
CASING HT: PVC 1.86 ft above grade
DEPTH TO WATER: (Static Water Level) 24.90 ft
REFERENCE POINT: Top of PVC
DATE/TIME PURGED: 2/6/88, 1449 hr
PURGING METHOD: Bailer
PURGING DEPTH(s): Top to Bottom
PURGE RATES (gpm): > 2 gpm
PURGED VOLUME: 27 gals, det. as in 6 cl
DTW AFTER PURGING: 19.08 ft
EST. YIELD RATE: > purge rate
SEAL No:
CHAIN OF CUSTODY No:

TYPE OF SCREENING CASING: pvc sch 40
WATER BEARING FORMATION(s): sand and gravels
SAMPLE DATE/TIME: 12-6-88 @ 1454 hr
SAMPLING METHOD: Clear Bailer
DTW BEFORE SAMPLING: 19.08 ft
WELL CONDITIONS: Good structurally
SAMPLING DEPTHS: @ and below interface
SAMPLING OBSERVATIONS: Oily product
rel. low HNu readings
Breathing zone range (4 to 6 ppm)

WET CHEMISTRIES

SAMPLE TEMP: Oily product
SAMPLE pH: interf.
SAMPLE SP. COND:
~~SAMPLE SULFIDE:~~
~~SAMPLE REDOX: Rel. mV: mV~~
~~SAMPLE D.O.:~~

PURGE CHEMISTRIES

~~TIME~~/VOL	TEMP (°C)	pH	SP. COND.	NTU
20 gal	—	—	—	>1000
25 gal	—	—	—	~80

SAMPLE ANALYSES (List Sample Jar Parameters) INV. No.
~~Sample turb sese~~
1-1l oil and grease cont
3-1l Gallon ABNs HSL+20, Pest, PCBs
1-1l widemouth for prod: EP Tox. metals only, PCBs, ignitability
2-VOAs HSL+10 VOCs
2-.5l plast. metals HSL & Cyanide

COMMENTS: HNU readings after opening well cover 12-14 ppm } subsq. rise in SWL
int.: 8.41' layer product
5.3' col. of water
no chems other than Sp. Cond & Turb taken

Crew Chief Signature:
Date: 12-6-88

Lawler, Matusky & Skelly Engineers

WELL SAMPLING LOG

Date: 2-21-90 / 2-22-90
Crew: Sm, Jng, CSH
Job No: 576-002
Project: Sampling
Project Site: Quanta Resources

METERS USED

Temp: DEC TLC 560
pH: pH paper
Cond: DEC TLC 560
Turb:

Well ID No: GW-2
Well Condition: Good
Well Depth/Diameter: 30.20' / 2"
Well Casing Type: PVC
Screened Interval: Bottom 10'
Casing Ht/Lock No: steel 1.77' PVC 1.86'
Reference Pt: Top of PVC
Depth to Water (DTW): 23.34' (1030) 23.25' (0935 2-22-90)
Water Column; Ht/Vol: 6.15' / 1.13 gal 2" well
Purge Est: 30.20' - 23.25 = 6.95'; 1.05 = 7.3 gal (5" Borehole) 7.3 x 4 = 29.2 gal.
Purge Date/Time(s): 2-22-90 / 0955-1020
Purge Method: Centrifugal Pump
Purge Depth(s): Bottom, mid, Surf, Bottom
Purge Rates (gpm): 2 gpm
Purged Volume: 45 gal
DTW After Purging: Not checked due to product. Appears to be about the same *
Yield Rate: L-[✓ M]-H
Purge Observations: Turbid, oily, Seems to be forming oily water emulsion

DTW Before Sampling: Not checked due to Product
Sample Date/Time(s): 2-21-90/1100-1155* / 2-22-90/1040-11[illegible]
Sampling Method: Teflon Bailer (#01)
Sampling Depth(s): Near Bottom **
DTW After Sampling: —
Sampling Observations: Turbid gray, some product. Noticed sample water turned from gray to black (oxidation?) as soon as it was drained into bottle
Chain-of-Custody No(s): 3958 + 3954
Analytical Lab(s): Compu Chem

WET SAMPLE CHEMISTRIES

	Temp. CO	pH	Sp. Cond.	Turb.
Before	—	} not collected to to the product interference		
After	—			

PURGE CHEMISTRIES

Vol.	TEMP. CO	pH	SP. COND.	TURB.
40 gal	13.4°	6.5	1814	— too oily

SAMPLE ANALYSES

	Parameters	Inv. No.	Pres. Meth.	Filt. (Y/N)
GW-2-FP-S 1100-1120 2-21-90	VOAs TCL	01	4°	N
	8080 Pest/PCBs + TCL Metals	01		
GW-2-FP-B * 1120-1135 2-21-90	VOCs TCL	01		
	8080 Pest./PCBs + TCL Metals	01		
GW-2 2-22-90	VOAs TCL	04		
	BNAs TCL	02		
	Pest/PCBs TCL	02		
	Metals TCL	01	HNO_3	
	Cyanide TCL	01	NaOH	

Air Temp: ~50° F
Weather Conditions: Overcast

Comments:
D.T.Oil: 16.24' (7.10' Product)
Took ~5l of product off surface → surface of/ bottom of product layer
We took product samples from well before PURGING. The next day (2-22) we returned + purged. As we purged we pulled up more + more product with the purge water
** Sampled near bottom to try and avoid product
sample became oily product very thick / not flowing through bailer very well. Took a long time to sample jars. [illegible] bailers usually come up w/ a lot of product in them which we tried to keep out of the sample jars. [illegible] should [illegible] PAC that samples may need cleanup before analysis

Crew Chief Signature: John M [illegible]
Date: 2-22-90

Date: 12-6-88
Crew: SM/KPA
Job No: 576-002
Project: Quarta DEC

pH Meter: 4776
Turb Met.: L3324
Cond. Meter: 560
HNU #: 801946

WELL SAMPLING LOG

WELL No: GU3
LOCATION: Southeast downgradient
WELL TYPE: Overburden
WELL DIAMETER: 2" ID
WELL DEPTH: 28.81 ft
SCREENED INTERVAL: 18.82' to 28.82'
CASING HT: PVC 1.82 ft above grade
DEPTH TO WATER: (Static Water Level) 22.56'
REFERENCE POINT: Top of PVC
DATE/TIME PURGED: 12-6-88 @ 1540 hr
PURGING METHOD: PVC Bailer
PURGING DEPTH(s): Top to Bottom
PURGE RATES (gpm): >2 gpm ±
PURGED VOLUME: 25 gals, det. as in GU1
DTW AFTER PURGING: 18.47 ft
EST. YIELD RATE: > purge rate
SEAL No:
CHAIN OF CUSTODY No: --

TYPE OF SCREENING CASING: PVC sch 40
WATER BEARING FORMATION(s): sands & gravels
SAMPLE DATE/TIME: 2-6-88 @ 1823-1920 hr
SAMPLING METHOD: Clear Bailer
DTW BEFORE SAMPLING: 18.47'
WELL CONDITIONS: good structurally
SAMPLING DEPTHS: @ and below interface
SAMPLING OBSERVATIONS:
Similar oily product charact. as GU2
Less oil seemed to enter well as at GU2

WET CHEMISTRIES

SAMPLE TEMP: Oily prod.
SAMPLE pH: in ref.
SAMPLE SP. COND:
~~SAMPLE SULFITE~~:
~~SAMPLE REDOX: Ref. mV mV~~
~~SAMPLE D.O.~~:

Sample turbidity ~ 73 NTUS

PURGE CHEMISTRIES

TIME/VOL	TEMP (°C)	pH	SP. COND.	NTU
Similar to GU2				

SAMPLE ANALYSES (List Sample Jar Parameters) INV. No.
Sample turb ~75 NTUS
3-1 l amber BNs-Pest + PCBS
1-1 l widemouth for prod: EP TOX-Met only, PCB's, ignitability
2-40 ml VOA VOCs HSL + 10
2-.5 l plast. Metals HSL, Cyanide
Matrix spike + Duplicate
1-1 l oil + grease cont.

COMMENTS: oil column 3.45 thick
int. Top of H2O @ 22.56 ft
" Top of Oil @ 18.11 ft
Turb at sampling ~75 NTU
60 gal and 68

Crew Chief Signature: Steve J. Mill

Date: 12-6-88

WELL SAMPLING LOG

Date: 2-21-90
Crew: JMG CSH SM
Job No: 576-002
Project: Quanta Resources
Project Site: Quanta Resources

Well ID No: GW-3
Well Condition: Good
Well Depth/Diameter: 28.81' / 2"
Well Casing Type: PVC
Screened Interval: Bottom 10'
Casing Ht/Lock No: steel PVC 1.87' ag / #2246
Reference Pt: Top of PVC Casing
Depth to Water (DTW): 21.64'
Water Column; Ht/Vol: 7.17' x .163 = 1.17 (2" well)
Purge Est: 7.17' x 1.05 = 7.53 gal (5" borehole)
7.53 x 4 = 30.2 gal
Purge Date/Time(s): 2-21-90 / 1309-1333
Purge Method: Cent Pump w/ Dedicated Tubing
Purge Depth(s): Bottom, mid, Surf, Bottom
Purge Rates (gpm): ~3 gpm
Purged Volume: 65 gal
DTW After Purging: didn't check due to product. Appeared to recover as quickly as we purged
Yield Rate: L-[✓ M-H]
Purge Observations: turbid oily odor,

PURGE CHEMISTRIES

VOL.	TEMP. (C)	pH	SP. COND.	TURB.
50 gal	13.3°	~7	1972	57

METERS USED

Temp: DEC TLC 560
pH: pH paper
Cond: DEC TLC 560
Turb: DEC DRT 15C

D.T.O. 14.59'
DTW Before Sampling: 19.50'
Sample Date/Time(s): 2-21-90 / 1350 - 1540
Sampling Method: Teflon Bailer (#18)
Sampling Depth(s): near bottom (to avoid product
DTW After Sampling: —
Sampling Observations: Slightly Turbid, gray oily product
Chain-of-Custody No(s): 3958, 3953
Analytical Lab(s): Compu Chem

WET SAMPLE CHEMISTRIES

	Temp. (C)	pH	Sp. Cond.	Turb.
Before	—	Not Done due to		
After	—	oily product interference		

SAMPLE ANALYSES

	Parameters	Inv. No.	Pres. Meth.	Filt. (Y/N)
GW-3-P-S 1200-1215	VOCs TCL	01	4°C	N
	Pest/PCBs 8080 +	01		
	TCL Metals			
GW-3-P-B 1215-1220	VOCs TCL	01		
	Pest/PCBs 8080 +	01		
	TCL Metals			
GW-3	TCL VOAs	04		
	TCL BNAs	02		
	TCL Metals	01	HNO3	
	TCL Cyanide	01	NaOH	
	TCL Pest./PCBs	02	4°C	

Comments:
D.T.Oil: 14.25' BPVC (7.36' Product on surface)
Collected surf & bottom product samples before purging
Air Temp: 40-50°F
Weather Conditions: Clear breezy
Purged from bottom first, then worked tubing up slowly to purge whole water column under product then lowered tubing just off bottom to finish purging. Sampled groundwater near bottom to try & avoid the product

Crew Chief Signature: John M Diegnand
Date: 2-21-90

oily product very thick, not going through bailer very well. Took a long time to sample

APPENDIX G

BAILDOWN TEST DATA AND ANALYSIS

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-1R **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		19.17	23.98	4.81	19.69	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
11:40:02	0.00	19.72	20.32	0.60	19.79	The first depth-to-fluids measurement after
11:40:40	0.63	19.69	20.33	0.64	19.76	bailer is raised above air-oil interface.
11:41:15	1.22	19.68	20.34	0.66	19.75	
11:42:00	1.97	19.68	20.33	0.65	19.75	
11:42:50	2.80	19.67	20.35	0.68	19.74	
11:43:20	3.30	19.66	20.37	0.71	19.74	
11:44:00	3.97	19.65	20.37	0.72	19.73	
11:44:30	4.47	19.65	20.38	0.73	19.73	
11:45:00	4.97	19.65	20.40	0.75	19.73	
11:45:30	5.47	19.65	20.38	0.73	19.73	
11:46:04	6.03	19.64	20.39	0.75	19.72	
11:46:50	6.80	19.64	20.40	0.76	19.72	
11:47:25	7.38	19.64	20.39	0.75	19.72	
11:48:00	7.97	19.63	20.41	0.78	19.72	
11:48:25	8.38	19.63	20.41	0.78	19.72	
11:48:50	8.80	19.63	20.43	0.80	19.72	
11:49:20	9.30	19.63	20.43	0.80	19.72	
11:49:40	9.63	19.63	20.43	0.80	19.72	
11:50:00	9.97	19.63	20.44	0.81	19.72	
11:51:00	10.97	19.62	20.46	0.84	19.71	
11:52:10	12.13	19.62	20.46	0.84	19.71	
11:53:10	13.13	19.61	20.48	0.87	19.70	
11:54:40	14.63	19.61	20.50	0.89	19.71	
11:56:45	16.72	19.61	20.53	0.92	19.71	
12:03:20	23.30	19.59	20.58	0.99	19.70	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties		
Specific gravity of oil:	0.891	(dimensionless)
Dynamic viscosity of free oil	82.1	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	33	dynes/cm
Oil-water interfacial tension:	12.68	dynes/cm
BETA-AO	2.182	
BETA-OW	5.68	

Soil Properties of Formation		
Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.3	1/feet
van Genuchten n:	1.7	(dimensionless)
van Genuchten m:	0.41	(dimensionless)

Free Oil Thickness in Well	4.81	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.2405	feet

Calculated Results		
Geometric mean Oil Conductivity (below oil table):	2.19E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	1.38E-01	ft2/day
Geometric mean oil saturation within free oil layer:	0.29	
Geometric mean water sat'n within free oil layer:	0.62	
Specific Volume of Oil (above & below oil table):	0.81	ft
Specific Volume of Water (above & below oil table):	1.52	ft
Estimate of oil storativity:	0.06	
Bouwer-Rice Oil Conductivity (below oil table):	5.42E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	7.22	2.143	0.786	0.350	0.358	0.075	2.14E-04	9.14E-05	1.20E-03	5.56E-06	1.34E-06	3.27E-02	6.88E-03	5.35E-01	4.00E-04	2.89E-01	9.80E-01	9.62E-01	-0.447	-5.255	-1.123
29	6.97	1.929	0.760	0.368	0.363	0.075	2.42E-04	9.71E-05	1.35E-03	5.90E-06	1.42E-06	3.32E-02	6.88E-03	5.41E-01	4.47E-04	2.89E-01	9.79E-01	9.61E-01	-0.440	-5.229	-1.123
28	6.73	1.714	0.734	0.390	0.370	0.075	2.75E-04	1.03E-04	1.54E-03	6.28E-06	1.51E-06	3.38E-02	6.88E-03	5.47E-01	5.02E-04	2.89E-01	9.78E-01	9.59E-01	-0.432	-5.202	-1.123
27	6.49	1.500	0.708	0.416	0.376	0.075	3.13E-04	1.10E-04	1.75E-03	6.71E-06	1.61E-06	3.44E-02	6.88E-03	5.54E-01	5.65E-04	2.89E-01	9.76E-01	9.57E-01	-0.425	-5.174	-1.123
26	6.25	1.286	0.682	0.448	0.383	0.075	3.58E-04	1.18E-04	2.01E-03	7.18E-06	1.73E-06	3.50E-02	6.88E-03	5.61E-01	6.39E-04	2.89E-01	9.75E-01	9.55E-01	-0.417	-5.144	-1.123
25	6.01	1.071	0.655	0.490	0.390	0.100	4.12E-04	2.87E-04	2.31E-03	1.74E-05	4.19E-06	3.57E-02	9.10E-03	5.68E-01	7.26E-04	3.33E-01	9.73E-01	9.44E-01	-0.408	-4.758	-1.002
24	5.77	0.857	0.629	0.545	0.398	0.147	4.77E-04	1.01E-03	2.67E-03	6.16E-05	1.48E-05	3.64E-02	1.34E-02	5.76E-01	8.28E-04	4.04E-01	9.71E-01	9.21E-01	-0.400	-4.210	-0.833
23	5.53	0.643	0.603	0.621	0.407	0.214	5.55E-04	3.79E-03	3.11E-03	2.30E-04	5.54E-05	3.72E-02	1.96E-02	5.84E-01	9.50E-04	4.88E-01	9.69E-01	8.81E-01	-0.391	-3.638	-0.670
22	5.29	0.429	0.577	0.728	0.416	0.313	6.49E-04	1.63E-02	3.64E-03	9.94E-04	2.39E-04	3.80E-02	2.86E-02	5.92E-01	1.10E-03	5.89E-01	9.67E-01	8.00E-01	-0.381	-3.003	-0.505
21	5.05	0.214	0.551	0.877	0.425	0.452	7.65E-04	8.93E-02	4.28E-03	5.43E-03	1.31E-03	3.89E-02	4.13E-02	6.01E-01	1.27E-03	7.08E-01	9.64E-01	6.09E-01	-0.371	-2.265	-0.345
20	4.81	0.0	0.524	1.0	0.436	0.564	9.08E-04	7.32E-01	5.08E-03	4.45E-02	1.07E-02	3.98E-02	5.16E-02	6.11E-01	1.49E-03	7.92E-01	9.61E-01	0.00E+00	-0.361	-1.352	-0.248
19	4.57	0.0	0.498	1.0	0.447	0.553	1.09E-03	7.20E-01	6.08E-03	4.38E-02	1.05E-02	4.08E-02	5.06E-02	6.21E-01	1.75E-03	7.84E-01	9.58E-01	0.00E+00	-0.350	-1.359	-0.257
18	4.33	0.0	0.472	1.0	0.459	0.541	1.31E-03	7.07E-01	7.33E-03	4.29E-02	1.03E-02	4.19E-02	4.95E-02	6.31E-01	2.07E-03	7.76E-01	9.54E-01	0.00E+00	-0.339	-1.367	-0.266
17	4.09	0.0	0.446	1.0	0.472	0.528	1.59E-03	6.92E-01	8.92E-03	4.20E-02	1.01E-02	4.31E-02	4.83E-02	6.43E-01	2.48E-03	7.66E-01	9.50E-01	0.00E+00	-0.326	-1.376	-0.277
16	3.85	0.0	0.419	1.0	0.486	0.514	1.96E-03	6.75E-01	1.10E-02	4.11E-02	9.87E-03	4.44E-02	4.70E-02	6.55E-01	2.99E-03	7.56E-01	9.45E-01	0.00E+00	-0.314	-1.387	-0.289
15	3.61	0.0	0.393	1.0	0.501	0.499	2.44E-03	6.57E-01	1.36E-02	3.99E-02	9.61E-03	4.58E-02	4.56E-02	6.68E-01	3.65E-03	7.45E-01	9.40E-01	0.00E+00	-0.300	-1.399	-0.302
14	3.37	0.0	0.367	1.0	0.518	0.482	3.07E-03	6.37E-01	1.72E-02	3.87E-02	9.31E-03	4.73E-02	4.41E-02	6.81E-01	4.50E-03	7.32E-01	9.33E-01	0.00E+00	-0.286	-1.412	-0.317
13	3.13	0.0	0.341	1.0	0.536	0.464	3.92E-03	6.14E-01	2.19E-02	3.73E-02	8.98E-03	4.90E-02	4.24E-02	6.96E-01	5.62E-03	7.18E-01	9.25E-01	0.00E+00	-0.270	-1.428	-0.334
12	2.89	0.0	0.315	1.0	0.557	0.443	5.08E-03	5.88E-01	2.84E-02	3.57E-02	8.60E-03	5.09E-02	4.05E-02	7.13E-01	7.12E-03	7.02E-01	9.16E-01	0.00E+00	-0.254	-1.447	-0.354
11	2.65	0.0	0.288	1.0	0.580	0.420	6.69E-03	5.59E-01	3.75E-02	3.40E-02	8.17E-03	5.30E-02	3.84E-02	7.30E-01	9.17E-03	6.83E-01	9.04E-01	0.00E+00	-0.237	-1.469	-0.376
10	2.41	0.0	0.262	1.0	0.605	0.395	8.99E-03	5.25E-01	5.03E-02	3.19E-02	7.68E-03	5.53E-02	3.61E-02	7.49E-01	1.20E-02	6.63E-01	8.90E-01	0.00E+00	-0.218	-1.496	-0.403
9	2.16	0.0	0.236	1.0	0.633	0.367	1.23E-02	4.87E-01	6.91E-02	2.96E-02	7.12E-03	5.79E-02	3.35E-02	7.70E-01	1.60E-02	6.39E-01	8.73E-01	0.00E+00	-0.199	-1.529	-0.435
8	1.92	0.0	0.210	1.0	0.665	0.335	1.74E-02	4.43E-01	9.72E-02	2.69E-02	6.48E-03	6.07E-02	3.06E-02	7.92E-01	2.19E-02	6.10E-01	8.52E-01	0.00E+00	-0.177	-1.570	-0.475
7	1.68	0.0	0.184	1.0	0.700	0.300	2.51E-02	3.93E-01	1.41E-01	2.39E-02	5.74E-03	6.40E-02	2.74E-02	8.17E-01	3.07E-02	5.77E-01	8.25E-01	0.00E+00	-0.155	-1.622	-0.523
6	1.44	0.0	0.157	1.0	0.740	0.260	3.74E-02	3.35E-01	2.09E-01	2.04E-02	4.90E-03	6.76E-02	2.38E-02	8.43E-01	4.43E-02	5.38E-01	7.89E-01	0.00E+00	-0.131	-1.691	-0.585
5	1.20	0.0	0.131	1.0	0.784	0.216	5.76E-02	2.70E-01	3.23E-01	1.64E-02	3.95E-03	7.17E-02	1.97E-02	8.72E-01	6.61E-02	4.90E-01	7.43E-01	0.00E+00	-0.106	-1.785	-0.666
4	0.96	0.0	0.105	1.0	0.833	0.167	9.20E-02	2.00E-01	5.15E-01	1.21E-02	2.92E-03	7.61E-02	1.53E-02	9.02E-01	1.02E-01	4.31E-01	6.81E-01	0.00E+00	-0.079	-1.916	-0.777
3	0.72	0.0	0.079	1.0	0.884	0.116	1.53E-01	1.27E-01	8.55E-01	7.73E-03	1.86E-03	8.08E-02	1.06E-02	9.34E-01	1.64E-01	3.59E-01	5.96E-01	0.00E+00	-0.053	-2.112	-0.937
2	0.48	0.0	0.052	1.0	0.935	0.065	2.63E-01	6.12E-02	1.47E+00	3.72E-03	8.94E-04	8.55E-02	5.93E-03	9.63E-01	2.73E-01	2.68E-01	4.77E-01	0.00E+00	-0.029	-2.430	-1.188
1	0.24	0.0	0.026	1.0	0.978	0.022	4.72E-01	1.49E-02	2.64E+00	9.03E-04	2.17E-04	8.94E-02	1.99E-03	9.88E-01	4.77E-01	1.56E-01	3.09E-01	0.00E+00	-0.010	-3.044	-1.662

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-02 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		16.50	24.40	7.9	17.30	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table. First measurement assumed to be static.
				0	0.00	
				0	0.00	
				0	0.00	

Measurements After Bailing

12/3/03 9:50	0.00	17.22	18.32	1.1	17.33	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
12/3/03 9:51	1.50	17.17	18.35	1.18	17.29	
12/3/03 9:53	3.42	17.15	18.35	1.2	17.27	
12/3/03 9:55	4.83	17.14	18.35	1.21	17.26	
12/3/03 9:58	7.87	17.11	18.25	1.14	17.23	
12/3/03 10:00	9.85	17.10	18.20	1.1	17.21	
12/3/03 10:03	13.67	17.10	18.26	1.16	17.22	
12/3/03 10:07	17.80	17.07	18.25	1.18	17.19	
12/3/03 10:34	44.08	17.02	18.10	1.08	17.13	
12/3/03 10:44	54.67	17.01	18.30	1.29	17.14	
12/3/03 10:56	65.85	17.03	18.40	1.37	17.17	
12/3/03 12:24	154.17	16.96	18.97	2.01	17.16	
12/3/03 13:07	196.92	16.92	19.10	2.18	17.14	
12/3/03 14:00	249.87	16.85	18.70	1.85	17.04	
12/3/03 15:01	310.87	16.79	19.70	2.91	17.09	
12/3/03 15:32	342.33	16.77	19.75	2.98	17.07	
12/4/03 8:27	1356.83	16.35	23.45	7.1	17.07	
12/4/03 9:33	1422.83	16.34	23.55	7.21	17.07	
12/4/03 10:56	1505.83	16.32	23.60	7.28	17.06	
12/4/03 11:13	1522.83	16.32	23.60	7.28	17.06	
12/4/03 13:17	1646.83	16.35	23.60	7.25	17.09	
12/4/03 14:20	1709.83	16.35	23.55	7.2	17.08	
12/5/03 8:17	2786.83	16.24	23.59	7.35	16.99	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties		
Specific gravity of oil:	0.8985	(dimensionless)
Dynamic viscosity of free oil:	117.6	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	38	dynes/cm
Oil-water interfacial tension:	32.97	dynes/cm
BETA-AO	1.895	
BETA-OW	2.18	

Soil Properties of Formation		
Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.5	1/feet
van Genuchten n:	1.72	(dimensionless)
van Genuchten m:	0.42	(dimensionless)

Free Oil Thickness in Well:	7.90	feet
Elevation at Oil-Wtr Interface	0	feet
Elevation increment for calcu	0.395	feet

Calculated Results		
Geometric mean Oil Conductivity (below oil table):	1.05E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	1.22E-01	ft2/day
Geometric mean oil saturation within free oil layer:	0.21	
Geometric mean water sat'n within free oil layer:	0.70	
Specific Volume of Oil (above & below oil table):	0.99	ft
Specific Volume of Water (above & below oil table):	2.85	ft
Estimate of oil storativity:	0.04	
Bouwer-Rice Oil Conductivity (below oil table):	7.35E-03	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	11.85	3.549	1.203	0.269	0.423	0.075	8.25E-04	1.84E-04	4.62E-03	7.88E-06	3.11E-06	6.35E-02	1.13E-02	5.99E-01	1.38E-03	2.89E-01	9.63E-01	9.38E-01	-0.374	-5.103	-1.123
29	11.46	3.194	1.163	0.282	0.430	0.075	9.31E-04	1.96E-04	5.21E-03	8.39E-06	3.31E-06	6.46E-02	1.13E-02	6.06E-01	1.54E-03	2.89E-01	9.61E-01	9.35E-01	-0.366	-5.076	-1.123
28	11.06	2.839	1.123	0.298	0.438	0.075	1.05E-03	2.09E-04	5.90E-03	8.96E-06	3.54E-06	6.57E-02	1.13E-02	6.13E-01	1.72E-03	2.89E-01	9.59E-01	9.32E-01	-0.359	-5.048	-1.123
27	10.67	2.484	1.082	0.317	0.446	0.075	1.20E-03	2.24E-04	6.71E-03	9.58E-06	3.78E-06	6.69E-02	1.13E-02	6.20E-01	1.93E-03	2.89E-01	9.56E-01	9.28E-01	-0.351	-5.019	-1.123
26	10.27	2.129	1.042	0.342	0.454	0.075	1.37E-03	2.40E-04	7.66E-03	1.03E-05	4.06E-06	6.82E-02	1.13E-02	6.28E-01	2.18E-03	2.89E-01	9.53E-01	9.25E-01	-0.343	-4.988	-1.123
25	9.88	1.775	1.002	0.374	0.463	0.075	1.57E-03	2.59E-04	8.78E-03	1.11E-05	4.37E-06	6.96E-02	1.13E-02	6.35E-01	2.47E-03	2.89E-01	9.50E-01	9.20E-01	-0.334	-4.956	-1.123
24	9.48	1.420	0.962	0.418	0.473	0.075	1.81E-03	2.79E-04	1.01E-02	1.19E-05	4.72E-06	7.10E-02	1.13E-02	6.44E-01	2.80E-03	2.89E-01	9.47E-01	9.16E-01	-0.325	-4.923	-1.123
23	9.09	1.065	0.922	0.483	0.483	0.075	2.09E-03	3.03E-04	1.17E-02	1.29E-05	5.11E-06	7.25E-02	1.13E-02	6.52E-01	3.20E-03	2.89E-01	9.43E-01	9.11E-01	-0.316	-4.888	-1.123
22	8.69	0.710	0.882	0.587	0.494	0.093	2.43E-03	5.96E-04	1.36E-02	2.55E-05	1.01E-05	7.41E-02	1.39E-02	6.61E-01	3.68E-03	3.21E-01	9.39E-01	8.96E-01	-0.306	-4.593	-1.032
21	8.30	0.355	0.842	0.771	0.505	0.266	2.85E-03	1.85E-02	1.60E-02	7.91E-04	3.12E-04	7.58E-02	3.99E-02	6.71E-01	4.25E-03	5.44E-01	9.35E-01	7.50E-01	-0.296	-3.102	-0.575
20	7.90	0.0	0.802	1.0	0.518	0.482	3.36E-03	6.33E-01	1.88E-02	2.71E-02	1.07E-02	7.77E-02	7.24E-02	6.81E-01	4.93E-03	7.32E-01	9.30E-01	0.00E+00	-0.286	-1.567	-0.317
19	7.51	0.0	0.762	1.0	0.531	0.469	3.98E-03	6.17E-01	2.23E-02	2.64E-02	1.04E-02	7.96E-02	7.05E-02	6.92E-01	5.76E-03	7.22E-01	9.24E-01	0.00E+00	-0.275	-1.579	-0.328
18	7.11	0.0	0.722	1.0	0.545	0.455	4.76E-03	5.99E-01	2.66E-02	2.56E-02	1.01E-02	8.17E-02	6.84E-02	7.03E-01	6.77E-03	7.11E-01	9.18E-01	0.00E+00	-0.264	-1.591	-0.342
17	6.72	0.0	0.682	1.0	0.560	0.440	5.73E-03	5.80E-01	3.21E-02	2.48E-02	9.80E-03	8.40E-02	6.61E-02	7.15E-01	8.02E-03	7.00E-01	9.10E-01	0.00E+00	-0.252	-1.605	-0.356
16	6.32	0.0	0.641	1.0	0.576	0.424	6.96E-03	5.59E-01	3.90E-02	2.39E-02	9.44E-03	8.64E-02	6.37E-02	7.27E-01	9.57E-03	6.87E-01	9.02E-01	0.00E+00	-0.240	-1.621	-0.372
15	5.93	0.0	0.601	1.0	0.593	0.407	8.53E-03	5.36E-01	4.77E-02	2.29E-02	9.06E-03	8.90E-02	6.11E-02	7.40E-01	1.15E-02	6.72E-01	8.93E-01	0.00E+00	-0.227	-1.640	-0.391
14	5.53	0.0	0.561	1.0	0.612	0.388	1.05E-02	5.11E-01	5.91E-02	2.18E-02	8.63E-03	9.18E-02	5.83E-02	7.54E-01	1.40E-02	6.57E-01	8.82E-01	0.00E+00	-0.213	-1.661	-0.411
13	5.14	0.0	0.521	1.0	0.632	0.368	1.32E-02	4.83E-01	7.39E-02	2.07E-02	8.16E-03	9.49E-02	5.52E-02	7.69E-01	1.72E-02	6.39E-01	8.69E-01	0.00E+00	-0.199	-1.685	-0.434
12	4.74	0.0	0.481	1.0	0.654	0.346	1.67E-02	4.52E-01	9.35E-02	1.94E-02	7.64E-03	9.82E-02	5.19E-02	7.85E-01	2.13E-02	6.20E-01	8.54E-01	0.00E+00	-0.184	-1.713	-0.461
11	4.35	0.0	0.441	1.0	0.678	0.322	2.14E-02	4.19E-01	1.20E-01	1.79E-02	7.08E-03	1.02E-01	4.84E-02	8.01E-01	2.67E-02	5.98E-01	8.37E-01	0.00E+00	-0.169	-1.747	-0.492
10	3.95	0.0	0.401	1.0	0.703	0.297	2.77E-02	3.82E-01	1.55E-01	1.63E-02	6.46E-03	1.06E-01	4.45E-02	8.19E-01	3.39E-02	5.74E-01	8.16E-01	0.00E+00	-0.153	-1.786	-0.528
9	3.56	0.0	0.361	1.0	0.731	0.269	3.65E-02	3.42E-01	2.05E-01	1.46E-02	5.78E-03	1.10E-01	4.03E-02	8.38E-01	4.36E-02	5.46E-01	7.91E-01	0.00E+00	-0.136	-1.835	-0.571
8	3.16	0.0	0.321	1.0	0.761	0.239	4.88E-02	2.99E-01	2.74E-01	1.28E-02	5.05E-03	1.14E-01	3.58E-02	8.57E-01	5.70E-02	5.15E-01	7.61E-01	0.00E+00	-0.118	-1.894	-0.622
7	2.77	0.0	0.281	1.0	0.793	0.207	6.64E-02	2.52E-01	3.72E-01	1.08E-02	4.26E-03	1.19E-01	3.10E-02	8.78E-01	7.56E-02	4.79E-01	7.25E-01	0.00E+00	-0.101	-1.967	-0.685
6	2.37	0.0	0.241	1.0	0.827	0.173	9.17E-02	2.03E-01	5.13E-01	8.68E-03	3.43E-03	1.24E-01	2.59E-02	8.99E-01	1.02E-01	4.38E-01	6.81E-01	0.00E+00	-0.082	-2.061	-0.763
5	1.98	0.0	0.200	1.0	0.863	0.137	1.29E-01	1.53E-01	7.21E-01	6.55E-03	2.59E-03	1.29E-01	2.06E-02	9.21E-01	1.40E-01	3.91E-01	6.26E-01	0.00E+00	-0.064	-2.184	-0.862
4	1.58	0.0	0.160	1.0	0.899	0.101	1.84E-01	1.05E-01	1.03E+00	4.47E-03	1.77E-03	1.35E-01	1.52E-02	9.42E-01	1.95E-01	3.36E-01	5.58E-01	0.00E+00	-0.046	-2.349	-0.994
3	1.19	0.0	0.120	1.0	0.933	0.067	2.67E-01	6.10E-02	1.49E+00	2.61E-03	1.03E-03	1.40E-01	9.99E-03	9.62E-01	2.77E-01	2.72E-01	4.74E-01	0.00E+00	-0.030	-2.583	-1.177
2	0.79	0.0	0.080	1.0	0.965	0.035	3.93E-01	2.67E-02	2.20E+00	1.14E-03	4.51E-04	1.45E-01	5.30E-03	9.80E-01	4.01E-01	1.98E-01	3.67E-01	0.00E+00	-0.016	-2.943	-1.452
1	0.40	0.0	0.040	1.0	0.989	0.011	5.91E-01	5.86E-03	3.31E+00	2.51E-04	9.90E-05	1.48E-01	1.69E-03	9.94E-01	5.94E-01	1.12E-01	2.29E-01	0.00E+00	-0.005	-3.601	-1.950

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-03 **Site:** Quanta

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
Measurements Prior to Bailing						
		20.70	26.07	5.37	21.24	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table. First measurement assumed to be static.
				0	0.00	
				0	0.00	
				0	0.00	
Measurements After Bailing						
9:38:00	0.00	21.07	22.02	0.95	21.17	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
9:38:40	0.67	21.05	22.06	1.01	21.15	
9:39:30	1.50	21.04	22.09	1.05	21.15	
9:42:29	4.48	21.01	22.26	1.25	21.14	
9:44:01	6.02	21.00	22.30	1.3	21.13	
9:45:30	7.50	20.99	22.41	1.42	21.13	
9:51:02	13.03	20.96	22.71	1.75	21.14	
9:54:40	16.67	20.93	22.88	1.95	21.13	
10:00:00	22.00	20.91	23.11	2.2	21.13	
10:01:30	23.50	20.89	23.18	2.29	21.12	
10:09:37	31.62	20.86	23.49	2.63	21.13	
10:13:01	35.02	20.82	23.60	2.78	21.10	
10:35:29	57.48	20.80	24.25	3.45	21.15	
10:53:23	75.38	20.72	24.55	3.83	21.11	
11:13:03	95.05	20.69	24.71	4.02	21.10	
11:47:30	129.50	20.66	24.93	4.27	21.09	
12:35:25	177.42	20.61	25.10	4.49	21.06	
13:19:25	221.42	20.60	25.17	4.57	21.06	
14:07:35	269.58	20.60	25.26	4.66	21.07	
15:26:40	348.67	20.62	25.42	4.8	21.10	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8992	(dimensionless)
Dynamic viscosity of free oil:	51.81	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	37.5	dynes/cm
Oil-water interfacial tension:	31.04	dynes/cm
BETA-AO	1.920	
BETA-OW	2.32	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.1	1/feet
van Genuchten n:	1.89	(dimensionless)
van Genuchten m:	0.47	(dimensionless)

Free Oil Thickness in Well:	5.37	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.2685	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	7.93E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	9.23E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.10	
Geometric mean water sat'n within free oil layer:	0.82	
Specific Volume of Oil (above & below oil table):	0.44	ft
Specific Volume of Water (above & below oil table):	2.29	ft
Estimate of oil storativity:	0.02	
Bouwer-Rice Oil Conductivity (below oil table):	3.62E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	8.06	2.414	0.812	0.307	0.523	0.075	6.94E-03	6.06E-04	3.88E-02	5.89E-05	1.58E-05	5.34E-02	7.68E-03	6.86E-01	1.01E-02	2.89E-01	8.99E-01	8.54E-01	-0.281	-4.230	-1.123
29	7.79	2.173	0.785	0.326	0.534	0.075	7.82E-03	6.47E-04	4.38E-02	6.29E-05	1.69E-05	5.44E-02	7.68E-03	6.94E-01	1.13E-02	2.89E-01	8.94E-01	8.47E-01	-0.273	-4.202	-1.123
28	7.52	1.931	0.758	0.349	0.544	0.075	8.85E-03	6.93E-04	4.95E-02	6.73E-05	1.81E-05	5.55E-02	7.68E-03	7.03E-01	1.26E-02	2.89E-01	8.88E-01	8.39E-01	-0.264	-4.172	-1.123
27	7.25	1.690	0.731	0.378	0.556	0.075	1.00E-02	7.44E-04	5.62E-02	7.23E-05	1.94E-05	5.67E-02	7.68E-03	7.11E-01	1.41E-02	2.89E-01	8.81E-01	8.31E-01	-0.255	-4.141	-1.123
26	6.98	1.449	0.704	0.415	0.567	0.075	1.14E-02	8.01E-04	6.40E-02	7.79E-05	2.09E-05	5.79E-02	7.68E-03	7.21E-01	1.59E-02	2.89E-01	8.74E-01	8.21E-01	-0.246	-4.109	-1.123
25	6.71	1.207	0.677	0.463	0.580	0.075	1.30E-02	8.66E-04	7.31E-02	8.41E-05	2.26E-05	5.91E-02	7.68E-03	7.30E-01	1.79E-02	2.89E-01	8.66E-01	8.12E-01	-0.237	-4.075	-1.123
24	6.44	0.966	0.650	0.528	0.592	0.075	1.49E-02	9.39E-04	8.37E-02	9.13E-05	2.45E-05	6.04E-02	7.68E-03	7.40E-01	2.02E-02	2.89E-01	8.58E-01	8.01E-01	-0.227	-4.040	-1.123
23	6.16	0.724	0.622	0.618	0.606	0.075	1.72E-02	1.02E-03	9.62E-02	9.94E-05	2.67E-05	6.18E-02	7.68E-03	7.50E-01	2.29E-02	2.89E-01	8.49E-01	7.89E-01	-0.218	-4.003	-1.123
22	5.91	0.483	0.595	0.744	0.620	0.124	1.98E-02	4.54E-03	1.11E-01	4.41E-04	1.19E-04	6.33E-02	1.26E-02	7.60E-01	2.61E-02	3.71E-01	8.38E-01	7.28E-01	-0.208	-3.355	-0.908
21	5.64	0.241	0.568	0.901	0.635	0.266	2.30E-02	6.23E-02	1.29E-01	6.06E-03	1.63E-03	6.48E-02	2.72E-02	7.71E-01	2.98E-02	5.44E-01	8.27E-01	4.89E-01	-0.197	-2.218	-0.575
20	5.37	0.0	0.541	1.0	0.650	0.350	2.67E-02	4.14E-01	1.50E-01	4.03E-02	1.08E-02	6.64E-02	3.57E-02	7.82E-01	3.41E-02	6.23E-01	8.15E-01	0.00E+00	-0.187	-1.395	-0.456
19	5.10	0.0	0.514	1.0	0.667	0.333	3.12E-02	3.91E-01	1.75E-01	3.80E-02	1.02E-02	6.80E-02	3.40E-02	7.93E-01	3.93E-02	6.09E-01	8.02E-01	0.00E+00	-0.176	-1.420	-0.477
18	4.83	0.0	0.487	1.0	0.684	0.316	3.65E-02	3.67E-01	2.05E-01	3.57E-02	9.58E-03	6.98E-02	3.23E-02	8.05E-01	4.54E-02	5.93E-01	7.87E-01	0.00E+00	-0.165	-1.447	-0.500
17	4.56	0.0	0.460	1.0	0.701	0.299	4.30E-02	3.42E-01	2.41E-01	3.33E-02	8.93E-03	7.16E-02	3.05E-02	8.17E-01	5.26E-02	5.76E-01	7.71E-01	0.00E+00	-0.154	-1.478	-0.525
16	4.30	0.0	0.433	1.0	0.720	0.280	5.08E-02	3.16E-01	2.84E-01	3.07E-02	8.25E-03	7.34E-02	2.86E-02	8.30E-01	6.12E-02	5.58E-01	7.53E-01	0.00E+00	-0.143	-1.513	-0.553
15	4.03	0.0	0.406	1.0	0.739	0.261	6.02E-02	2.89E-01	3.37E-01	2.81E-02	7.54E-03	7.54E-02	2.66E-02	8.43E-01	7.14E-02	5.38E-01	7.33E-01	0.00E+00	-0.131	-1.551	-0.584
14	3.76	0.0	0.379	1.0	0.759	0.241	7.17E-02	2.61E-01	4.01E-01	2.54E-02	6.82E-03	7.74E-02	2.46E-02	8.56E-01	8.38E-02	5.17E-01	7.11E-01	0.00E+00	-0.120	-1.595	-0.618
13	3.49	0.0	0.352	1.0	0.780	0.220	8.57E-02	2.33E-01	4.80E-01	2.26E-02	6.08E-03	7.95E-02	2.25E-02	8.69E-01	9.86E-02	4.95E-01	6.86E-01	0.00E+00	-0.108	-1.645	-0.657
12	3.22	0.0	0.325	1.0	0.801	0.199	1.03E-01	2.04E-01	5.75E-01	1.98E-02	5.33E-03	8.17E-02	2.03E-02	8.82E-01	1.16E-01	4.70E-01	6.59E-01	0.00E+00	-0.096	-1.702	-0.701
11	2.95	0.0	0.298	1.0	0.822	0.178	1.24E-01	1.75E-01	6.93E-01	1.71E-02	4.58E-03	8.39E-02	1.81E-02	8.96E-01	1.38E-01	4.44E-01	6.28E-01	0.00E+00	-0.085	-1.768	-0.751
10	2.69	0.0	0.271	1.0	0.844	0.156	1.49E-01	1.47E-01	8.36E-01	1.43E-02	3.84E-03	8.61E-02	1.59E-02	9.09E-01	1.64E-01	4.16E-01	5.95E-01	0.00E+00	-0.073	-1.845	-0.808
9	2.42	0.0	0.244	1.0	0.866	0.134	1.81E-01	1.20E-01	1.01E+00	1.16E-02	3.13E-03	8.84E-02	1.36E-02	9.23E-01	1.96E-01	3.85E-01	5.58E-01	0.00E+00	-0.062	-1.934	-0.874
8	2.15	0.0	0.217	1.0	0.888	0.112	2.19E-01	9.40E-02	1.23E+00	9.14E-03	2.45E-03	9.06E-02	1.14E-02	9.36E-01	2.34E-01	3.53E-01	5.16E-01	0.00E+00	-0.052	-2.039	-0.951
7	1.88	0.0	0.189	1.0	0.909	0.091	2.66E-01	7.04E-02	1.49E+00	6.84E-03	1.84E-03	9.28E-02	9.26E-03	9.48E-01	2.80E-01	3.17E-01	4.71E-01	0.00E+00	-0.041	-2.165	-1.042
6	1.61	0.0	0.162	1.0	0.929	0.071	3.22E-01	4.95E-02	1.80E+00	4.82E-03	1.29E-03	9.48E-02	7.19E-03	9.60E-01	3.36E-01	2.80E-01	4.21E-01	0.00E+00	-0.032	-2.317	-1.152
5	1.34	0.0	0.135	1.0	0.948	0.052	3.90E-01	3.21E-02	2.19E+00	3.12E-03	8.37E-04	9.67E-02	5.28E-03	9.71E-01	4.02E-01	2.40E-01	3.66E-01	0.00E+00	-0.023	-2.506	-1.286
4	1.07	0.0	0.108	1.0	0.965	0.035	4.72E-01	1.84E-02	2.65E+00	1.79E-03	4.81E-04	9.85E-02	3.57E-03	9.80E-01	4.82E-01	1.97E-01	3.06E-01	0.00E+00	-0.015	-2.746	-1.456
3	0.81	0.0	0.081	1.0	0.979	0.021	5.70E-01	8.81E-03	3.19E+00	8.57E-04	2.30E-04	9.99E-02	2.13E-03	9.88E-01	5.77E-01	1.52E-01	2.41E-01	0.00E+00	-0.009	-3.067	-1.681
2	0.54	0.0	0.054	1.0	0.990	0.010	6.85E-01	3.02E-03	3.84E+00	2.94E-04	7.89E-05	1.01E-01	1.01E-03	9.94E-01	6.89E-01	1.05E-01	1.70E-01	0.00E+00	-0.004	-3.532	-2.005
1	0.27	0.0	0.027	1.0	0.997	0.003	8.23E-01	4.67E-04	4.61E+00	4.54E-05	1.22E-05	1.02E-01	2.75E-04	9.98E-01	8.24E-01	5.48E-02	9.24E-02	0.00E+00	-0.001	-4.343	-2.569

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-04 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		13.75	18.40	4.65	14.25	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table. First measurement assumed to be static.
				0	0.00	
				0	0.00	
				0	0.00	

Measurements After Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
10:28:18	0.00	14.21	14.68	0.47	14.26	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
10:29:30	1.20	14.19	14.70	0.51	14.25	
10:31:00	2.70	14.16	14.65	0.49	14.21	
10:32:00	3.70	14.16	14.67	0.51	14.22	
10:33:00	4.70	14.16	14.68	0.52	14.22	
10:34:00	5.70	14.16	14.68	0.52	14.22	
10:36:00	7.70	14.16	14.68	0.52	14.22	
10:38:00	9.70	14.16	14.69	0.53	14.22	
10:40:50	12.53	14.16	14.69	0.53	14.22	
10:43:50	15.53	14.16	14.70	0.54	14.22	
10:56:30	28.20	14.19	14.70	0.51	14.25	
11:00:35	32.28	14.21	14.70	0.49	14.26	
11:03:00	34.70	14.20	14.70	0.5	14.25	
11:20:20	52.03	14.19	14.70	0.51	14.25	
11:42:50	74.53	14.19	14.70	0.51	14.25	
12:42:20	134.03	14.16	14.70	0.54	14.22	
13:13:45	165.45	14.14	14.71	0.57	14.20	
13:54:48	206.50	14.16	14.71	0.55	14.22	
15:36:10	307.87	14.21	14.91	0.7	14.29	
23:31:18	783.00	14.01	15.95	1.94	14.22	
25:34:18	906.00	13.93	16.01	2.08	14.15	
27:06:42	998.40	13.90	16.05	2.15	14.13	
				0	0.00	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8921 (dimensionless)
Dynamic viscosity of free oil	75.9 centipoise
Air-water surface tension:	72 dynes/cm
Air-oil surface tension:	30.5 dynes/cm
Oil-water interfacial tension:	37.5 dynes/cm
BETA-AO	2.361
BETA-OW	1.92

Soil Properties of Formation

Hydraulic conductivity:	5.6 ft/day
Porosity:	0.32 (dimensionless)
Irreducible water saturation:	0.1 (dimensionless)
van Genuchten alpha:	2.2 1/feet
van Genuchten n:	1.35 (dimensionless)
van Genuchten m:	0.26 (dimensionless)

Free Oil Thickness in Well	4.65 feet
Elevation at Oil-Wtr Interfac	0 feet
Elevation increment for calc	0.2325 feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	1.51E-02 ft/day
Oil Transmissivity of free oil layer (below oil table):	8.61E-02 ft2/day
Geometric mean oil saturation within free oil layer:	0.12
Geometric mean water sat'n within free oil layer:	0.84
Specific Volume of Oil (above & below oil table):	0.28 ft
Specific Volume of Water (above & below oil table):	1.78 ft
Estimate of oil storativity:	0.02
Bouwer-Rice Oil Conductivity (below oil table):	1.34E-03 ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	6.98	2.074	0.753	0.488	0.671	0.075	1.85E-03	3.21E-04	1.04E-02	2.11E-05	4.92E-06	5.00E-02	5.60E-03	7.97E-01	2.32E-03	2.89E-01	9.52E-01	9.18E-01	-0.173	-4.675	-1.123
29	6.74	1.867	0.728	0.502	0.677	0.075	2.02E-03	3.44E-04	1.13E-02	2.26E-05	5.26E-06	5.04E-02	5.60E-03	8.01E-01	2.52E-03	2.89E-01	9.50E-01	9.15E-01	-0.169	-4.645	-1.123
28	6.51	1.659	0.702	0.518	0.683	0.075	2.20E-03	3.69E-04	1.23E-02	2.43E-05	5.65E-06	5.08E-02	5.60E-03	8.05E-01	2.74E-03	2.89E-01	9.48E-01	9.12E-01	-0.166	-4.615	-1.123
27	6.28	1.452	0.677	0.537	0.689	0.075	2.41E-03	3.97E-04	1.35E-02	2.61E-05	6.08E-06	5.13E-02	5.60E-03	8.09E-01	2.98E-03	2.89E-01	9.45E-01	9.08E-01	-0.162	-4.583	-1.123
26	6.05	1.244	0.652	0.559	0.695	0.075	2.65E-03	4.29E-04	1.48E-02	2.82E-05	6.56E-06	5.17E-02	5.60E-03	8.13E-01	3.26E-03	2.89E-01	9.43E-01	9.04E-01	-0.158	-4.550	-1.123
25	5.81	1.037	0.627	0.587	0.702	0.075	2.92E-03	4.64E-04	1.64E-02	3.06E-05	7.10E-06	5.22E-02	5.60E-03	8.18E-01	3.57E-03	2.89E-01	9.40E-01	9.00E-01	-0.154	-4.515	-1.123
24	5.58	0.830	0.602	0.622	0.708	0.075	3.23E-03	5.05E-04	1.81E-02	3.32E-05	7.72E-06	5.27E-02	5.60E-03	8.22E-01	3.93E-03	2.89E-01	9.37E-01	8.96E-01	-0.150	-4.479	-1.123
23	5.35	0.622	0.577	0.669	0.716	0.075	3.58E-03	5.51E-04	2.01E-02	3.62E-05	8.43E-06	5.32E-02	5.60E-03	8.27E-01	4.33E-03	2.89E-01	9.34E-01	8.91E-01	-0.145	-4.441	-1.123
22	5.12	0.415	0.552	0.736	0.723	0.075	3.99E-03	6.03E-04	2.23E-02	3.97E-05	9.24E-06	5.38E-02	5.60E-03	8.32E-01	4.80E-03	2.89E-01	9.31E-01	8.85E-01	-0.141	-4.401	-1.123
21	4.88	0.207	0.527	0.842	0.731	0.111	4.46E-03	2.30E-03	2.50E-02	1.51E-04	3.52E-05	5.44E-02	8.29E-03	8.37E-01	5.33E-03	3.52E-01	9.27E-01	8.46E-01	-0.136	-3.820	-0.953
20	4.65	0.0	0.502	1.0	0.739	0.261	5.01E-03	4.59E-01	2.80E-02	3.02E-02	7.02E-03	5.50E-02	1.94E-02	8.42E-01	5.95E-03	5.39E-01	9.23E-01	0.00E+00	-0.132	-1.520	-0.583
19	4.42	0.0	0.477	1.0	0.747	0.253	5.65E-03	4.47E-01	3.16E-02	2.94E-02	6.84E-03	5.56E-02	1.88E-02	8.48E-01	6.66E-03	5.30E-01	9.18E-01	0.00E+00	-0.127	-1.531	-0.597
18	4.19	0.0	0.452	1.0	0.756	0.244	6.40E-03	4.35E-01	3.59E-02	2.86E-02	6.65E-03	5.62E-02	1.82E-02	8.54E-01	7.50E-03	5.21E-01	9.13E-01	0.00E+00	-0.122	-1.544	-0.612
17	3.95	0.0	0.426	1.0	0.765	0.235	7.30E-03	4.21E-01	4.09E-02	2.77E-02	6.45E-03	5.69E-02	1.75E-02	8.60E-01	8.49E-03	5.11E-01	9.08E-01	0.00E+00	-0.116	-1.557	-0.629
16	3.72	0.0	0.401	1.0	0.775	0.225	8.36E-03	4.07E-01	4.68E-02	2.68E-02	6.23E-03	5.76E-02	1.68E-02	8.66E-01	9.66E-03	5.00E-01	9.02E-01	0.00E+00	-0.111	-1.572	-0.647
15	3.49	0.0	0.376	1.0	0.785	0.215	9.64E-03	3.92E-01	5.40E-02	2.58E-02	5.99E-03	5.84E-02	1.60E-02	8.72E-01	1.11E-02	4.89E-01	8.95E-01	0.00E+00	-0.105	-1.589	-0.667
14	3.26	0.0	0.351	1.0	0.795	0.205	1.12E-02	3.75E-01	6.27E-02	2.47E-02	5.74E-03	5.92E-02	1.52E-02	8.79E-01	1.27E-02	4.77E-01	8.87E-01	0.00E+00	-0.099	-1.607	-0.689
13	3.02	0.0	0.326	1.0	0.807	0.193	1.31E-02	3.58E-01	7.34E-02	2.35E-02	5.47E-03	6.00E-02	1.44E-02	8.86E-01	1.48E-02	4.63E-01	8.78E-01	0.00E+00	-0.093	-1.628	-0.714
12	2.79	0.0	0.301	1.0	0.819	0.181	1.55E-02	3.39E-01	8.66E-02	2.23E-02	5.18E-03	6.09E-02	1.35E-02	8.94E-01	1.73E-02	4.49E-01	8.68E-01	0.00E+00	-0.087	-1.652	-0.741
11	2.56	0.0	0.276	1.0	0.831	0.169	1.84E-02	3.18E-01	1.03E-01	2.09E-02	4.87E-03	6.18E-02	1.26E-02	9.01E-01	2.04E-02	4.33E-01	8.57E-01	0.00E+00	-0.080	-1.679	-0.772
10	2.33	0.0	0.251	1.0	0.844	0.156	2.22E-02	2.96E-01	1.24E-01	1.95E-02	4.53E-03	6.28E-02	1.16E-02	9.09E-01	2.44E-02	4.16E-01	8.44E-01	0.00E+00	-0.074	-1.710	-0.808
9	2.09	0.0	0.226	1.0	0.858	0.142	2.70E-02	2.73E-01	1.51E-01	1.79E-02	4.17E-03	6.38E-02	1.06E-02	9.18E-01	2.94E-02	3.97E-01	8.29E-01	0.00E+00	-0.066	-1.746	-0.848
8	1.86	0.0	0.201	1.0	0.873	0.127	3.33E-02	2.47E-01	1.87E-01	1.63E-02	3.78E-03	6.49E-02	9.47E-03	9.27E-01	3.59E-02	3.76E-01	8.10E-01	0.00E+00	-0.059	-1.789	-0.895
7	1.63	0.0	0.176	1.0	0.888	0.112	4.17E-02	2.19E-01	2.34E-01	1.44E-02	3.36E-03	6.61E-02	8.32E-03	9.36E-01	4.46E-02	3.52E-01	7.89E-01	0.00E+00	-0.051	-1.841	-0.951
6	1.40	0.0	0.151	1.0	0.904	0.096	5.32E-02	1.90E-01	2.98E-01	1.25E-02	2.90E-03	6.73E-02	7.12E-03	9.45E-01	5.63E-02	3.26E-01	7.63E-01	0.00E+00	-0.044	-1.904	-1.019
5	1.16	0.0	0.125	1.0	0.921	0.079	6.94E-02	1.58E-01	3.88E-01	1.04E-02	2.42E-03	6.85E-02	5.87E-03	9.55E-01	7.26E-02	2.96E-01	7.31E-01	0.00E+00	-0.036	-1.983	-1.103
4	0.93	0.0	0.100	1.0	0.939	0.061	9.28E-02	1.24E-01	5.20E-01	8.19E-03	1.90E-03	6.98E-02	4.58E-03	9.65E-01	9.62E-02	2.61E-01	6.90E-01	0.00E+00	-0.028	-2.087	-1.211
3	0.70	0.0	0.075	1.0	0.956	0.044	1.29E-01	8.96E-02	7.20E-01	5.90E-03	1.37E-03	7.11E-02	3.27E-03	9.75E-01	1.32E-01	2.21E-01	6.37E-01	0.00E+00	-0.020	-2.229	-1.357
2	0.47	0.0	0.050	1.0	0.973	0.027	1.87E-01	5.47E-02	1.05E+00	3.60E-03	8.38E-04	7.24E-02	1.99E-03	9.85E-01	1.90E-01	1.72E-01	5.64E-01	0.00E+00	-0.012	-2.443	-1.574
1	0.23	0.0	0.025	1.0	0.989	0.011	3.00E-01	2.24E-02	1.68E+00	1.47E-03	3.42E-04	7.36E-02	8.14E-04	9.94E-01	3.02E-01	1.10E-01	4.50E-01	0.00E+00	-0.005	-2.832	-1.961

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-05 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		19.64	24.28	4.64	20.12	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table. First measurement assumed to be static.
				0	0.00	
				0	0.00	
				0	0.00	

Measurements After Bailing

0:00:00	0.00	20.10	20.90	0.8	20.18	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
0:01:05	1.08	20.05	20.93	0.88	20.14	
0:02:05	2.08	20.05	20.97	0.92	20.15	
0:04:25	4.42	20.00	21.00	1	20.10	
0:06:25	6.42	20.02	21.17	1.15	20.14	
0:08:25	8.42	20.00	21.20	1.2	20.12	
0:11:22	11.37	20.00	21.38	1.38	20.14	
0:13:35	13.58	20.00	21.51	1.51	20.16	
0:16:25	16.42	20.00	21.58	1.58	20.16	
0:20:10	20.17	20.00	21.78	1.78	20.18	
0:23:05	23.08	20.00	21.90	1.9	20.20	
0:27:10	27.17	20.00	21.91	1.91	20.20	
0:32:40	32.67	20.00	22.23	2.23	20.23	
0:39:05	39.08	20.00	22.36	2.36	20.24	
0:50:10	50.17	20.00	22.79	2.79	20.29	
0:55:35	55.58	20.00	22.94	2.94	20.30	
1:01:25	61.42	20.00	23.05	3.05	20.32	
1:12:10	72.17	20.00	23.30	3.3	20.34	
1:30:05	90.08	20.00	23.50	3.5	20.36	
2:00:24	120.40	20.00	23.80	3.8	20.39	
2:16:50	136.83	20.00	23.90	3.9	20.40	
2:58:55	178.92	20.00	24.00	4	20.41	
18:37:05	1117.08	19.90	25.02	5.12	20.43	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8965	(dimensionless)
Dynamic viscosity of free oil:	49.47	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	38	dynes/cm
Oil-water interfacial tension:	30.24	dynes/cm
BETA-AO	1.895	
BETA-OW	2.38	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.2	1/feet
van Genuchten n:	1.89	(dimensionless)
van Genuchten m:	0.47	(dimensionless)

Free Oil Thickness in Well:	4.64	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.232	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	8.18E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	8.25E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.10	
Geometric mean water sat'n within free oil layer:	0.83	
Specific Volume of Oil (above & below oil table):	0.38	ft
Specific Volume of Water (above & below oil table):	1.98	ft
Estimate of oil storativity:	0.02	
Bouwer-Rice Oil Conductivity (below oil table):	1.47E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	6.96	2.080	0.720	0.320	0.525	0.075	7.10E-03	6.13E-04	3.98E-02	6.23E-05	1.44E-05	4.63E-02	6.64E-03	6.87E-01	1.03E-02	2.89E-01	8.98E-01	8.52E-01	-0.280	-4.206	-1.123
29	6.73	1.872	0.696	0.341	0.536	0.075	8.01E-03	6.55E-04	4.48E-02	6.65E-05	1.54E-05	4.72E-02	6.64E-03	6.96E-01	1.15E-02	2.89E-01	8.93E-01	8.45E-01	-0.271	-4.177	-1.123
28	6.50	1.664	0.672	0.365	0.546	0.075	9.05E-03	7.02E-04	5.07E-02	7.12E-05	1.65E-05	4.82E-02	6.64E-03	7.04E-01	1.29E-02	2.89E-01	8.87E-01	8.37E-01	-0.263	-4.147	-1.123
27	6.26	1.456	0.648	0.396	0.558	0.075	1.03E-02	7.53E-04	5.75E-02	7.65E-05	1.77E-05	4.92E-02	6.64E-03	7.13E-01	1.44E-02	2.89E-01	8.80E-01	8.29E-01	-0.254	-4.117	-1.123
26	6.03	1.248	0.624	0.435	0.569	0.075	1.17E-02	8.12E-04	6.54E-02	8.24E-05	1.91E-05	5.02E-02	6.64E-03	7.22E-01	1.62E-02	2.89E-01	8.73E-01	8.20E-01	-0.245	-4.084	-1.123
25	5.80	1.040	0.600	0.485	0.582	0.075	1.33E-02	8.77E-04	7.47E-02	8.90E-05	2.07E-05	5.13E-02	6.64E-03	7.32E-01	1.82E-02	2.89E-01	8.65E-01	8.10E-01	-0.235	-4.051	-1.123
24	5.57	0.832	0.576	0.551	0.595	0.075	1.53E-02	9.51E-04	8.55E-02	9.65E-05	2.24E-05	5.24E-02	6.64E-03	7.41E-01	2.06E-02	2.89E-01	8.56E-01	7.99E-01	-0.226	-4.015	-1.123
23	5.34	0.624	0.552	0.642	0.608	0.075	1.76E-02	1.04E-03	9.83E-02	1.05E-04	2.44E-05	5.36E-02	6.64E-03	7.51E-01	2.34E-02	2.89E-01	8.47E-01	7.87E-01	-0.216	-3.978	-1.123
22	5.10	0.416	0.528	0.765	0.622	0.143	2.02E-02	7.11E-03	1.13E-01	7.22E-04	1.67E-04	5.49E-02	1.26E-02	7.62E-01	2.66E-02	3.99E-01	8.37E-01	7.03E-01	-0.206	-3.142	-0.845
21	4.87	0.208	0.504	0.912	0.637	0.275	2.34E-02	7.26E-02	1.31E-01	7.37E-03	1.71E-03	5.62E-02	2.43E-02	7.72E-01	3.03E-02	5.53E-01	8.26E-01	4.64E-01	-0.196	-2.133	-0.560
20	4.64	0.0	0.480	1.0	0.653	0.347	2.72E-02	4.11E-01	1.53E-01	4.17E-02	9.68E-03	5.75E-02	3.06E-02	7.84E-01	3.48E-02	6.21E-01	8.14E-01	0.00E+00	-0.185	-1.380	-0.459
19	4.41	0.0	0.456	1.0	0.669	0.331	3.18E-02	3.88E-01	1.78E-01	3.94E-02	9.14E-03	5.90E-02	2.92E-02	7.95E-01	4.00E-02	6.07E-01	8.00E-01	0.00E+00	-0.175	-1.404	-0.480
18	4.18	0.0	0.432	1.0	0.686	0.314	3.72E-02	3.64E-01	2.08E-01	3.70E-02	8.58E-03	6.05E-02	2.77E-02	8.07E-01	4.61E-02	5.91E-01	7.85E-01	0.00E+00	-0.164	-1.432	-0.503
17	3.94	0.0	0.408	1.0	0.703	0.297	4.38E-02	3.39E-01	2.45E-01	3.44E-02	7.99E-03	6.20E-02	2.61E-02	8.19E-01	5.34E-02	5.74E-01	7.69E-01	0.00E+00	-0.153	-1.463	-0.528
16	3.71	0.0	0.384	1.0	0.722	0.278	5.17E-02	3.13E-01	2.89E-01	3.18E-02	7.38E-03	6.36E-02	2.45E-02	8.31E-01	6.22E-02	5.56E-01	7.51E-01	0.00E+00	-0.142	-1.498	-0.556
15	3.48	0.0	0.360	1.0	0.741	0.259	6.12E-02	2.86E-01	3.43E-01	2.91E-02	6.74E-03	6.53E-02	2.28E-02	8.44E-01	7.25E-02	5.36E-01	7.31E-01	0.00E+00	-0.130	-1.537	-0.587
14	3.25	0.0	0.336	1.0	0.761	0.239	7.28E-02	2.59E-01	4.08E-01	2.63E-02	6.09E-03	6.71E-02	2.11E-02	8.57E-01	8.50E-02	5.15E-01	7.08E-01	0.00E+00	-0.119	-1.581	-0.621
13	3.02	0.0	0.312	1.0	0.781	0.219	8.70E-02	2.30E-01	4.87E-01	2.34E-02	5.43E-03	6.89E-02	1.93E-02	8.70E-01	1.00E-01	4.93E-01	6.84E-01	0.00E+00	-0.107	-1.631	-0.660
12	2.78	0.0	0.288	1.0	0.802	0.198	1.04E-01	2.02E-01	5.84E-01	2.05E-02	4.75E-03	7.07E-02	1.74E-02	8.83E-01	1.18E-01	4.68E-01	6.56E-01	0.00E+00	-0.096	-1.688	-0.704
11	2.55	0.0	0.264	1.0	0.824	0.176	1.25E-01	1.73E-01	7.02E-01	1.76E-02	4.08E-03	7.26E-02	1.55E-02	8.97E-01	1.40E-01	4.42E-01	6.26E-01	0.00E+00	-0.084	-1.755	-0.754
10	2.32	0.0	0.240	1.0	0.846	0.154	1.51E-01	1.45E-01	8.46E-01	1.48E-02	3.42E-03	7.46E-02	1.36E-02	9.10E-01	1.66E-01	4.14E-01	5.93E-01	0.00E+00	-0.073	-1.831	-0.812
9	2.09	0.0	0.216	1.0	0.868	0.132	1.83E-01	1.18E-01	1.02E+00	1.20E-02	2.78E-03	7.65E-02	1.17E-02	9.24E-01	1.98E-01	3.84E-01	5.55E-01	0.00E+00	-0.062	-1.921	-0.878
8	1.86	0.0	0.192	1.0	0.889	0.111	2.21E-01	9.27E-02	1.24E+00	9.41E-03	2.18E-03	7.84E-02	9.77E-03	9.36E-01	2.36E-01	3.51E-01	5.14E-01	0.00E+00	-0.051	-2.026	-0.955
7	1.62	0.0	0.168	1.0	0.910	0.090	2.68E-01	6.94E-02	1.50E+00	7.04E-03	1.63E-03	8.02E-02	7.91E-03	9.49E-01	2.82E-01	3.16E-01	4.69E-01	0.00E+00	-0.041	-2.152	-1.047
6	1.39	0.0	0.144	1.0	0.930	0.070	3.25E-01	4.88E-02	1.82E+00	4.95E-03	1.15E-03	8.20E-02	6.15E-03	9.60E-01	3.38E-01	2.78E-01	4.19E-01	0.00E+00	-0.031	-2.305	-1.157
5	1.16	0.0	0.120	1.0	0.949	0.051	3.93E-01	3.16E-02	2.20E+00	3.21E-03	7.44E-04	8.36E-02	4.51E-03	9.71E-01	4.05E-01	2.38E-01	3.64E-01	0.00E+00	-0.023	-2.494	-1.291
4	0.93	0.0	0.096	1.0	0.965	0.035	4.75E-01	1.81E-02	2.66E+00	1.84E-03	4.27E-04	8.51E-02	3.05E-03	9.81E-01	4.84E-01	1.96E-01	3.04E-01	0.00E+00	-0.015	-2.735	-1.461
3	0.70	0.0	0.072	1.0	0.979	0.021	5.72E-01	8.66E-03	3.20E+00	8.79E-04	2.04E-04	8.63E-02	1.82E-03	9.88E-01	5.79E-01	1.51E-01	2.39E-01	0.00E+00	-0.009	-3.056	-1.686
2	0.46	0.0	0.048	1.0	0.990	0.010	6.87E-01	2.97E-03	3.85E+00	3.01E-04	6.99E-05	8.73E-02	8.60E-04	9.95E-01	6.91E-01	1.04E-01	1.69E-01	0.00E+00	-0.004	-3.521	-2.011
1	0.23	0.0	0.024	1.0	0.997	0.003	8.24E-01	4.59E-04	4.61E+00	4.66E-05	1.08E-05	8.79E-02	2.35E-04	9.99E-01	8.25E-01	5.44E-02	9.18E-02	0.00E+00	-0.001	-4.332	-2.574

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Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8966	(dimensionless)
Dynamic viscosity of free oil	30.72	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	39	dynes/cm
Oil-water interfacial tension:	32.94	dynes/cm
BETA-AO	1.846	
BETA-OW	2.19	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	3.5	1/feet
van Genuchten n:	1.92	(dimensionless)
van Genuchten m:	0.48	(dimensionless)

Free Oil Thickness in Well	2.00	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.1	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	1.65E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	6.97E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.13	
Geometric mean water sat'n within free oil layer:	0.79	
Specific Volume of Oil (above & below oil table):	0.19	ft
Specific Volume of Water (above & below oil table):	0.81	ft
Estimate of oil storativity:	0.02	
Bouwer-Rice Oil Conductivity (below oil table):	3.59E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	3.00	0.897	0.310	0.276	0.474	0.075	4.13E-03	4.65E-04	2.31E-02	7.60E-05	7.60E-06	1.80E-02	2.86E-03	6.45E-01	6.41E-03	2.89E-01	9.20E-01	8.80E-01	-0.324	-4.119	-1.123
29	2.90	0.807	0.300	0.293	0.484	0.075	4.69E-03	4.96E-04	2.63E-02	8.11E-05	8.11E-06	1.84E-02	2.86E-03	6.53E-01	7.19E-03	2.89E-01	9.15E-01	8.74E-01	-0.315	-4.091	-1.123
28	2.80	0.717	0.290	0.314	0.494	0.075	5.35E-03	5.30E-04	2.99E-02	8.67E-05	8.67E-06	1.88E-02	2.86E-03	6.62E-01	8.08E-03	2.89E-01	9.10E-01	8.67E-01	-0.306	-4.062	-1.123
27	2.70	0.628	0.279	0.341	0.505	0.075	6.11E-03	5.69E-04	3.42E-02	9.29E-05	9.29E-06	1.92E-02	2.86E-03	6.71E-01	9.11E-03	2.89E-01	9.05E-01	8.60E-01	-0.297	-4.032	-1.123
26	2.60	0.538	0.269	0.374	0.517	0.075	7.02E-03	6.12E-04	3.93E-02	1.00E-04	1.00E-05	1.96E-02	2.86E-03	6.80E-01	1.03E-02	2.89E-01	8.98E-01	8.52E-01	-0.287	-4.000	-1.123
25	2.50	0.448	0.259	0.419	0.529	0.075	8.08E-03	6.60E-04	4.53E-02	1.08E-04	1.08E-05	2.01E-02	2.86E-03	6.90E-01	1.17E-02	2.89E-01	8.92E-01	8.44E-01	-0.277	-3.967	-1.123
24	2.40	0.359	0.248	0.481	0.541	0.075	9.35E-03	7.14E-04	5.23E-02	1.17E-04	1.17E-05	2.06E-02	2.86E-03	7.00E-01	1.33E-02	2.89E-01	8.84E-01	8.35E-01	-0.267	-3.933	-1.123
23	2.30	0.269	0.238	0.569	0.555	0.075	1.09E-02	7.77E-04	6.08E-02	1.27E-04	1.27E-05	2.11E-02	2.86E-03	7.11E-01	1.53E-02	2.89E-01	8.76E-01	8.25E-01	-0.256	-3.896	-1.123
22	2.20	0.179	0.227	0.700	0.569	0.131	1.27E-02	4.10E-03	7.09E-02	6.70E-04	6.70E-05	2.16E-02	5.00E-03	7.22E-01	1.75E-02	3.82E-01	8.68E-01	7.64E-01	-0.245	-3.174	-0.881
21	2.10	0.090	0.217	0.879	0.584	0.295	1.48E-02	6.38E-02	8.31E-02	1.04E-02	1.04E-03	2.22E-02	1.12E-02	7.33E-01	2.02E-02	5.73E-01	8.58E-01	5.24E-01	-0.234	-1.982	-0.530
20	2.00	0.0	0.207	1.0	0.600	0.400	1.75E-02	4.78E-01	9.78E-02	7.82E-02	7.82E-03	2.28E-02	1.52E-02	7.45E-01	2.34E-02	6.67E-01	8.47E-01	0.00E+00	-0.222	-1.107	-0.398
19	1.90	0.0	0.196	1.0	0.617	0.383	2.07E-02	4.55E-01	1.16E-01	7.44E-02	7.44E-03	2.34E-02	1.46E-02	7.58E-01	2.73E-02	6.53E-01	8.35E-01	0.00E+00	-0.210	-1.129	-0.416
18	1.80	0.0	0.186	1.0	0.634	0.366	2.45E-02	4.30E-01	1.37E-01	7.03E-02	7.03E-03	2.41E-02	1.39E-02	7.70E-01	3.19E-02	6.38E-01	8.21E-01	0.00E+00	-0.198	-1.153	-0.437
17	1.70	0.0	0.176	1.0	0.653	0.347	2.93E-02	4.04E-01	1.64E-01	6.60E-02	6.60E-03	2.48E-02	1.32E-02	7.84E-01	3.74E-02	6.21E-01	8.07E-01	0.00E+00	-0.185	-1.180	-0.459
16	1.60	0.0	0.165	1.0	0.672	0.328	3.52E-02	3.76E-01	1.97E-01	6.15E-02	6.15E-03	2.55E-02	1.25E-02	7.97E-01	4.42E-02	6.03E-01	7.90E-01	0.00E+00	-0.172	-1.211	-0.485
15	1.50	0.0	0.155	1.0	0.693	0.307	4.25E-02	3.47E-01	2.38E-01	5.68E-02	5.68E-03	2.63E-02	1.17E-02	8.12E-01	5.24E-02	5.84E-01	7.71E-01	0.00E+00	-0.159	-1.246	-0.513
14	1.40	0.0	0.145	1.0	0.715	0.285	5.16E-02	3.17E-01	2.89E-01	5.18E-02	5.18E-03	2.72E-02	1.08E-02	8.26E-01	6.24E-02	5.63E-01	7.50E-01	0.00E+00	-0.146	-1.286	-0.545
13	1.30	0.0	0.134	1.0	0.737	0.263	6.29E-02	2.85E-01	3.52E-01	4.66E-02	4.66E-03	2.80E-02	9.98E-03	8.41E-01	7.48E-02	5.40E-01	7.27E-01	0.00E+00	-0.132	-1.331	-0.581
12	1.20	0.0	0.124	1.0	0.761	0.239	7.71E-02	2.53E-01	4.32E-01	4.13E-02	4.13E-03	2.89E-02	9.09E-03	8.57E-01	9.00E-02	5.15E-01	7.00E-01	0.00E+00	-0.119	-1.384	-0.621
11	1.10	0.0	0.114	1.0	0.785	0.215	9.50E-02	2.19E-01	5.32E-01	3.58E-02	3.58E-03	2.98E-02	8.16E-03	8.73E-01	1.09E-01	4.88E-01	6.70E-01	0.00E+00	-0.105	-1.446	-0.668
10	1.00	0.0	0.103	1.0	0.811	0.189	1.17E-01	1.86E-01	6.58E-01	3.04E-02	3.04E-03	3.08E-02	7.20E-03	8.89E-01	1.32E-01	4.59E-01	6.36E-01	0.00E+00	-0.091	-1.518	-0.723
9	0.90	0.0	0.093	1.0	0.836	0.164	1.46E-01	1.53E-01	8.17E-01	2.50E-02	2.50E-03	3.18E-02	6.22E-03	9.04E-01	1.61E-01	4.27E-01	5.98E-01	0.00E+00	-0.078	-1.603	-0.786
8	0.80	0.0	0.083	1.0	0.862	0.138	1.82E-01	1.21E-01	1.02E+00	1.98E-02	1.98E-03	3.28E-02	5.24E-03	9.20E-01	1.97E-01	3.92E-01	5.56E-01	0.00E+00	-0.065	-1.704	-0.860
7	0.70	0.0	0.072	1.0	0.887	0.113	2.26E-01	9.12E-02	1.27E+00	1.49E-02	1.49E-03	3.37E-02	4.28E-03	9.35E-01	2.42E-01	3.54E-01	5.08E-01	0.00E+00	-0.052	-1.826	-0.949
6	0.60	0.0	0.062	1.0	0.912	0.088	2.83E-01	6.46E-02	1.58E+00	1.06E-02	1.06E-03	3.47E-02	3.34E-03	9.50E-01	2.97E-01	3.12E-01	4.55E-01	0.00E+00	-0.040	-1.977	-1.056
5	0.50	0.0	0.052	1.0	0.935	0.065	3.52E-01	4.19E-02	1.97E+00	6.85E-03	6.85E-04	3.55E-02	2.46E-03	9.63E-01	3.66E-01	2.68E-01	3.95E-01	0.00E+00	-0.029	-2.164	-1.189
4	0.40	0.0	0.041	1.0	0.956	0.044	4.38E-01	2.40E-02	2.45E+00	3.93E-03	3.93E-04	3.63E-02	1.66E-03	9.75E-01	4.49E-01	2.21E-01	3.30E-01	0.00E+00	-0.019	-2.406	-1.358
3	0.30	0.0	0.031	1.0	0.974	0.026	5.42E-01	1.14E-02	3.03E+00	1.86E-03	1.86E-04	3.70E-02	9.89E-04	9.85E-01	5.50E-01	1.70E-01	2.59E-01	0.00E+00	-0.011	-2.731	-1.584
2	0.20	0.0	0.021	1.0	0.988	0.012	6.66E-01	3.82E-03	3.73E+00	6.24E-04	6.24E-05	3.75E-02	4.65E-04	9.93E-01	6.71E-01	1.17E-01	1.81E-01	0.00E+00	-0.005	-3.205	-1.912
1	0.10	0.0	0.010	1.0	0.997	0.003	8.15E-01	5.63E-04	4.56E+00	9.21E-05	9.21E-06	3.79E-02	1.25E-04	9.98E-01	8.16E-01	6.04E-02	9.66E-02	0.00E+00	-0.001	-4.036	-2.483

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties		**Soil Properties of Formation**	
Specific gravity of oil:	0.9029 (dimensionless)	Hydraulic conductivity:	5.6 ft/day
Dynamic viscosity of free oil:	45.02 centipoise	Porosity:	0.38 (dimensionless)
Air-water surface tension:	72 dynes/cm	Irreducible water saturation:	0.1 (dimensionless)
Air-oil surface tension:	39 dynes/cm		
Oil-water interfacial tension:	34.38 dynes/cm	van Genuchten alpha:	2.8 1/feet
BETA-AO	1.846	van Genuchten n:	1.92 (dimensionless)
BETA-OW	2.09	van Genuchten m:	0.48 (dimensionless)

Free Oil Thickness in Well:	5.85 feet	**Calculated Results**	
Elevation at Oil-Wtr Interfac	0 feet	Geometric mean Oil Conductivity (below oil table):	3.36E-02 ft/day
Elevation increment for calc	0.2925 feet	Oil Transmissivity of free oil layer (below oil table):	2.98E-01 ft2/day
		Geometric mean oil saturation within free oil layer:	0.29
		Geometric mean water sat'n within free oil layer:	0.59
		Specific Volume of Oil (above & below oil table):	0.95 ft
		Specific Volume of Water (above & below oil table):	1.75 ft
		Estimate of oil storativity:	0.05
		Bouwer-Rice Oil Conductivity (below oil table):	2.13E-01 ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	8.78	2.641	0.852	0.181	0.301	0.075	2.11E-04	1.21E-04	1.18E-03	1.36E-05	3.97E-06	3.34E-02	8.37E-03	4.72E-01	4.46E-04	2.89E-01	9.79E-01	9.58E-01	-0.522	-4.868	-1.123
29	8.48	2.377	0.824	0.189	0.307	0.075	2.42E-04	1.28E-04	1.36E-03	1.44E-05	4.21E-06	3.41E-02	8.37E-03	4.79E-01	5.06E-04	2.89E-01	9.78E-01	9.56E-01	-0.513	-4.842	-1.123
28	8.19	2.113	0.795	0.199	0.313	0.075	2.80E-04	1.36E-04	1.57E-03	1.53E-05	4.47E-06	3.48E-02	8.37E-03	4.87E-01	5.76E-04	2.89E-01	9.76E-01	9.54E-01	-0.504	-4.816	-1.123
27	7.90	1.849	0.767	0.212	0.320	0.075	3.26E-04	1.45E-04	1.82E-03	1.63E-05	4.76E-06	3.56E-02	8.37E-03	4.94E-01	6.59E-04	2.89E-01	9.74E-01	9.52E-01	-0.495	-4.788	-1.123
26	7.61	1.585	0.738	0.229	0.327	0.075	3.81E-04	1.55E-04	2.13E-03	1.74E-05	5.09E-06	3.64E-02	8.37E-03	5.03E-01	7.57E-04	2.89E-01	9.72E-01	9.49E-01	-0.485	-4.760	-1.123
25	7.31	1.320	0.710	0.252	0.335	0.075	4.47E-04	1.66E-04	2.50E-03	1.86E-05	5.45E-06	3.72E-02	8.37E-03	5.11E-01	8.75E-04	2.89E-01	9.70E-01	9.46E-01	-0.475	-4.730	-1.123
24	7.02	1.056	0.682	0.285	0.344	0.075	5.28E-04	1.78E-04	2.96E-03	2.00E-05	5.86E-06	3.82E-02	8.37E-03	5.20E-01	1.02E-03	2.89E-01	9.68E-01	9.43E-01	-0.464	-4.698	-1.123
23	6.73	0.792	0.653	0.338	0.353	0.075	6.28E-04	1.92E-04	3.52E-03	2.16E-05	6.32E-06	3.92E-02	8.37E-03	5.30E-01	1.19E-03	2.89E-01	9.66E-01	9.40E-01	-0.453	-4.665	-1.123
22	6.44	0.528	0.625	0.435	0.362	0.075	7.53E-04	2.08E-04	4.21E-03	2.34E-05	6.84E-06	4.03E-02	8.37E-03	5.40E-01	1.39E-03	2.89E-01	9.63E-01	9.36E-01	-0.441	-4.631	-1.123
21	6.14	0.264	0.596	0.648	0.373	0.275	9.08E-04	1.22E-02	5.08E-03	1.37E-03	4.02E-04	4.14E-02	3.06E-02	5.51E-01	1.65E-03	5.53E-01	9.59E-01	8.11E-01	-0.428	-2.862	-0.561
20	5.85	0.0	0.568	1.0	0.384	0.616	1.10E-03	7.55E-01	6.18E-03	8.48E-02	2.48E-02	4.27E-02	6.84E-02	5.62E-01	1.96E-03	8.27E-01	9.56E-01	0.00E+00	-0.415	-1.071	-0.211
19	5.56	0.0	0.540	1.0	0.397	0.603	1.35E-03	7.41E-01	7.59E-03	8.32E-02	2.43E-02	4.41E-02	6.71E-02	5.74E-01	2.36E-03	8.19E-01	9.51E-01	0.00E+00	-0.402	-1.080	-0.219
18	5.27	0.0	0.511	1.0	0.410	0.590	1.68E-03	7.25E-01	9.40E-03	8.15E-02	2.38E-02	4.56E-02	6.55E-02	5.87E-01	2.86E-03	8.09E-01	9.47E-01	0.00E+00	-0.387	-1.089	-0.229
17	4.97	0.0	0.483	1.0	0.425	0.575	2.10E-03	7.08E-01	1.18E-02	7.95E-02	2.32E-02	4.72E-02	6.39E-02	6.01E-01	3.49E-03	7.99E-01	9.41E-01	0.00E+00	-0.372	-1.100	-0.240
16	4.68	0.0	0.454	1.0	0.441	0.559	2.66E-03	6.88E-01	1.49E-02	7.72E-02	2.26E-02	4.91E-02	6.21E-02	6.16E-01	4.31E-03	7.88E-01	9.34E-01	0.00E+00	-0.355	-1.112	-0.253
15	4.39	0.0	0.426	1.0	0.459	0.541	3.40E-03	6.66E-01	1.91E-02	7.48E-02	2.19E-02	5.10E-02	6.01E-02	6.32E-01	5.39E-03	7.75E-01	9.27E-01	0.00E+00	-0.338	-1.126	-0.267
14	4.10	0.0	0.398	1.0	0.479	0.521	4.42E-03	6.41E-01	2.47E-02	7.19E-02	2.10E-02	5.32E-02	5.79E-02	6.49E-01	6.81E-03	7.61E-01	9.18E-01	0.00E+00	-0.320	-1.143	-0.283
13	3.80	0.0	0.369	1.0	0.501	0.499	5.82E-03	6.12E-01	3.26E-02	6.87E-02	2.01E-02	5.57E-02	5.55E-02	6.67E-01	8.71E-03	7.45E-01	9.07E-01	0.00E+00	-0.300	-1.163	-0.302
12	3.51	0.0	0.341	1.0	0.525	0.475	7.76E-03	5.80E-01	4.36E-02	6.51E-02	1.91E-02	5.84E-02	5.28E-02	6.87E-01	1.13E-02	7.26E-01	8.94E-01	0.00E+00	-0.280	-1.186	-0.324
11	3.22	0.0	0.312	1.0	0.553	0.447	1.06E-02	5.43E-01	5.93E-02	6.10E-02	1.78E-02	6.14E-02	4.97E-02	7.09E-01	1.49E-02	7.05E-01	8.78E-01	0.00E+00	-0.258	-1.215	-0.349
10	2.93	0.0	0.284	1.0	0.583	0.417	1.47E-02	5.01E-01	8.24E-02	5.63E-02	1.65E-02	6.48E-02	4.63E-02	7.33E-01	2.01E-02	6.81E-01	8.58E-01	0.00E+00	-0.234	-1.249	-0.380
9	2.63	0.0	0.256	1.0	0.617	0.383	2.08E-02	4.54E-01	1.17E-01	5.10E-02	1.49E-02	6.86E-02	4.25E-02	7.58E-01	2.75E-02	6.52E-01	8.34E-01	0.00E+00	-0.209	-1.293	-0.417
8	2.34	0.0	0.227	1.0	0.656	0.344	3.02E-02	4.00E-01	1.69E-01	4.49E-02	1.31E-02	7.29E-02	3.63E-02	7.86E-01	3.84E-02	6.18E-01	8.04E-01	0.00E+00	-0.183	-1.348	-0.463
7	2.05	0.0	0.199	1.0	0.699	0.301	4.47E-02	3.39E-01	2.50E-01	3.81E-02	1.12E-02	7.76E-02	3.35E-02	8.16E-01	5.48E-02	5.79E-01	7.66E-01	0.00E+00	-0.156	-1.419	-0.521
6	1.76	0.0	0.170	1.0	0.746	0.254	6.78E-02	2.73E-01	3.80E-01	3.07E-02	8.98E-03	8.29E-02	2.82E-02	8.47E-01	8.00E-02	5.31E-01	7.17E-01	0.00E+00	-0.127	-1.513	-0.595
5	1.46	0.0	0.142	1.0	0.797	0.203	1.05E-01	2.03E-01	5.88E-01	2.28E-02	6.68E-03	8.86E-02	2.25E-02	8.80E-01	1.19E-01	4.75E-01	6.55E-01	0.00E+00	-0.098	-1.641	-0.693
4	1.17	0.0	0.114	1.0	0.851	0.149	1.66E-01	1.34E-01	9.27E-01	1.51E-02	4.41E-03	9.46E-02	1.65E-02	9.14E-01	1.81E-01	4.07E-01	5.74E-01	0.00E+00	-0.070	-1.822	-0.827
3	0.88	0.0	0.085	1.0	0.904	0.096	2.63E-01	7.26E-02	1.48E+00	8.16E-03	2.39E-03	1.01E-01	1.06E-02	9.45E-01	2.79E-01	3.26E-01	4.72E-01	0.00E+00	-0.044	-2.089	-1.020
2	0.59	0.0	0.057	1.0	0.952	0.048	4.18E-01	2.74E-02	2.34E+00	3.07E-03	8.99E-04	1.06E-01	5.33E-03	9.73E-01	4.30E-01	2.31E-01	3.44E-01	0.00E+00	-0.021	-2.512	-1.319
1	0.29	0.0	0.028	1.0	0.987	0.013	6.52E-01	4.39E-03	3.65E+00	4.93E-04	1.44E-04	1.10E-01	1.50E-03	9.92E-01	6.57E-01	1.22E-01	1.89E-01	0.00E+00	-0.006	-3.307	-1.870

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation
Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties		
Specific gravity of oil:	0.8965	(dimensionless)
Dynamic viscosity of free oil:	49.47	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	38	dynes/cm
Oil-water interfacial tension:	30.24	dynes/cm
BETA-AO	1.895	
BETA-OW	2.38	

Soil Properties of Formation		
Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.2	1/feet
van Genuchten n:	1.89	(dimensionless)
van Genuchten m:	0.47	(dimensionless)

Free Oil Thickness in Well:	4.64	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.232	feet

Calculated Results		
Geometric mean Oil Conductivity (below oil table):	8.18E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	8.25E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.10	
Geometric mean water sat'n within free oil layer:	0.83	
Specific Volume of Oil (above & below oil table):	0.38	ft
Specific Volume of Water (above & below oil table):	1.98	ft
Estimate of oil storativity:	0.02	
Bouwer-Rice Oil Conductivity (below oil table):	1.47E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	6.96	2.080	0.720	0.320	0.525	0.075	7.10E-03	6.13E-04	3.98E-02	6.23E-05	1.44E-05	4.63E-02	6.64E-03	6.87E-01	1.03E-02	2.89E-01	8.98E-01	8.52E-01	-0.280	-4.206	-1.123
29	6.73	1.872	0.696	0.341	0.536	0.075	8.01E-03	6.55E-04	4.48E-02	6.65E-05	1.54E-05	4.72E-02	6.64E-03	6.96E-01	1.15E-02	2.89E-01	8.93E-01	8.45E-01	-0.271	-4.177	-1.123
28	6.50	1.664	0.672	0.365	0.546	0.075	9.05E-03	7.02E-04	5.07E-02	7.12E-05	1.65E-05	4.82E-02	6.64E-03	7.04E-01	1.29E-02	2.89E-01	8.87E-01	8.37E-01	-0.263	-4.147	-1.123
27	6.26	1.456	0.648	0.396	0.558	0.075	1.03E-02	7.53E-04	5.75E-02	7.65E-05	1.77E-05	4.92E-02	6.64E-03	7.13E-01	1.44E-02	2.89E-01	8.80E-01	8.29E-01	-0.254	-4.117	-1.123
26	6.03	1.248	0.624	0.435	0.569	0.075	1.17E-02	8.12E-04	6.54E-02	8.24E-05	1.91E-05	5.02E-02	6.64E-03	7.22E-01	1.62E-02	2.89E-01	8.73E-01	8.20E-01	-0.245	-4.084	-1.123
25	5.80	1.040	0.600	0.485	0.582	0.075	1.33E-02	8.77E-04	7.47E-02	8.90E-05	2.07E-05	5.13E-02	6.64E-03	7.32E-01	1.82E-02	2.89E-01	8.65E-01	8.10E-01	-0.235	-4.051	-1.123
24	5.57	0.832	0.576	0.551	0.595	0.075	1.53E-02	9.51E-04	8.55E-02	9.65E-05	2.24E-05	5.24E-02	6.64E-03	7.41E-01	2.06E-02	2.89E-01	8.56E-01	7.99E-01	-0.226	-4.015	-1.123
23	5.34	0.624	0.552	0.642	0.608	0.075	1.76E-02	1.04E-03	9.83E-02	1.05E-04	2.44E-05	5.36E-02	6.64E-03	7.51E-01	2.34E-02	2.89E-01	8.47E-01	7.87E-01	-0.216	-3.978	-1.123
22	5.10	0.416	0.528	0.765	0.622	0.143	2.02E-02	7.11E-03	1.13E-01	7.22E-04	1.67E-04	5.49E-02	1.26E-02	7.62E-01	2.66E-02	3.99E-01	8.37E-01	7.03E-01	-0.206	-3.142	-0.845
21	4.87	0.208	0.504	0.912	0.637	0.275	2.34E-02	7.26E-02	1.31E-01	7.37E-03	1.71E-03	5.62E-02	2.43E-02	7.72E-01	3.03E-02	5.53E-01	8.26E-01	4.64E-01	-0.196	-2.133	-0.560
20	4.64	0.0	0.480	1.0	0.653	0.347	2.72E-02	4.11E-01	1.53E-01	4.17E-02	9.68E-03	5.75E-02	3.06E-02	7.84E-01	3.48E-02	6.21E-01	8.14E-01	0.00E+00	-0.185	-1.380	-0.459
19	4.41	0.0	0.456	1.0	0.669	0.331	3.18E-02	3.88E-01	1.78E-01	3.94E-02	9.14E-03	5.90E-02	2.92E-02	7.95E-01	4.00E-02	6.07E-01	8.00E-01	0.00E+00	-0.175	-1.404	-0.480
18	4.18	0.0	0.432	1.0	0.686	0.314	3.72E-02	3.64E-01	2.08E-01	3.70E-02	8.58E-03	6.05E-02	2.77E-02	8.07E-01	4.61E-02	5.91E-01	7.85E-01	0.00E+00	-0.164	-1.432	-0.503
17	3.94	0.0	0.408	1.0	0.703	0.297	4.38E-02	3.39E-01	2.45E-01	3.44E-02	7.99E-03	6.20E-02	2.61E-02	8.19E-01	5.34E-02	5.74E-01	7.69E-01	0.00E+00	-0.153	-1.463	-0.528
16	3.71	0.0	0.384	1.0	0.722	0.278	5.17E-02	3.13E-01	2.89E-01	3.18E-02	7.38E-03	6.36E-02	2.45E-02	8.31E-01	6.22E-02	5.56E-01	7.51E-01	0.00E+00	-0.142	-1.498	-0.556
15	3.48	0.0	0.360	1.0	0.741	0.259	6.12E-02	2.86E-01	3.43E-01	2.91E-02	6.74E-03	6.53E-02	2.28E-02	8.44E-01	7.25E-02	5.36E-01	7.31E-01	0.00E+00	-0.130	-1.537	-0.587
14	3.25	0.0	0.336	1.0	0.761	0.239	7.28E-02	2.59E-01	4.08E-01	2.63E-02	6.09E-03	6.71E-02	2.11E-02	8.57E-01	8.50E-02	5.15E-01	7.08E-01	0.00E+00	-0.119	-1.581	-0.621
13	3.02	0.0	0.312	1.0	0.781	0.219	8.70E-02	2.30E-01	4.87E-01	2.34E-02	5.43E-03	6.89E-02	1.93E-02	8.70E-01	1.00E-01	4.93E-01	6.84E-01	0.00E+00	-0.107	-1.631	-0.660
12	2.78	0.0	0.288	1.0	0.802	0.198	1.04E-01	2.02E-01	5.84E-01	2.05E-02	4.75E-03	7.07E-02	1.74E-02	8.83E-01	1.18E-01	4.68E-01	6.56E-01	0.00E+00	-0.096	-1.688	-0.704
11	2.55	0.0	0.264	1.0	0.824	0.176	1.25E-01	1.73E-01	7.02E-01	1.76E-02	4.08E-03	7.26E-02	1.55E-02	8.97E-01	1.40E-01	4.42E-01	6.26E-01	0.00E+00	-0.084	-1.755	-0.754
10	2.32	0.0	0.240	1.0	0.846	0.154	1.51E-01	1.45E-01	8.46E-01	1.48E-02	3.42E-03	7.46E-02	1.36E-02	9.10E-01	1.66E-01	4.14E-01	5.93E-01	0.00E+00	-0.073	-1.831	-0.812
9	2.09	0.0	0.216	1.0	0.868	0.132	1.83E-01	1.18E-01	1.02E+00	1.20E-02	2.78E-03	7.65E-02	1.17E-02	9.24E-01	1.98E-01	3.84E-01	5.55E-01	0.00E+00	-0.062	-1.921	-0.878
8	1.86	0.0	0.192	1.0	0.889	0.111	2.21E-01	9.27E-02	1.24E+00	9.41E-03	2.18E-03	7.84E-02	9.77E-03	9.36E-01	2.36E-01	3.51E-01	5.14E-01	0.00E+00	-0.051	-2.026	-0.955
7	1.62	0.0	0.168	1.0	0.910	0.090	2.68E-01	6.94E-02	1.50E+00	7.04E-03	1.63E-03	8.02E-02	7.91E-03	9.49E-01	2.82E-01	3.16E-01	4.69E-01	0.00E+00	-0.041	-2.152	-1.047
6	1.39	0.0	0.144	1.0	0.930	0.070	3.25E-01	4.88E-02	1.82E+00	4.95E-03	1.15E-03	8.20E-02	6.15E-03	9.60E-01	3.38E-01	2.78E-01	4.19E-01	0.00E+00	-0.031	-2.305	-1.157
5	1.16	0.0	0.120	1.0	0.949	0.051	3.93E-01	3.16E-02	2.20E+00	3.21E-03	7.44E-04	8.36E-02	4.51E-03	9.71E-01	4.05E-01	2.38E-01	3.64E-01	0.00E+00	-0.023	-2.494	-1.291
4	0.93	0.0	0.096	1.0	0.965	0.035	4.75E-01	1.81E-02	2.66E+00	1.84E-03	4.27E-04	8.51E-02	3.05E-03	9.81E-01	4.84E-01	1.96E-01	3.04E-01	0.00E+00	-0.015	-2.735	-1.461
3	0.70	0.0	0.072	1.0	0.979	0.021	5.72E-01	8.66E-03	3.20E+00	8.79E-04	2.04E-04	8.63E-02	1.82E-03	9.88E-01	5.79E-01	1.51E-01	2.39E-01	0.00E+00	-0.009	-3.056	-1.686
2	0.46	0.0	0.048	1.0	0.990	0.010	6.87E-01	2.97E-03	3.85E+00	3.01E-04	6.99E-05	8.73E-02	8.60E-04	9.95E-01	6.91E-01	1.04E-01	1.69E-01	0.00E+00	-0.004	-3.521	-2.011
1	0.23	0.0	0.024	1.0	0.997	0.003	8.24E-01	4.59E-04	4.61E+00	4.66E-05	1.08E-05	8.79E-02	2.35E-04	9.99E-01	8.25E-01	5.44E-02	9.18E-02	0.00E+00	-0.001	-4.332	-2.574

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Innovations in the Subsurface

ES&T

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-06 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		24.55	26.55	2	24.76	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
0:00:00	0.00	24.71	25.05	0.34	24.75	The first depth-to-fluids measurement after
0:01:20	1.33	24.71	25.07	0.36	24.75	bailer is raised above air-oil interface.
0:03:45	3.75	24.69	25.19	0.5	24.74	
0:06:00	6.00	24.68	25.20	0.52	24.73	
0:07:57	7.95	24.68	25.20	0.52	24.73	
0:09:50	9.83	24.66	25.20	0.54	24.72	
0:12:00	12.00	24.66	25.21	0.55	24.72	
0:14:29	14.48	24.67	25.22	0.55	24.73	
0:16:30	16.50	24.67	25.23	0.56	24.73	
0:21:15	21.25	24.66	25.29	0.63	24.73	
0:26:25	26.42	24.64	25.31	0.67	24.71	
0:36:25	36.42	24.64	25.39	0.75	24.72	
0:48:30	48.50	24.64	25.42	0.78	24.72	
1:03:30	63.50	24.62	25.46	0.84	24.71	
1:25:00	85.00	24.61	25.51	0.9	24.70	
1:45:00	105.00	24.60	25.57	0.97	24.70	
2:11:00	131.00	24.59	25.65	1.06	24.70	
2:39:00	159.00	24.58	25.66	1.08	24.69	
3:07:02	187.03	24.55	25.69	1.14	24.67	
3:43:30	223.50	24.56	25.70	1.14	24.68	
4:31:10	271.17	24.56	25.79	1.23	24.69	
5:46:55	346.92	24.55	25.89	1.34	24.69	
20:51:00	1251.00	24.69	26.74	2.05	24.90	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8966	(dimensionless)
Dynamic viscosity of free oil	30.72	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	39	dynes/cm
Oil-water interfacial tension:	32.94	dynes/cm
BETA-AO	1.846	
BETA-OW	2.19	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	3.5	1/feet
van Genuchten n:	1.92	(dimensionless)
van Genuchten m:	0.48	(dimensionless)

Free Oil Thickness in Well	2.00	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.1	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	1.65E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	6.97E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.13	
Geometric mean water sat'n within free oil layer:	0.79	
Specific Volume of Oil (above & below oil table):	0.19	ft
Specific Volume of Water (above & below oil table):	0.81	ft
Estimate of oil storativity:	0.02	
Bouwer-Rice Oil Conductivity (below oil table):	3.59E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	3.00	0.897	0.310	0.276	0.474	0.075	4.13E-03	4.65E-04	2.31E-02	7.60E-05	7.60E-06	1.80E-02	2.86E-03	6.45E-01	6.41E-03	2.89E-01	9.20E-01	8.80E-01	-0.324	-4.119	-1.123
29	2.90	0.807	0.300	0.293	0.484	0.075	4.69E-03	4.96E-04	2.63E-02	8.11E-05	8.11E-06	1.84E-02	2.86E-03	6.53E-01	7.19E-03	2.89E-01	9.15E-01	8.74E-01	-0.315	-4.091	-1.123
28	2.80	0.717	0.290	0.314	0.494	0.075	5.35E-03	5.30E-04	2.99E-02	8.67E-05	8.67E-06	1.88E-02	2.86E-03	6.62E-01	8.08E-03	2.89E-01	9.10E-01	8.67E-01	-0.306	-4.062	-1.123
27	2.70	0.628	0.279	0.341	0.505	0.075	6.11E-03	5.69E-04	3.42E-02	9.29E-05	9.29E-06	1.92E-02	2.86E-03	6.71E-01	9.11E-03	2.89E-01	9.05E-01	8.60E-01	-0.297	-4.032	-1.123
26	2.60	0.538	0.269	0.374	0.517	0.075	7.02E-03	6.12E-04	3.93E-02	1.00E-04	1.00E-05	1.96E-02	2.86E-03	6.80E-01	1.03E-02	2.89E-01	8.98E-01	8.52E-01	-0.287	-4.000	-1.123
25	2.50	0.448	0.259	0.419	0.529	0.075	8.08E-03	6.60E-04	4.53E-02	1.08E-04	1.08E-05	2.01E-02	2.86E-03	6.90E-01	1.17E-02	2.89E-01	8.92E-01	8.44E-01	-0.277	-3.967	-1.123
24	2.40	0.359	0.248	0.481	0.541	0.075	9.35E-03	7.14E-04	5.23E-02	1.17E-04	1.17E-05	2.06E-02	2.86E-03	7.00E-01	1.33E-02	2.89E-01	8.84E-01	8.35E-01	-0.267	-3.933	-1.123
23	2.30	0.269	0.238	0.569	0.555	0.075	1.09E-02	7.77E-04	6.08E-02	1.27E-04	1.27E-05	2.11E-02	2.86E-03	7.11E-01	1.53E-02	2.89E-01	8.76E-01	8.25E-01	-0.256	-3.896	-1.123
22	2.20	0.179	0.227	0.700	0.569	0.131	1.27E-02	4.10E-03	7.09E-02	6.70E-04	6.70E-05	2.16E-02	5.00E-03	7.22E-01	1.75E-02	3.82E-01	8.68E-01	7.64E-01	-0.245	-3.174	-0.881
21	2.10	0.090	0.217	0.879	0.584	0.295	1.48E-02	6.38E-02	8.31E-02	1.04E-02	1.04E-03	2.22E-02	1.12E-02	7.33E-01	2.02E-02	5.73E-01	8.58E-01	5.24E-01	-0.234	-1.982	-0.530
20	2.00	0.0	0.207	1.0	0.600	0.400	1.75E-02	4.78E-01	9.78E-02	7.82E-02	7.82E-03	2.28E-02	1.52E-02	7.45E-01	2.34E-02	6.67E-01	8.47E-01	0.00E+00	-0.222	-1.107	-0.398
19	1.90	0.0	0.196	1.0	0.617	0.383	2.07E-02	4.55E-01	1.16E-01	7.44E-02	7.44E-03	2.34E-02	1.46E-02	7.58E-01	2.73E-02	6.53E-01	8.35E-01	0.00E+00	-0.210	-1.129	-0.416
18	1.80	0.0	0.186	1.0	0.634	0.366	2.45E-02	4.30E-01	1.37E-01	7.03E-02	7.03E-03	2.41E-02	1.39E-02	7.70E-01	3.19E-02	6.38E-01	8.21E-01	0.00E+00	-0.198	-1.153	-0.437
17	1.70	0.0	0.176	1.0	0.653	0.347	2.93E-02	4.04E-01	1.64E-01	6.60E-02	6.60E-03	2.48E-02	1.32E-02	7.84E-01	3.74E-02	6.21E-01	8.07E-01	0.00E+00	-0.185	-1.180	-0.459
16	1.60	0.0	0.165	1.0	0.672	0.328	3.52E-02	3.76E-01	1.97E-01	6.15E-02	6.15E-03	2.55E-02	1.25E-02	7.97E-01	4.42E-02	6.03E-01	7.90E-01	0.00E+00	-0.172	-1.211	-0.485
15	1.50	0.0	0.155	1.0	0.693	0.307	4.25E-02	3.47E-01	2.38E-01	5.68E-02	5.68E-03	2.63E-02	1.17E-02	8.12E-01	5.24E-02	5.84E-01	7.71E-01	0.00E+00	-0.159	-1.246	-0.513
14	1.40	0.0	0.145	1.0	0.715	0.285	5.16E-02	3.17E-01	2.89E-01	5.18E-02	5.18E-03	2.72E-02	1.08E-02	8.26E-01	6.24E-02	5.63E-01	7.50E-01	0.00E+00	-0.146	-1.286	-0.545
13	1.30	0.0	0.134	1.0	0.737	0.263	6.29E-02	2.85E-01	3.52E-01	4.66E-02	4.66E-03	2.80E-02	9.98E-03	8.41E-01	7.48E-02	5.40E-01	7.27E-01	0.00E+00	-0.132	-1.331	-0.581
12	1.20	0.0	0.124	1.0	0.761	0.239	7.71E-02	2.53E-01	4.32E-01	4.13E-02	4.13E-03	2.89E-02	9.09E-03	8.57E-01	9.00E-02	5.15E-01	7.00E-01	0.00E+00	-0.119	-1.384	-0.621
11	1.10	0.0	0.114	1.0	0.785	0.215	9.50E-02	2.19E-01	5.32E-01	3.58E-02	3.58E-03	2.98E-02	8.16E-03	8.73E-01	1.09E-01	4.88E-01	6.70E-01	0.00E+00	-0.105	-1.446	-0.668
10	1.00	0.0	0.103	1.0	0.811	0.189	1.17E-01	1.86E-01	6.58E-01	3.04E-02	3.04E-03	3.08E-02	7.20E-03	8.89E-01	1.32E-01	4.59E-01	6.36E-01	0.00E+00	-0.091	-1.518	-0.723
9	0.90	0.0	0.093	1.0	0.836	0.164	1.46E-01	1.53E-01	8.17E-01	2.50E-02	2.50E-03	3.18E-02	6.22E-03	9.04E-01	1.61E-01	4.27E-01	5.98E-01	0.00E+00	-0.078	-1.603	-0.786
8	0.80	0.0	0.083	1.0	0.862	0.138	1.82E-01	1.21E-01	1.02E+00	1.98E-02	1.98E-03	3.28E-02	5.24E-03	9.20E-01	1.97E-01	3.92E-01	5.56E-01	0.00E+00	-0.065	-1.704	-0.860
7	0.70	0.0	0.072	1.0	0.887	0.113	2.26E-01	9.12E-02	1.27E+00	1.49E-02	1.49E-03	3.37E-02	4.28E-03	9.35E-01	2.42E-01	3.54E-01	5.08E-01	0.00E+00	-0.052	-1.826	-0.949
6	0.60	0.0	0.062	1.0	0.912	0.088	2.83E-01	6.46E-02	1.58E+00	1.06E-02	1.06E-03	3.47E-02	3.34E-03	9.50E-01	2.97E-01	3.12E-01	4.55E-01	0.00E+00	-0.040	-1.977	-1.056
5	0.50	0.0	0.052	1.0	0.935	0.065	3.52E-01	4.19E-02	1.97E+00	6.85E-03	6.85E-04	3.55E-02	2.46E-03	9.63E-01	3.66E-01	2.68E-01	3.95E-01	0.00E+00	-0.029	-2.164	-1.189
4	0.40	0.0	0.041	1.0	0.956	0.044	4.38E-01	2.40E-02	2.45E+00	3.93E-03	3.93E-04	3.63E-02	1.66E-03	9.75E-01	4.49E-01	2.21E-01	3.30E-01	0.00E+00	-0.019	-2.406	-1.358
3	0.30	0.0	0.031	1.0	0.974	0.026	5.42E-01	1.14E-02	3.03E+00	1.86E-03	1.86E-04	3.70E-02	9.89E-04	9.85E-01	5.50E-01	1.70E-01	2.59E-01	0.00E+00	-0.011	-2.731	-1.584
2	0.20	0.0	0.021	1.0	0.988	0.012	6.66E-01	3.82E-03	3.73E+00	6.24E-04	6.24E-05	3.75E-02	4.65E-04	9.93E-01	6.71E-01	1.17E-01	1.81E-01	0.00E+00	-0.005	-3.205	-1.912
1	0.10	0.0	0.010	1.0	0.997	0.003	8.15E-01	5.63E-04	4.56E+00	9.21E-05	9.21E-06	3.79E-02	1.25E-04	9.98E-01	8.16E-01	6.04E-02	9.66E-02	0.00E+00	-0.001	-4.036	-2.483

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EST

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-07 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		16.71	22.56	5.85	17.28	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
0:00:00	0.00	17.62	19.05	1.43	17.76	The first depth-to-fluids measurement after
0:00:48	0.80	17.40	18.92	1.52	17.55	bailer is raised above air-oil interface.
0:01:28	1.47	17.31	18.88	1.57	17.46	
0:02:20	2.33	17.26	18.82	1.56	17.41	
0:04:07	4.12	17.21	18.91	1.7	17.38	
0:05:38	5.63	17.18	18.96	1.78	17.35	
0:07:48	7.80	17.16	19.05	1.89	17.34	
0:09:38	9.63	17.14	19.15	2.01	17.34	
0:12:49	12.82	17.11	19.35	2.24	17.33	
0:14:50	14.83	17.09	19.43	2.34	17.32	
0:17:00	17.00	17.08	19.54	2.46	17.32	
0:29:38	29.63	17.02	20.11	3.09	17.32	
0:37:53	37.88	16.97	20.44	3.47	17.31	
0:45:58	45.97	16.92	20.51	3.59	17.27	
0:55:48	55.80	16.89	21.08	4.19	17.30	
1:19:00	79.00	16.81	21.62	4.81	17.28	
1:36:00	96.00	16.80	21.92	5.12	17.30	
1:54:53	114.88	16.74	22.17	5.43	17.27	
2:28:18	148.30	16.71	22.40	5.69	17.26	
3:33:08	213.13	16.69	22.71	6.02	17.27	
3:59:49	239.82	16.67	22.74	6.07	17.26	
4:46:33	286.55	16.65	22.80	6.15	17.25	
6:22:23	382.38	16.70	23.00	6.3	17.31	
				0	0.00	

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Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation
Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.9029 (dimensionless)
Dynamic viscosity of free oil:	45.02 centipoise
Air-water surface tension:	72 dynes/cm
Air-oil surface tension:	39 dynes/cm
Oil-water interfacial tension:	34.38 dynes/cm
BETA-AO	1.846
BETA-OW	2.09

Soil Properties of Formation

Hydraulic conductivity:	5.6 ft/day
Porosity:	0.38 (dimensionless)
Irreducible water saturation:	0.1 (dimensionless)
van Genuchten alpha:	2.8 1/feet
van Genuchten n:	1.92 (dimensionless)
van Genuchten m:	0.48 (dimensionless)

Free Oil Thickness in Well:	5.85 feet
Elevation at Oil-Wtr Interfac	0 feet
Elevation increment for calc	0.2925 feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	3.36E-02 ft/day
Oil Transmissivity of free oil layer (below oil table):	2.98E-01 ft2/day
Geometric mean oil saturation within free oil layer:	0.29
Geometric mean water sat'n within free oil layer:	0.59
Specific Volume of Oil (above & below oil table):	0.95 ft
Specific Volume of Water (above & below oil table):	1.75 ft
Estimate of oil storativity:	0.05
Bouwer-Rice Oil Conductivity (below oil table):	2.13E-01 ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	8.78	2.641	0.852	0.181	0.301	0.075	2.11E-04	1.21E-04	1.18E-03	1.36E-05	3.97E-06	3.34E-02	8.37E-03	4.72E-01	4.46E-04	2.89E-01	9.79E-01	9.58E-01	-0.522	-4.868	-1.123
29	8.48	2.377	0.824	0.189	0.307	0.075	2.42E-04	1.28E-04	1.36E-03	1.44E-05	4.21E-06	3.41E-02	8.37E-03	4.79E-01	5.06E-04	2.89E-01	9.78E-01	9.56E-01	-0.513	-4.842	-1.123
28	8.19	2.113	0.795	0.199	0.313	0.075	2.80E-04	1.36E-04	1.57E-03	1.53E-05	4.47E-06	3.48E-02	8.37E-03	4.87E-01	5.76E-04	2.89E-01	9.76E-01	9.54E-01	-0.504	-4.816	-1.123
27	7.90	1.849	0.767	0.212	0.320	0.075	3.26E-04	1.45E-04	1.82E-03	1.63E-05	4.76E-06	3.56E-02	8.37E-03	4.94E-01	6.59E-04	2.89E-01	9.74E-01	9.52E-01	-0.495	-4.788	-1.123
26	7.61	1.585	0.738	0.229	0.327	0.075	3.81E-04	1.55E-04	2.13E-03	1.74E-05	5.09E-06	3.64E-02	8.37E-03	5.03E-01	7.57E-04	2.89E-01	9.72E-01	9.49E-01	-0.485	-4.760	-1.123
25	7.31	1.320	0.710	0.252	0.335	0.075	4.47E-04	1.66E-04	2.50E-03	1.86E-05	5.45E-06	3.72E-02	8.37E-03	5.11E-01	8.75E-04	2.89E-01	9.70E-01	9.46E-01	-0.475	-4.730	-1.123
24	7.02	1.056	0.682	0.285	0.344	0.075	5.28E-04	1.78E-04	2.96E-03	2.00E-05	5.86E-06	3.82E-02	8.37E-03	5.20E-01	1.02E-03	2.89E-01	9.68E-01	9.43E-01	-0.464	-4.698	-1.123
23	6.73	0.792	0.653	0.338	0.353	0.075	6.28E-04	1.92E-04	3.52E-03	2.16E-05	6.32E-06	3.92E-02	8.37E-03	5.30E-01	1.19E-03	2.89E-01	9.66E-01	9.40E-01	-0.453	-4.665	-1.123
22	6.44	0.528	0.625	0.435	0.362	0.075	7.53E-04	2.08E-04	4.21E-03	2.34E-05	6.84E-06	4.03E-02	8.37E-03	5.40E-01	1.39E-03	2.89E-01	9.63E-01	9.36E-01	-0.441	-4.631	-1.123
21	6.14	0.264	0.596	0.648	0.373	0.275	9.08E-04	1.22E-02	5.08E-03	1.37E-03	4.02E-04	4.14E-02	3.06E-02	5.51E-01	1.65E-03	5.53E-01	9.59E-01	8.11E-01	-0.428	-2.862	-0.561
20	5.85	0.0	0.568	1.0	0.384	0.616	1.10E-03	7.55E-01	6.18E-03	8.48E-02	2.48E-02	4.27E-02	6.84E-02	5.62E-01	1.96E-03	8.27E-01	9.56E-01	0.00E+00	-0.415	-1.071	-0.211
19	5.56	0.0	0.540	1.0	0.397	0.603	1.35E-03	7.41E-01	7.59E-03	8.32E-02	2.43E-02	4.41E-02	6.71E-02	5.74E-01	2.36E-03	8.19E-01	9.51E-01	0.00E+00	-0.402	-1.080	-0.219
18	5.27	0.0	0.511	1.0	0.410	0.590	1.68E-03	7.25E-01	9.40E-03	8.15E-02	2.38E-02	4.56E-02	6.55E-02	5.87E-01	2.86E-03	8.09E-01	9.47E-01	0.00E+00	-0.387	-1.089	-0.229
17	4.97	0.0	0.483	1.0	0.425	0.575	2.10E-03	7.08E-01	1.18E-02	7.95E-02	2.32E-02	4.72E-02	6.39E-02	6.01E-01	3.49E-03	7.99E-01	9.41E-01	0.00E+00	-0.372	-1.100	-0.240
16	4.68	0.0	0.454	1.0	0.441	0.559	2.66E-03	6.88E-01	1.49E-02	7.72E-02	2.26E-02	4.91E-02	6.21E-02	6.16E-01	4.31E-03	7.88E-01	9.34E-01	0.00E+00	-0.355	-1.112	-0.253
15	4.39	0.0	0.426	1.0	0.459	0.541	3.40E-03	6.66E-01	1.91E-02	7.48E-02	2.19E-02	5.10E-02	6.01E-02	6.32E-01	5.39E-03	7.75E-01	9.27E-01	0.00E+00	-0.338	-1.126	-0.267
14	4.10	0.0	0.398	1.0	0.479	0.521	4.42E-03	6.41E-01	2.47E-02	7.19E-02	2.10E-02	5.32E-02	5.79E-02	6.49E-01	6.81E-03	7.61E-01	9.18E-01	0.00E+00	-0.320	-1.143	-0.283
13	3.80	0.0	0.369	1.0	0.501	0.499	5.82E-03	6.12E-01	3.26E-02	6.87E-02	2.01E-02	5.57E-02	5.55E-02	6.67E-01	8.71E-03	7.45E-01	9.07E-01	0.00E+00	-0.300	-1.163	-0.302
12	3.51	0.0	0.341	1.0	0.525	0.475	7.76E-03	5.80E-01	4.36E-02	6.51E-02	1.91E-02	5.84E-02	5.28E-02	6.87E-01	1.13E-02	7.26E-01	8.94E-01	0.00E+00	-0.280	-1.186	-0.324
11	3.22	0.0	0.312	1.0	0.553	0.447	1.06E-02	5.43E-01	5.93E-02	6.10E-02	1.78E-02	6.14E-02	4.97E-02	7.09E-01	1.49E-02	7.05E-01	8.78E-01	0.00E+00	-0.258	-1.215	-0.349
10	2.93	0.0	0.284	1.0	0.583	0.417	1.47E-02	5.01E-01	8.24E-02	5.63E-02	1.65E-02	6.48E-02	4.63E-02	7.33E-01	2.01E-02	6.81E-01	8.58E-01	0.00E+00	-0.234	-1.249	-0.380
9	2.63	0.0	0.256	1.0	0.617	0.383	2.08E-02	4.54E-01	1.17E-01	5.10E-02	1.49E-02	6.86E-02	4.25E-02	7.58E-01	2.75E-02	6.52E-01	8.34E-01	0.00E+00	-0.209	-1.293	-0.417
8	2.34	0.0	0.227	1.0	0.656	0.344	3.02E-02	4.00E-01	1.69E-01	4.49E-02	1.31E-02	7.29E-02	3.83E-02	7.86E-01	3.84E-02	6.18E-01	8.04E-01	0.00E+00	-0.183	-1.348	-0.463
7	2.05	0.0	0.199	1.0	0.699	0.301	4.47E-02	3.39E-01	2.50E-01	3.81E-02	1.12E-02	7.76E-02	3.35E-02	8.16E-01	5.48E-02	5.79E-01	7.66E-01	0.00E+00	-0.156	-1.419	-0.521
6	1.76	0.0	0.170	1.0	0.746	0.254	6.78E-02	2.73E-01	3.80E-01	3.07E-02	8.98E-03	8.29E-02	2.82E-02	8.47E-01	8.00E-02	5.31E-01	7.17E-01	0.00E+00	-0.127	-1.513	-0.595
5	1.46	0.0	0.142	1.0	0.797	0.203	1.05E-01	2.03E-01	5.88E-01	2.28E-02	6.68E-03	8.86E-02	2.25E-02	8.80E-01	1.19E-01	4.75E-01	6.55E-01	0.00E+00	-0.098	-1.641	-0.693
4	1.17	0.0	0.114	1.0	0.851	0.149	1.66E-01	1.34E-01	9.27E-01	1.51E-02	4.41E-03	9.46E-02	1.65E-02	9.14E-01	1.81E-01	4.07E-01	5.74E-01	0.00E+00	-0.070	-1.822	-0.827
3	0.88	0.0	0.085	1.0	0.904	0.096	2.63E-01	7.26E-02	1.48E+00	8.16E-03	2.39E-03	1.01E-01	1.06E-02	9.45E-01	2.79E-01	3.26E-01	4.72E-01	0.00E+00	-0.044	-2.089	-1.020
2	0.59	0.0	0.057	1.0	0.952	0.048	4.18E-01	2.74E-02	2.34E+00	3.07E-03	8.99E-04	1.06E-01	5.33E-03	9.73E-01	4.30E-01	2.31E-01	3.44E-01	0.00E+00	-0.021	-2.512	-1.319
1	0.29	0.0	0.028	1.0	0.987	0.013	6.52E-01	4.39E-03	3.65E+00	4.93E-04	1.44E-04	1.10E-01	1.50E-03	9.92E-01	6.57E-01	1.22E-01	1.89E-01	0.00E+00	-0.006	-3.307	-1.870

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-08 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		18.30	24.73	6.43	18.85	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
12/3/03 8:29	0.00	19.28	21.30	2.02	19.45	The first depth-to-fluids measurement after
12/3/03 8:31	2.67	18.82	20.91	2.09	19.00	bailer is raised above air-oil interface.
12/3/03 8:33	3.95	18.71	20.41	1.7	18.86	
12/3/03 8:34	5.75	18.65	19.55	0.9	18.73	
12/3/03 8:37	8.00	18.58	19.40	0.82	18.65	
12/3/03 8:39	9.87	18.53	19.35	0.82	18.60	
12/3/03 8:41	12.70	18.46	18.90	0.44	18.50	
12/3/03 8:45	16.33	18.41	18.80	0.39	18.44	
12/3/03 8:48	19.17	18.38	18.78	0.4	18.41	
12/3/03 8:51	22.30	18.35	18.79	0.44	18.39	
12/3/03 8:54	25.25	18.35	18.78	0.43	18.39	
12/3/03 8:56	27.00	18.33	18.75	0.42	18.37	
12/3/03 9:25	55.83	18.29	18.75	0.46	18.33	
12/3/03 10:11	102.80	18.30	18.78	0.48	18.34	
12/3/03 10:51	142.42	18.32	18.75	0.43	18.36	
12/3/03 12:54	265.08	18.28	18.80	0.52	18.32	
12/3/03 14:09	340.58	18.30	18.80	0.5	18.34	
12/3/03 15:07	398.00	18.31	18.83	0.52	18.35	
12/3/03 15:39	430.08	18.30	18.83	0.53	18.35	
12/4/03 8:02	1412.83	18.27	19.05	0.78	18.34	
12/4/03 9:25	1495.83	18.34	18.95	0.61	18.39	
12/4/03 10:30	1560.83	18.32	19.10	0.78	18.39	
12/4/03 11:52	1642.83	18.31	18.75	0.44	18.35	
12/4/03 13:05	1715.83	18.31	19.10	0.79	18.38	
12/4/03 14:05	1775.83	18.31	19.00			
12/5/03 7:58	2848.83	18.25	19.27			

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Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.9147	(dimensionless)
Dynamic viscosity of free oil:	47.13	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	30.5	dynes/cm
Oil-water interfacial tension:	22.76	dynes/cm
BETA-AO	2.361	
BETA-OW	3.16	

Free Oil Thickness in Well:

Free Oil Thickness in Well:	6.43	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.3215	feet

Soil Properties of Formation

Hydraulic conductivity:	0.03	ft/day
Porosity:	0.46	(dimensionless)
Irreducible water saturation:	0.15	(dimensionless)
van Genuchten alpha:	0.42	1/feet
van Genuchten n:	1.75	(dimensionless)
van Genuchten m:	0.43	(dimensionless)

Calculated Results

Geometric mean Oil Conductivity (below oil table):	1.77E-05	ft/day
Oil Transmissivity of free oil layer (below oil table):	2.52E-04	ft2/day
Geometric mean oil saturation within free oil layer:	0.04	
Geometric mean water sat'n within free oil layer:	0.93	
Specific Volume of Oil (above & below oil table):	0.28	ft
Specific Volume of Water (above & below oil table):	3.95	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	4.35E-04	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	9.65	2.941	0.823	0.508	0.760	0.050	4.59E-02	8.81E-04	1.38E-03	5.13E-07	1.65E-07	1.12E-01	7.43E-03	8.47E-01	5.42E-02	2.43E-01	7.67E-01	7.07E-01	-0.119	-6.290	-1.299
29	9.32	2.647	0.795	0.533	0.768	0.050	4.99E-02	9.46E-04	1.50E-03	5.51E-07	1.77E-07	1.14E-01	7.43E-03	8.53E-01	5.85E-02	2.43E-01	7.58E-01	6.96E-01	-0.114	-6.259	-1.299
28	9.00	2.353	0.768	0.563	0.777	0.050	5.43E-02	1.02E-03	1.63E-03	5.94E-07	1.91E-07	1.15E-01	7.43E-03	8.59E-01	6.32E-02	2.43E-01	7.49E-01	6.84E-01	-0.110	-6.227	-1.299
27	8.68	2.059	0.740	0.597	0.785	0.050	5.92E-02	1.10E-03	1.77E-03	6.42E-07	2.06E-07	1.16E-01	7.43E-03	8.65E-01	6.84E-02	2.43E-01	7.38E-01	6.71E-01	-0.105	-6.193	-1.299
26	8.36	1.764	0.713	0.637	0.794	0.050	6.45E-02	1.20E-03	1.94E-03	6.96E-07	2.24E-07	1.17E-01	7.43E-03	8.71E-01	7.41E-02	2.43E-01	7.28E-01	6.58E-01	-0.100	-6.157	-1.299
25	8.04	1.470	0.686	0.686	0.803	0.050	7.05E-02	1.30E-03	2.11E-03	7.58E-07	2.44E-07	1.19E-01	7.43E-03	8.77E-01	8.04E-02	2.43E-01	7.16E-01	6.43E-01	-0.095	-6.120	-1.299
24	7.72	1.176	0.658	0.744	0.812	0.050	7.71E-02	1.42E-03	2.31E-03	8.29E-07	2.66E-07	1.20E-01	7.43E-03	8.83E-01	8.73E-02	2.43E-01	7.04E-01	6.28E-01	-0.090	-6.082	-1.299
23	7.39	0.882	0.631	0.812	0.821	0.050	8.44E-02	1.56E-03	2.53E-03	9.10E-07	2.93E-07	1.21E-01	7.43E-03	8.89E-01	9.50E-02	2.43E-01	6.92E-01	6.12E-01	-0.085	-6.041	-1.299
22	7.07	0.588	0.603	0.888	0.831	0.058	9.25E-02	2.54E-03	2.78E-03	1.48E-06	4.76E-07	1.23E-01	8.52E-03	8.95E-01	1.03E-01	2.60E-01	6.78E-01	5.80E-01	-0.081	-5.830	-1.239
21	6.75	0.294	0.576	0.961	0.840	0.121	1.02E-01	3.08E-02	3.05E-03	1.79E-05	5.76E-06	1.24E-01	1.79E-02	9.01E-01	1.13E-01	3.77E-01	6.64E-01	3.79E-01	-0.076	-4.747	-0.918
20	6.43	0.0	0.548	1.0	0.850	0.150	1.12E-01	1.77E-01	3.35E-03	1.03E-04	3.32E-05	1.26E-01	2.22E-02	9.07E-01	1.23E-01	4.21E-01	6.49E-01	0.00E+00	-0.071	-3.986	-0.823
19	6.11	0.0	0.521	1.0	0.859	0.141	1.23E-01	1.63E-01	3.68E-03	9.50E-05	3.05E-05	1.27E-01	2.08E-02	9.13E-01	1.34E-01	4.07E-01	6.33E-01	0.00E+00	-0.066	-4.022	-0.852
18	5.79	0.0	0.494	1.0	0.869	0.131	1.35E-01	1.49E-01	4.06E-03	8.69E-05	2.79E-05	1.29E-01	1.94E-02	9.20E-01	1.47E-01	3.93E-01	6.16E-01	0.00E+00	-0.061	-4.061	-0.883
17	5.47	0.0	0.466	1.0	0.879	0.121	1.49E-01	1.35E-01	4.48E-03	7.88E-05	2.53E-05	1.30E-01	1.79E-02	9.26E-01	1.61E-01	3.78E-01	5.99E-01	0.00E+00	-0.056	-4.103	-0.916
16	5.14	0.0	0.439	1.0	0.888	0.112	1.65E-01	1.22E-01	4.94E-03	7.09E-05	2.28E-05	1.31E-01	1.65E-02	9.32E-01	1.77E-01	3.62E-01	5.80E-01	0.00E+00	-0.051	-4.150	-0.952
15	4.82	0.0	0.411	1.0	0.898	0.102	1.82E-01	1.08E-01	5.46E-03	6.31E-05	2.03E-05	1.33E-01	1.51E-02	9.38E-01	1.94E-01	3.46E-01	5.59E-01	0.00E+00	-0.047	-4.200	-0.992
14	4.50	0.0	0.384	1.0	0.908	0.092	2.02E-01	9.54E-02	6.05E-03	5.56E-05	1.79E-05	1.34E-01	1.37E-02	9.44E-01	2.13E-01	3.30E-01	5.38E-01	0.00E+00	-0.042	-4.255	-1.034
13	4.18	0.0	0.357	1.0	0.917	0.083	2.23E-01	8.29E-02	6.70E-03	4.83E-05	1.55E-05	1.36E-01	1.23E-02	9.50E-01	2.35E-01	3.12E-01	5.15E-01	0.00E+00	-0.038	-4.316	-1.082
12	3.86	0.0	0.329	1.0	0.926	0.074	2.47E-01	7.10E-02	7.42E-03	4.13E-05	1.33E-05	1.37E-01	1.09E-02	9.56E-01	2.59E-01	2.94E-01	4.91E-01	0.00E+00	-0.033	-4.384	-1.133
11	3.54	0.0	0.302	1.0	0.936	0.064	2.75E-01	5.97E-02	8.24E-03	3.47E-05	1.12E-05	1.38E-01	9.53E-03	9.61E-01	2.86E-01	2.75E-01	4.66E-01	0.00E+00	-0.029	-4.459	-1.191
10	3.22	0.0	0.274	1.0	0.944	0.056	3.05E-01	4.91E-02	9.15E-03	2.86E-05	9.20E-06	1.40E-01	8.22E-03	9.67E-01	3.15E-01	2.56E-01	4.38E-01	0.00E+00	-0.025	-4.544	-1.255
9	2.89	0.0	0.247	1.0	0.953	0.047	3.39E-01	3.94E-02	1.02E-02	2.30E-05	7.38E-06	1.41E-01	6.96E-03	9.72E-01	3.49E-01	2.35E-01	4.09E-01	0.00E+00	-0.021	-4.639	-1.327
8	2.57	0.0	0.219	1.0	0.961	0.039	3.77E-01	3.07E-02	1.13E-02	1.79E-05	5.74E-06	1.42E-01	5.76E-03	9.77E-01	3.86E-01	2.14E-01	3.79E-01	0.00E+00	-0.017	-4.748	-1.410
7	2.25	0.0	0.192	1.0	0.969	0.031	4.20E-01	2.29E-02	1.26E-02	1.34E-05	4.29E-06	1.43E-01	4.63E-03	9.81E-01	4.28E-01	1.92E-01	3.46E-01	0.00E+00	-0.014	-4.874	-1.504
6	1.93	0.0	0.165	1.0	0.976	0.024	4.68E-01	1.63E-02	1.41E-02	9.49E-06	3.05E-06	1.44E-01	3.59E-03	9.86E-01	4.75E-01	1.69E-01	3.11E-01	0.00E+00	-0.011	-5.023	-1.615
5	1.61	0.0	0.137	1.0	0.982	0.018	5.23E-01	1.08E-02	1.57E-02	6.29E-06	2.02E-06	1.45E-01	2.64E-03	9.89E-01	5.29E-01	1.45E-01	2.73E-01	0.00E+00	-0.008	-5.201	-1.748
4	1.29	0.0	0.110	1.0	0.988	0.012	5.85E-01	6.48E-03	1.75E-02	3.77E-06	1.21E-06	1.46E-01	1.81E-03	9.93E-01	5.89E-01	1.20E-01	2.32E-01	0.00E+00	-0.005	-5.423	-1.913
3	0.96	0.0	0.082	1.0	0.993	0.007	6.56E-01	3.33E-03	1.97E-02	1.94E-06	6.23E-07	1.47E-01	1.10E-03	9.96E-01	6.59E-01	9.37E-02	1.88E-01	0.00E+00	-0.003	-5.713	-2.127
2	0.64	0.0	0.055	1.0	0.996	0.004	7.39E-01	1.29E-03	2.22E-02	7.49E-07	2.41E-07	1.47E-01	5.47E-04	9.98E-01	7.40E-01	6.59E-02	1.40E-01	0.00E+00	-0.002	-6.126	-2.432
1	0.32	0.0	0.027	1.0	0.999	0.001	8.40E-01	2.50E-04	2.52E-02	1.46E-07	4.68E-08	1.48E-01	1.63E-04	9.99E-01	8.40E-01	3.60E-02	8.33E-02	0.00E+00	0.000	-6.837	-2.957

MULTIPHASE ENVIRONMENTAL, Inc.
Innovations in the Subsurface

EST

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-09 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		24.96	27.63	2.67	25.23	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
14:20:30	0.00	25.23	25.85	0.62	25.29	The first depth-to-fluids measurement after
14:21:05	0.58	25.22	25.81	0.59	25.28	bailer is raised above air-oil interface.
14:21:40	1.17	25.22	25.93	0.71	25.29	
14:22:10	1.67	25.22	25.94	0.72	25.29	
14:22:50	2.33	25.22	25.96	0.74	25.30	
14:23:05	2.58	25.20	25.97	0.77	25.28	
14:23:28	2.97	25.20	25.97	0.77	25.28	
14:23:52	3.37	25.19	25.99	0.8	25.27	
14:24:01	3.52	25.18	26.01	0.83	25.26	
14:24:40	4.17	25.19	26.01	0.82	25.27	
14:25:05	4.58	25.19	26.03	0.84	25.28	
14:25:40	5.17	25.18	26.07	0.89	25.27	
14:26:10	5.67	25.18	26.08	0.9	25.27	
14:26:50	6.33	25.18	26.09	0.91	25.27	
14:27:08	6.63	25.18	26.10	0.92	25.27	
14:27:38	7.13	25.17	26.13	0.96	25.27	
14:28:33	8.05	25.17	26.16	0.99	25.27	
14:29:13	8.72	25.17	26.16	0.99	25.27	
14:29:42	9.20	25.17	26.17	1	25.27	
14:30:07	9.62	25.17	26.19	1.02	25.27	
14:30:39	10.15	25.17	26.21	1.04	25.28	
14:30:58	10.47	25.16	26.22	1.06	25.27	
14:31:15	10.75	25.16	26.23	1.07	25.27	
14:33:10	12.67	25.15	26.24	1.09	25.26	
14:35:20	14.83	25.14	26.32	1.18	25.26	
14:37:30	17.00	25.13	26.39	1.26	25.26	
14:39:28	18.97	25.12	26.47	1.35	25.26	
14:41:22	20.87	25.11	26.57	1.46	25.26	
14:49:17	28.78	25.09	26.69	1.6	25.25	
14:55:20	34.83	25.08	26.80	1.72	25.26	
14:58:20	37.83	25.08	26.82	1.74	25.26	
15:03:35	43.08	25.07	26.89	1.82	25.26	
15:09:30	49.00	25.07	26.94	1.87	25.26	
15:28:15	67.75	25.04	27.00	1.96	25.24	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

EST

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.898	(dimensionless)
Dynamic viscosity of free oil:	34.34	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	36	dynes/cm
Oil-water interfacial tension:	20.64	dynes/cm
BETA-AO	2.000	
BETA-OW	3.49	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.2	1/feet
van Genuchten n:	2.28	(dimensionless)
van Genuchten m:	0.56	(dimensionless)

Free Oil Thickness in Well:	2.67	feet
Elevation at Oil-Wtr Interface	0	feet
Elevation increment for calc	0.1335	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	4.18E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	4.36E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.07	
Geometric mean water sat'n within free oil layer:	0.85	
Specific Volume of Oil (above & below oil table):	0.21	ft
Specific Volume of Water (above & below oil table):	1.15	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	3.96E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	4.01	1.199	0.409	0.322	0.492	0.075	1.20E-02	8.40E-04	6.72E-02	1.23E-04	1.64E-05	2.50E-02	3.82E-03	6.60E-01	1.82E-02	2.89E-01	8.65E-01	8.11E-01	-0.308	-3.910	-1.123
29	3.87	1.079	0.395	0.351	0.505	0.075	1.38E-02	8.96E-04	7.74E-02	1.31E-04	1.75E-05	2.56E-02	3.82E-03	6.71E-01	2.06E-02	2.89E-01	8.56E-01	8.01E-01	-0.297	-3.882	-1.123
28	3.74	0.959	0.381	0.386	0.519	0.075	1.60E-02	9.60E-04	8.95E-02	1.41E-04	1.88E-05	2.63E-02	3.82E-03	6.82E-01	2.34E-02	2.89E-01	8.47E-01	7.89E-01	-0.285	-3.852	-1.123
27	3.60	0.839	0.368	0.431	0.534	0.075	1.85E-02	1.03E-03	1.04E-01	1.51E-04	2.01E-05	2.71E-02	3.82E-03	6.94E-01	2.67E-02	2.89E-01	8.37E-01	7.77E-01	-0.273	-3.821	-1.123
26	3.47	0.719	0.354	0.488	0.549	0.075	2.16E-02	1.11E-03	1.21E-01	1.63E-04	2.17E-05	2.78E-02	3.82E-03	7.06E-01	3.05E-02	2.89E-01	8.25E-01	7.63E-01	-0.261	-3.789	-1.123
25	3.34	0.599	0.340	0.561	0.565	0.075	2.51E-02	1.20E-03	1.41E-01	1.76E-04	2.35E-05	2.87E-02	3.82E-03	7.19E-01	3.50E-02	2.89E-01	8.13E-01	7.49E-01	-0.248	-3.755	-1.123
24	3.20	0.480	0.327	0.653	0.582	0.075	2.94E-02	1.30E-03	1.65E-01	1.91E-04	2.54E-05	2.95E-02	3.82E-03	7.32E-01	4.02E-02	2.89E-01	8.00E-01	7.33E-01	-0.235	-3.720	-1.123
23	3.07	0.360	0.313	0.765	0.599	0.165	3.45E-02	1.28E-02	1.93E-01	1.88E-03	2.51E-04	3.04E-02	8.39E-03	7.45E-01	4.63E-02	4.29E-01	7.85E-01	6.12E-01	-0.222	-2.726	-0.782
22	2.94	0.240	0.300	0.882	0.618	0.264	4.05E-02	6.28E-02	2.27E-01	9.20E-03	1.23E-03	3.13E-02	1.34E-02	7.59E-01	5.34E-02	5.42E-01	7.69E-01	4.28E-01	-0.209	-2.036	-0.578
21	2.80	0.120	0.286	0.972	0.637	0.335	4.77E-02	1.88E-01	2.67E-01	2.75E-02	3.67E-03	3.23E-02	1.70E-02	7.73E-01	6.18E-02	6.10E-01	7.51E-01	1.97E-01	-0.196	-1.561	-0.476
20	2.67	0.0	0.272	1.0	0.657	0.343	5.64E-02	3.31E-01	3.16E-01	4.85E-02	6.47E-03	3.33E-02	1.74E-02	7.87E-01	7.16E-02	6.17E-01	7.32E-01	0.00E+00	-0.182	-1.315	-0.465
19	2.54	0.0	0.259	1.0	0.678	0.322	6.67E-02	3.03E-01	3.74E-01	4.43E-02	5.92E-03	3.44E-02	1.63E-02	8.02E-01	8.32E-02	5.98E-01	7.11E-01	0.00E+00	-0.169	-1.353	-0.492
18	2.40	0.0	0.245	1.0	0.700	0.300	7.91E-02	2.74E-01	4.43E-01	4.01E-02	5.36E-03	3.55E-02	1.52E-02	8.16E-01	9.69E-02	5.78E-01	6.89E-01	0.00E+00	-0.155	-1.397	-0.523
17	2.27	0.0	0.231	1.0	0.722	0.278	9.39E-02	2.45E-01	5.26E-01	3.59E-02	4.79E-03	3.66E-02	1.41E-02	8.31E-01	1.13E-01	5.56E-01	6.64E-01	0.00E+00	-0.141	-1.445	-0.556
16	2.14	0.0	0.218	1.0	0.745	0.255	1.12E-01	2.16E-01	6.25E-01	3.16E-02	4.22E-03	3.78E-02	1.29E-02	8.47E-01	1.32E-01	5.32E-01	6.37E-01	0.00E+00	-0.128	-1.500	-0.593
15	2.00	0.0	0.204	1.0	0.768	0.232	1.33E-01	1.87E-01	7.43E-01	2.74E-02	3.66E-03	3.90E-02	1.18E-02	8.62E-01	1.54E-01	5.07E-01	6.08E-01	0.00E+00	-0.115	-1.562	-0.635
14	1.87	0.0	0.191	1.0	0.792	0.208	1.58E-01	1.59E-01	8.83E-01	2.34E-02	3.12E-03	4.02E-02	1.06E-02	8.77E-01	1.80E-01	4.81E-01	5.76E-01	0.00E+00	-0.101	-1.632	-0.682
13	1.74	0.0	0.177	1.0	0.815	0.185	1.87E-01	1.33E-01	1.05E+00	1.95E-02	2.60E-03	4.14E-02	9.36E-03	8.92E-01	2.10E-01	4.53E-01	5.42E-01	0.00E+00	-0.089	-1.711	-0.734
12	1.60	0.0	0.163	1.0	0.839	0.161	2.22E-01	1.08E-01	1.24E+00	1.58E-02	2.11E-03	4.26E-02	8.17E-03	9.06E-01	2.45E-01	4.23E-01	5.05E-01	0.00E+00	-0.076	-1.801	-0.793
11	1.47	0.0	0.150	1.0	0.862	0.138	2.63E-01	8.50E-02	1.47E+00	1.24E-02	1.66E-03	4.37E-02	7.00E-03	9.20E-01	2.85E-01	3.92E-01	4.66E-01	0.00E+00	-0.064	-1.905	-0.860
10	1.34	0.0	0.136	1.0	0.884	0.116	3.09E-01	6.46E-02	1.73E+00	9.46E-03	1.26E-03	4.49E-02	5.87E-03	9.34E-01	3.31E-01	3.58E-01	4.24E-01	0.00E+00	-0.053	-2.024	-0.937
9	1.20	0.0	0.123	1.0	0.906	0.094	3.63E-01	4.70E-02	2.03E+00	6.88E-03	9.19E-04	4.59E-02	4.79E-03	9.46E-01	3.83E-01	3.24E-01	3.81E-01	0.00E+00	-0.043	-2.162	-1.025
8	1.07	0.0	0.109	1.0	0.925	0.075	4.23E-01	3.25E-02	2.37E+00	4.75E-03	6.34E-04	4.69E-02	3.79E-03	9.58E-01	4.41E-01	2.88E-01	3.36E-01	0.00E+00	-0.034	-2.323	-1.127
7	0.93	0.0	0.095	1.0	0.943	0.057	4.89E-01	2.10E-02	2.74E+00	3.07E-03	4.10E-04	4.78E-02	2.88E-03	9.68E-01	5.05E-01	2.51E-01	2.89E-01	0.00E+00	-0.025	-2.512	-1.246
6	0.80	0.0	0.082	1.0	0.959	0.041	5.62E-01	1.25E-02	3.15E+00	1.83E-03	2.44E-04	4.86E-02	2.08E-03	9.77E-01	5.75E-01	2.13E-01	2.42E-01	0.00E+00	-0.018	-2.738	-1.387
5	0.67	0.0	0.068	1.0	0.972	0.028	6.39E-01	6.62E-03	3.58E+00	9.70E-04	1.29E-04	4.93E-02	1.40E-03	9.85E-01	6.49E-01	1.75E-01	1.94E-01	0.00E+00	-0.012	-3.013	-1.558
4	0.53	0.0	0.054	1.0	0.983	0.017	7.19E-01	3.00E-03	4.03E+00	4.39E-04	5.86E-05	4.99E-02	8.58E-04	9.91E-01	7.26E-01	1.37E-01	1.48E-01	0.00E+00	-0.007	-3.358	-1.772
3	0.40	0.0	0.041	1.0	0.991	0.009	8.00E-01	1.06E-03	4.48E+00	1.55E-04	2.07E-05	5.03E-02	4.51E-04	9.95E-01	8.04E-01	9.94E-02	1.03E-01	0.00E+00	-0.004	-3.809	-2.051
2	0.27	0.0	0.027	1.0	0.996	0.004	8.78E-01	2.40E-04	4.92E+00	3.52E-05	4.70E-06	5.05E-02	1.80E-04	9.98E-01	8.80E-01	6.29E-02	6.18E-02	0.00E+00	-0.002	-4.454	-2.449
1	0.13	0.0	0.014	1.0	0.999	0.001	9.49E-01	1.86E-05	5.32E+00	2.73E-06	3.64E-07	5.07E-02	3.73E-05	1.00E+00	9.50E-01	2.86E-02	2.55E-02	0.00E+00	0.000	-5.564	-3.134

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-10 **Site:** Quanta

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
Measurements Prior to Bailing						
		19.42	20.56	1.14	19.55	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
10:12:15	0.00	19.53	19.85	0.32	19.57	The first depth-to-fluids measurement after
10:12:50	0.58	19.52	19.91	0.39	19.56	bailer is raised above air-oil interface.
10:13:20	1.08	19.52	19.92	0.4	19.56	
10:13:53	1.63	19.52	19.93	0.41	19.57	
10:14:08	1.88	19.52	19.94	0.42	19.57	
10:14:33	2.30	19.52	19.94	0.42	19.57	
10:14:58	2.72	19.52	19.93	0.41	19.57	
10:15:15	3.00	19.52	19.94	0.42	19.57	
10:15:38	3.38	19.52	19.93	0.41	19.57	
10:15:58	3.72	19.52	19.95	0.43	19.57	
10:16:10	3.92	19.51	19.94	0.43	19.56	
10:16:42	4.45	19.51	19.93	0.42	19.56	
10:17:10	4.92	19.52	19.94	0.42	19.57	
10:17:28	5.22	19.51	19.92	0.41	19.56	
10:17:56	5.68	19.51	19.92	0.41	19.56	
10:18:20	6.08	19.51	19.92	0.41	19.56	
10:18:50	6.58	19.51	19.92	0.41	19.56	
10:19:10	6.92	19.51	19.94	0.43	19.56	
10:19:47	7.53	19.51	19.93	0.42	19.56	
10:20:33	8.30	19.51	19.93	0.42	19.56	
10:20:49	8.57	19.51	19.93	0.42	19.56	
10:21:15	9.00	19.51	19.93	0.42	19.56	
10:21:47	9.53	19.51	19.92	0.41	19.56	
10:22:15				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8889	(dimensionless)
Dynamic viscosity of free oil:	25.4	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	35.8	dynes/cm
Oil-water interfacial tension:	16	dynes/cm
BETA-AO	2.011	
BETA-OW	4.50	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.5	1/feet
van Genuchten n:	1.72	(dimensionless)
van Genuchten m:	0.42	(dimensionless)

Free Oil Thickness in Well:	1.14	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.057	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	8.72E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	2.05E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.05	
Geometric mean water sat'n within free oil layer:	0.91	
Specific Volume of Oil (above & below oil table):	0.06	ft
Specific Volume of Water (above & below oil table):	0.56	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	2.10E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	1.71	0.507	0.190	0.662	0.710	0.075	2.96E-02	1.66E-03	1.66E-01	3.26E-04	1.86E-05	1.54E-02	1.63E-03	8.23E-01	3.59E-02	2.89E-01	8.10E-01	7.35E-01	-0.149	-3.487	-1.123
29	1.65	0.456	0.184	0.691	0.719	0.075	3.23E-02	1.79E-03	1.81E-01	3.50E-04	1.99E-05	1.56E-02	1.63E-03	8.29E-01	3.90E-02	2.89E-01	8.03E-01	7.24E-01	-0.143	-3.456	-1.123
28	1.60	0.405	0.177	0.722	0.728	0.075	3.54E-02	1.92E-03	1.98E-01	3.77E-04	2.15E-05	1.58E-02	1.63E-03	8.35E-01	4.24E-02	2.89E-01	7.94E-01	7.13E-01	-0.138	-3.424	-1.123
27	1.54	0.355	0.171	0.757	0.737	0.075	3.88E-02	2.08E-03	2.17E-01	4.08E-04	2.32E-05	1.60E-02	1.63E-03	8.42E-01	4.61E-02	2.89E-01	7.85E-01	7.00E-01	-0.132	-3.390	-1.123
26	1.48	0.304	0.165	0.794	0.747	0.075	4.26E-02	2.26E-03	2.39E-01	4.42E-04	2.52E-05	1.62E-02	1.63E-03	8.48E-01	5.03E-02	2.89E-01	7.76E-01	6.87E-01	-0.127	-3.354	-1.123
25	1.43	0.253	0.158	0.834	0.757	0.077	4.69E-02	2.58E-03	2.63E-01	5.06E-04	2.88E-05	1.64E-02	1.66E-03	8.54E-01	5.49E-02	2.92E-01	7.66E-01	6.72E-01	-0.121	-3.296	-1.116
24	1.37	0.203	0.152	0.875	0.767	0.108	5.17E-02	7.86E-03	2.89E-01	1.54E-03	8.79E-05	1.66E-02	2.34E-03	8.61E-01	6.00E-02	3.46E-01	7.55E-01	6.04E-01	-0.115	-2.812	-0.967
23	1.31	0.152	0.146	0.917	0.777	0.139	5.71E-02	2.01E-02	3.20E-01	3.94E-03	2.24E-04	1.68E-02	3.01E-03	8.68E-01	6.58E-02	3.93E-01	7.44E-01	5.18E-01	-0.109	-2.405	-0.857
22	1.25	0.101	0.139	0.955	0.788	0.167	6.31E-02	4.60E-02	3.53E-01	9.01E-03	5.13E-04	1.71E-02	3.62E-03	8.74E-01	7.22E-02	4.31E-01	7.31E-01	4.05E-01	-0.103	-2.045	-0.777
21	1.20	0.051	0.133	0.986	0.799	0.187	6.99E-02	9.80E-02	3.91E-01	1.92E-02	1.09E-03	1.73E-02	4.05E-03	8.81E-01	7.93E-02	4.56E-01	7.18E-01	2.54E-01	-0.098	-1.716	-0.729
20	1.14	0.0	0.127	1.0	0.810	0.190	7.76E-02	2.28E-01	4.34E-01	4.47E-02	2.55E-03	1.75E-02	4.12E-03	8.88E-01	8.74E-02	4.60E-01	7.04E-01	0.00E+00	-0.092	-1.350	-0.721
19	1.08	0.0	0.120	1.0	0.821	0.179	8.63E-02	2.12E-01	4.83E-01	4.16E-02	2.37E-03	1.78E-02	3.88E-03	8.95E-01	9.64E-02	4.46E-01	6.90E-01	0.00E+00	-0.086	-1.381	-0.747
18	1.03	0.0	0.114	1.0	0.832	0.168	9.61E-02	1.96E-01	5.38E-01	3.84E-02	2.19E-03	1.80E-02	3.63E-03	9.02E-01	1.07E-01	4.32E-01	6.74E-01	0.00E+00	-0.080	-1.416	-0.775
17	0.97	0.0	0.108	1.0	0.844	0.156	1.07E-01	1.80E-01	6.00E-01	3.52E-02	2.01E-03	1.83E-02	3.39E-03	9.09E-01	1.18E-01	4.17E-01	6.57E-01	0.00E+00	-0.074	-1.453	-0.806
16	0.91	0.0	0.101	1.0	0.855	0.145	1.20E-01	1.63E-01	6.71E-01	3.20E-02	1.83E-03	1.85E-02	3.14E-03	9.16E-01	1.31E-01	4.01E-01	6.38E-01	0.00E+00	-0.068	-1.494	-0.839
15	0.85	0.0	0.095	1.0	0.867	0.133	1.34E-01	1.47E-01	7.51E-01	2.89E-02	1.64E-03	1.88E-02	2.88E-03	9.23E-01	1.45E-01	3.85E-01	6.19E-01	0.00E+00	-0.062	-1.540	-0.876
14	0.80	0.0	0.089	1.0	0.879	0.121	1.50E-01	1.31E-01	8.43E-01	2.57E-02	1.47E-03	1.90E-02	2.63E-03	9.30E-01	1.62E-01	3.67E-01	5.98E-01	0.00E+00	-0.056	-1.590	-0.916
13	0.74	0.0	0.082	1.0	0.890	0.110	1.69E-01	1.16E-01	9.47E-01	2.26E-02	1.29E-03	1.93E-02	2.38E-03	9.37E-01	1.80E-01	3.49E-01	5.75E-01	0.00E+00	-0.050	-1.645	-0.960
12	0.68	0.0	0.076	1.0	0.902	0.098	1.90E-01	1.00E-01	1.07E+00	1.96E-02	1.12E-03	1.95E-02	2.12E-03	9.44E-01	2.02E-01	3.30E-01	5.51E-01	0.00E+00	-0.045	-1.707	-1.009
11	0.63	0.0	0.070	1.0	0.913	0.087	2.15E-01	8.55E-02	1.20E+00	1.67E-02	9.55E-04	1.98E-02	1.87E-03	9.51E-01	2.26E-01	3.10E-01	5.25E-01	0.00E+00	-0.039	-1.776	-1.063
10	0.57	0.0	0.063	1.0	0.925	0.075	2.42E-01	7.14E-02	1.36E+00	1.40E-02	7.98E-04	2.00E-02	1.63E-03	9.57E-01	2.53E-01	2.89E-01	4.97E-01	0.00E+00	-0.034	-1.854	-1.124
9	0.51	0.0	0.057	1.0	0.936	0.064	2.74E-01	5.82E-02	1.53E+00	1.14E-02	6.50E-04	2.03E-02	1.39E-03	9.64E-01	2.84E-01	2.67E-01	4.67E-01	0.00E+00	-0.029	-1.943	-1.192
8	0.46	0.0	0.051	1.0	0.946	0.054	3.10E-01	4.60E-02	1.74E+00	9.02E-03	5.14E-04	2.05E-02	1.16E-03	9.70E-01	3.20E-01	2.44E-01	4.34E-01	0.00E+00	-0.024	-2.045	-1.271
7	0.40	0.0	0.044	1.0	0.957	0.043	3.52E-01	3.50E-02	1.97E+00	6.86E-03	3.91E-04	2.07E-02	9.41E-04	9.76E-01	3.61E-01	2.20E-01	3.99E-01	0.00E+00	-0.019	-2.163	-1.362
6	0.34	0.0	0.038	1.0	0.966	0.034	4.00E-01	2.54E-02	2.24E+00	4.97E-03	2.83E-04	2.09E-02	7.36E-04	9.81E-01	4.08E-01	1.94E-01	3.61E-01	0.00E+00	-0.015	-2.304	-1.469
5	0.28	0.0	0.032	1.0	0.975	0.025	4.56E-01	1.72E-02	2.55E+00	3.36E-03	1.92E-04	2.11E-02	5.47E-04	9.86E-01	4.62E-01	1.68E-01	3.20E-01	0.00E+00	-0.011	-2.473	-1.598
4	0.23	0.0	0.025	1.0	0.983	0.017	5.21E-01	1.05E-02	2.92E+00	2.06E-03	1.18E-04	2.13E-02	3.78E-04	9.90E-01	5.26E-01	1.39E-01	2.75E-01	0.00E+00	-0.008	-2.685	-1.758
3	0.17	0.0	0.019	1.0	0.989	0.011	5.97E-01	5.55E-03	3.34E+00	1.09E-03	6.20E-05	2.14E-02	2.34E-04	9.94E-01	6.00E-01	1.09E-01	2.25E-01	0.00E+00	-0.005	-2.963	-1.967
2	0.11	0.0	0.013	1.0	0.995	0.005	6.88E-01	2.22E-03	3.85E+00	4.36E-04	2.48E-05	2.15E-02	1.18E-04	9.97E-01	6.90E-01	7.76E-02	1.69E-01	0.00E+00	-0.002	-3.361	-2.265
1	0.06	0.0	0.006	1.0	0.998	0.002	8.04E-01	4.57E-04	4.50E+00	8.95E-05	5.10E-06	2.16E-02	3.59E-05	9.99E-01	8.04E-01	4.29E-02	1.03E-01	0.00E+00	-0.001	-4.048	-2.780

MULTIPHASE ENVIRONMENTAL, Inc.
Innovations in the Subsurface

EST

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-11 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		14.80	18.20	3.4	15.23	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
8:47:10	0.00	15.12	15.75	0.63	15.20	The first depth-to-fluids measurement after
8:47:20	0.17	15.10	15.82	0.72	15.19	bailer is raised above air-oil interface.
8:48:32	1.37	15.10	15.88	0.78	15.20	
8:48:45	1.58	15.10	15.90	0.8	15.20	
8:49:00	1.83	15.10	15.92	0.82	15.20	
8:49:20	2.17	15.11	15.98	0.87	15.22	
8:50:10	3.00	15.08	15.97	0.89	15.19	
8:50:40	3.50	15.08	15.99	0.91	15.19	
8:51:10	4.00	15.09	16.02	0.93	15.21	
8:51:38	4.47	15.09	16.02	0.93	15.21	
8:52:22	5.20	15.09	16.05	0.96	15.21	
8:52:45	5.58	15.10	16.05	0.95	15.22	
8:53:20	6.17	15.09	16.10	1.01	15.22	
8:54:18	7.13	15.08	16.10	1.02	15.21	
8:54:52	7.70	15.08	16.11	1.03	15.21	
8:55:20	8.17	15.06	16.12	1.06	15.19	
8:56:02	8.87	15.06	16.13	1.07	15.19	
8:56:35	9.42	15.06	16.13	1.07	15.19	
8:57:02	9.87	15.06	16.15	1.09	15.20	
8:57:33	10.38	15.05	16.16	1.11	15.19	
8:58:05	10.92	15.05	16.17	1.12	15.19	
8:58:35	11.42	15.06	16.20	1.14	15.20	
9:01:15	14.08	15.06	16.23	1.17	15.21	
9:03:02	15.87	15.04	16.30	1.26	15.20	
9:05:10	18.00	15.04	16.33	1.29	15.20	
9:06:35	19.42	15.04	16.36	1.32	15.21	
9:08:10	21.00	15.03	16.41	1.38	15.20	
9:10:20	23.17	15.03	16.45	1.42	15.21	
9:12:30	25.33	15.02	16.51	1.49	15.21	
9:14:10	27.00	15.01	16.55	1.54	15.20	
9:17:00	29.83	15.01	16.60	1.59	15.21	
9:22:15	35.08	15.01	16.68	1.67	15.22	
9:30:45	43.58	14.99	16.81	1.82	15.22	
9:39:30	52.33	14.97	16.93	1.96	15.22	
9:48:40	61.50	14.95	17.04	2.09	15.21	
9:57:15	70.08	14.92	17.14	2.22	15.20	
10:11:30	84.33	14.92	17.31	2.39	15.22	
10:48:10	121.00	14.90	17.36	2.46	15.21	
11:22:20	155.17	14.89	17.58	2.69	15.23	
13:51:30	304.33	14.81	17.84	3.03	15.19	
15:20:00	392.83	14.82	17.88	3.06	15.20	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

ES&T

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties		
Specific gravity of oil:	0.8746	(dimensionless)
Dynamic viscosity of free oil:	50.55	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	36	dynes/cm
Oil-water interfacial tension:	15.78	dynes/cm
BETA-AO	2.000	
BETA-OW	4.56	

Soil Properties of Formation		
Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	0.5	1/feet
van Genuchten n:	2.22	(dimensionless)
van Genuchten m:	0.55	(dimensionless)

Free Oil Thickness in Well:	3.40	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.17	feet

Calculated Results		
Geometric mean Oil Conductivity (below oil table):	1.97E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	2.64E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.05	
Geometric mean water sat'n within free oil layer:	0.88	
Specific Volume of Oil (above & below oil table):	0.25	ft
Specific Volume of Water (above & below oil table):	1.56	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	2.59E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	5.10	1.487	0.640	0.558	0.566	0.075	2.31E-02	1.15E-03	1.29E-01	1.12E-04	1.90E-05	3.66E-02	4.87E-03	7.20E-01	3.21E-02	2.89E-01	8.21E-01	7.58E-01	-0.247	-3.952	-1.123
29	4.93	1.338	0.618	0.600	0.579	0.075	2.62E-02	1.23E-03	1.47E-01	1.19E-04	2.03E-05	3.74E-02	4.87E-03	7.30E-01	3.60E-02	2.89E-01	8.10E-01	7.45E-01	-0.237	-3.923	-1.123
28	4.76	1.189	0.597	0.648	0.593	0.075	2.99E-02	1.32E-03	1.67E-01	1.28E-04	2.18E-05	3.83E-02	4.87E-03	7.40E-01	4.03E-02	2.89E-01	7.99E-01	7.32E-01	-0.227	-3.892	-1.123
27	4.59	1.041	0.576	0.700	0.608	0.092	3.41E-02	2.43E-03	1.91E-01	2.36E-04	4.01E-05	3.93E-02	5.93E-03	7.51E-01	4.54E-02	3.19E-01	7.87E-01	7.00E-01	-0.216	-3.627	-1.037
26	4.42	0.892	0.554	0.756	0.623	0.133	3.89E-02	7.49E-03	2.18E-01	7.26E-04	1.23E-04	4.03E-02	8.61E-03	7.62E-01	5.11E-02	3.85E-01	7.74E-01	6.34E-01	-0.205	-3.139	-0.875
25	4.25	0.743	0.533	0.816	0.639	0.177	4.46E-02	1.88E-02	2.50E-01	1.83E-03	3.10E-04	4.13E-02	1.14E-02	7.74E-01	5.76E-02	4.43E-01	7.60E-01	5.54E-01	-0.195	-2.739	-0.753
24	4.08	0.595	0.512	0.874	0.655	0.219	5.12E-02	4.11E-02	2.86E-01	3.98E-03	6.76E-04	4.23E-02	1.41E-02	7.85E-01	6.51E-02	4.93E-01	7.45E-01	4.56E-01	-0.184	-2.400	-0.659
23	3.91	0.446	0.490	0.927	0.672	0.255	5.88E-02	7.91E-02	3.29E-01	7.66E-03	1.30E-03	4.34E-02	1.65E-02	7.97E-01	7.37E-02	5.32E-01	7.28E-01	3.43E-01	-0.173	-2.116	-0.593
22	3.74	0.297	0.469	0.968	0.689	0.279	6.76E-02	1.34E-01	3.79E-01	1.30E-02	2.21E-03	4.45E-02	1.80E-02	8.09E-01	8.36E-02	5.57E-01	7.11E-01	2.20E-01	-0.162	-1.885	-0.554
21	3.57	0.149	0.448	0.993	0.707	0.286	7.79E-02	2.00E-01	4.36E-01	1.93E-02	3.29E-03	4.57E-02	1.85E-02	8.21E-01	9.49E-02	5.64E-01	6.92E-01	9.70E-02	-0.151	-1.714	-0.544
20	3.40	0.0	0.426	1.0	0.725	0.275	8.99E-02	2.49E-01	5.03E-01	2.41E-02	4.11E-03	4.68E-02	1.78E-02	8.33E-01	1.08E-01	5.53E-01	6.72E-01	0.00E+00	-0.140	-1.617	-0.561
19	3.23	0.0	0.405	1.0	0.744	0.256	1.04E-01	2.25E-01	5.81E-01	2.18E-02	3.71E-03	4.81E-02	1.65E-02	8.46E-01	1.23E-01	5.33E-01	6.50E-01	0.00E+00	-0.128	-1.661	-0.592
18	3.06	0.0	0.384	1.0	0.763	0.237	1.20E-01	2.01E-01	6.71E-01	1.95E-02	3.32E-03	4.93E-02	1.53E-02	8.58E-01	1.40E-01	5.13E-01	6.26E-01	0.00E+00	-0.118	-1.710	-0.625
17	2.89	0.0	0.362	1.0	0.782	0.218	1.39E-01	1.78E-01	7.76E-01	1.72E-02	2.93E-03	5.05E-02	1.41E-02	8.71E-01	1.59E-01	4.92E-01	6.01E-01	0.00E+00	-0.107	-1.764	-0.662
16	2.72	0.0	0.341	1.0	0.802	0.198	1.60E-01	1.55E-01	8.97E-01	1.50E-02	2.55E-03	5.18E-02	1.28E-02	8.83E-01	1.81E-01	4.69E-01	5.74E-01	0.00E+00	-0.096	-1.824	-0.703
15	2.55	0.0	0.320	1.0	0.821	0.179	1.85E-01	1.33E-01	1.04E+00	1.28E-02	2.18E-03	5.30E-02	1.16E-02	8.95E-01	2.07E-01	4.46E-01	5.45E-01	0.00E+00	-0.086	-1.891	-0.748
14	2.38	0.0	0.298	1.0	0.841	0.159	2.14E-01	1.12E-01	1.20E+00	1.08E-02	1.84E-03	5.43E-02	1.03E-02	9.07E-01	2.35E-01	4.21E-01	5.15E-01	0.00E+00	-0.075	-1.966	-0.797
13	2.21	0.0	0.277	1.0	0.860	0.140	2.46E-01	9.19E-02	1.38E+00	8.91E-03	1.51E-03	5.55E-02	9.07E-03	9.19E-01	2.68E-01	3.95E-01	4.82E-01	0.00E+00	-0.066	-2.050	-0.853
12	2.04	0.0	0.256	1.0	0.878	0.122	2.83E-01	7.39E-02	1.58E+00	7.16E-03	1.22E-03	5.67E-02	7.86E-03	9.30E-01	3.04E-01	3.68E-01	4.48E-01	0.00E+00	-0.056	-2.145	-0.915
11	1.87	0.0	0.234	1.0	0.896	0.104	3.25E-01	5.77E-02	1.82E+00	5.60E-03	9.51E-04	5.79E-02	6.70E-03	9.41E-01	3.45E-01	3.39E-01	4.13E-01	0.00E+00	-0.048	-2.252	-0.984
10	1.70	0.0	0.213	1.0	0.914	0.086	3.71E-01	4.36E-02	2.08E+00	4.23E-03	7.19E-04	5.90E-02	5.59E-03	9.51E-01	3.90E-01	3.10E-01	3.75E-01	0.00E+00	-0.039	-2.374	-1.063
9	1.53	0.0	0.192	1.0	0.930	0.070	4.23E-01	3.17E-02	2.37E+00	3.07E-03	5.21E-04	6.01E-02	4.55E-03	9.60E-01	4.40E-01	2.80E-01	3.36E-01	0.00E+00	-0.032	-2.513	-1.152
8	1.36	0.0	0.171	1.0	0.944	0.056	4.79E-01	2.19E-02	2.68E+00	2.12E-03	3.60E-04	6.10E-02	3.59E-03	9.69E-01	4.95E-01	2.49E-01	2.97E-01	0.00E+00	-0.025	-2.674	-1.255
7	1.19	0.0	0.149	1.0	0.958	0.042	5.40E-01	1.42E-02	3.03E+00	1.38E-03	2.34E-04	6.19E-02	2.73E-03	9.76E-01	5.54E-01	2.17E-01	2.56E-01	0.00E+00	-0.019	-2.862	-1.374
6	1.02	0.0	0.128	1.0	0.969	0.031	6.06E-01	8.52E-03	3.39E+00	8.26E-04	1.40E-04	6.26E-02	1.98E-03	9.83E-01	6.16E-01	1.84E-01	2.15E-01	0.00E+00	-0.013	-3.083	-1.514
5	0.85	0.0	0.107	1.0	0.979	0.021	6.74E-01	4.60E-03	3.78E+00	4.46E-04	7.57E-05	6.33E-02	1.34E-03	9.88E-01	6.82E-01	1.52E-01	1.74E-01	0.00E+00	-0.009	-3.351	-1.683
4	0.68	0.0	0.085	1.0	0.987	0.013	7.45E-01	2.13E-03	4.17E+00	2.07E-04	3.51E-05	6.38E-02	8.27E-04	9.93E-01	7.50E-01	1.19E-01	1.34E-01	0.00E+00	-0.006	-3.685	-1.893
3	0.51	0.0	0.064	1.0	0.993	0.007	8.16E-01	7.83E-04	4.57E+00	7.58E-05	1.29E-05	6.42E-02	4.41E-04	9.96E-01	8.19E-01	8.71E-02	9.48E-02	0.00E+00	-0.003	-4.120	-2.166
2	0.34	0.0	0.043	1.0	0.997	0.003	8.86E-01	1.88E-04	4.96E+00	1.82E-05	3.09E-06	6.44E-02	1.80E-04	9.98E-01	8.87E-01	5.57E-02	5.81E-02	0.00E+00	-0.001	-4.740	-2.554
1	0.17	0.0	0.021	1.0	0.999	0.001	9.50E-01	1.61E-05	5.32E+00	1.56E-06	2.66E-07	6.46E-02	3.88E-05	1.00E+00	9.51E-01	2.58E-02	2.50E-02	0.00E+00	0.000	-5.806	-3.221

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-12 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		12.98	16.95	3.97	13.37	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
10:57:15	0.00	13.72	14.31	0.59	13.78	The first depth-to-fluids measurement after
10:57:50	0.58	13.65	14.25	0.60	13.71	bailer is raised above air-oil interface.
10:58:10	0.92	13.59	14.20	0.61	13.65	
10:58:52	1.62	13.55	14.13	0.58	13.61	
10:59:00	1.75	13.49	14.10	0.61	13.55	
10:59:37	2.37	13.45	14.08	0.63	13.51	
10:59:58	2.72	13.42	14.07	0.65	13.48	
11:00:18	3.05	13.39	14.04	0.65	13.45	
11:00:35	3.33	13.37	14.02	0.65	13.43	
11:01:10	3.92	13.37	14.02	0.65	13.43	
11:01:37	4.37	13.35	14.02	0.67	13.42	
11:01:59	4.73	13.35	14.01	0.66	13.42	
11:02:11	4.93	13.34	14.00	0.66	13.41	
11:02:35	5.33	13.33	14.00	0.67	13.40	
11:02:58	5.72	13.32	13.99	0.67	13.39	
11:03:10	5.92	13.32	13.99	0.67	13.39	
11:03:36	6.35	13.31	13.98	0.67	13.38	
11:03:58	6.72	13.32	13.98	0.66	13.39	
11:04:09	6.90	13.31	13.98	0.67	13.38	
11:04:29	7.23	13.31	13.98	0.67	13.38	
11:04:49	7.57	13.31	13.99	0.68	13.38	
11:05:06	7.85	13.31	13.99	0.68	13.38	
11:05:30	8.25	13.31	13.99	0.68	13.38	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties			**Soil Properties of Formation**		
Specific gravity of oil:	0.9009	(dimensionless)	Hydraulic conductivity:	5.6	ft/day
Dynamic viscosity of free oil:	45.93	centipoise	Porosity:	0.38	(dimensionless)
Air-water surface tension:	72	dynes/cm	Irreducible water saturation:	0.1	(dimensionless)
Air-oil surface tension:	35.5	dynes/cm			
Oil-water interfacial tension:	17.26	dynes/cm	van Genuchten alpha:	1.1	1/feet
BETA-AO	2.028		van Genuchten n:	1.43	(dimensionless)
BETA-OW	4.17		van Genuchten m:	0.30	(dimensionless)

Free Oil Thickness in Well:	3.97	feet	**Calculated Results**		
Elevation at Oil-Wtr Interfac	0	feet	Geometric mean Oil Conductivity (below oil table):	2.10E-02	ft/day
Elevation increment for calc	0.1985	feet	Oil Transmissivity of free oil layer (below oil table):	1.10E-01	ft2/day
			Geometric mean oil saturation within free oil layer:	0.12	
			Geometric mean water sat'n within free oil layer:	0.84	
			Specific Volume of Oil (above & below oil table):	0.31	ft
			Specific Volume of Water (above & below oil table):	1.79	ft
			Estimate of oil storativity:	0.02	
			Bouwer-Rice Oil Conductivity (below oil table):	5.70E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	5.96	1.788	0.590	0.577	0.650	0.075	3.08E-03	4.15E-04	1.72E-02	4.56E-05	9.05E-06	4.90E-02	5.68E-03	7.81E-01	3.94E-03	2.89E-01	9.37E-01	8.99E-01	-0.187	-4.341	-1.123
29	5.76	1.609	0.570	0.597	0.656	0.075	3.37E-03	4.44E-04	1.89E-02	4.88E-05	9.68E-06	4.95E-02	5.68E-03	7.86E-01	4.29E-03	2.89E-01	9.35E-01	8.95E-01	-0.183	-4.312	-1.123
28	5.56	1.431	0.551	0.619	0.663	0.075	3.70E-03	4.76E-04	2.07E-02	5.23E-05	1.04E-05	5.00E-02	5.68E-03	7.91E-01	4.67E-03	2.89E-01	9.32E-01	8.91E-01	-0.179	-4.281	-1.123
27	5.36	1.252	0.531	0.644	0.670	0.075	4.07E-03	5.13E-04	2.28E-02	5.63E-05	1.12E-05	5.05E-02	5.68E-03	7.96E-01	5.11E-03	2.89E-01	9.29E-01	8.86E-01	-0.174	-4.249	-1.123
26	5.16	1.073	0.511	0.673	0.677	0.075	4.49E-03	5.53E-04	2.51E-02	6.08E-05	1.21E-05	5.11E-02	5.68E-03	8.01E-01	5.60E-03	2.89E-01	9.25E-01	8.81E-01	-0.169	-4.216	-1.123
25	4.96	0.894	0.492	0.708	0.684	0.075	4.96E-03	5.99E-04	2.78E-02	6.58E-05	1.31E-05	5.16E-02	5.68E-03	8.06E-01	6.16E-03	2.89E-01	9.22E-01	8.76E-01	-0.165	-4.182	-1.123
24	4.76	0.715	0.472	0.750	0.692	0.075	5.51E-03	6.51E-04	3.08E-02	7.15E-05	1.42E-05	5.22E-02	5.68E-03	8.11E-01	6.79E-03	2.89E-01	9.18E-01	8.70E-01	-0.160	-4.145	-1.123
23	4.57	0.536	0.452	0.801	0.700	0.101	6.13E-03	1.71E-03	3.44E-02	1.88E-04	3.74E-05	5.28E-02	7.60E-03	8.17E-01	7.51E-03	3.35E-01	9.13E-01	8.42E-01	-0.155	-3.725	-0.996
22	4.37	0.358	0.433	0.864	0.709	0.155	6.86E-03	7.94E-03	3.84E-02	8.72E-04	1.73E-04	5.35E-02	1.17E-02	8.23E-01	8.34E-03	4.15E-01	9.09E-01	7.70E-01	-0.149	-3.059	-0.809
21	4.17	0.179	0.413	0.938	0.718	0.220	7.69E-03	3.78E-02	4.31E-02	4.15E-03	8.25E-04	5.41E-02	1.66E-02	8.28E-01	9.29E-03	4.95E-01	9.04E-01	6.27E-01	-0.144	-2.381	-0.657
20	3.97	0.0	0.393	1.0	0.727	0.273	8.67E-03	4.44E-01	4.85E-02	4.88E-02	9.69E-03	5.48E-02	2.06E-02	8.35E-01	1.04E-02	5.51E-01	8.98E-01	0.00E+00	-0.138	-1.312	-0.564
19	3.77	0.0	0.374	1.0	0.737	0.263	9.81E-03	4.30E-01	5.49E-02	4.73E-02	9.39E-03	5.56E-02	1.99E-02	8.41E-01	1.17E-02	5.41E-01	8.92E-01	0.00E+00	-0.133	-1.325	-0.579
18	3.57	0.0	0.354	1.0	0.747	0.253	1.12E-02	4.16E-01	6.25E-02	4.57E-02	9.07E-03	5.63E-02	1.91E-02	8.48E-01	1.32E-02	5.31E-01	8.85E-01	0.00E+00	-0.127	-1.340	-0.596
17	3.37	0.0	0.334	1.0	0.757	0.243	1.27E-02	4.00E-01	7.14E-02	4.40E-02	8.73E-03	5.71E-02	1.83E-02	8.55E-01	1.49E-02	5.19E-01	8.78E-01	0.00E+00	-0.121	-1.357	-0.615
16	3.18	0.0	0.315	1.0	0.768	0.232	1.46E-02	3.84E-01	8.20E-02	4.22E-02	8.37E-03	5.79E-02	1.75E-02	8.62E-01	1.70E-02	5.07E-01	8.70E-01	0.00E+00	-0.114	-1.375	-0.635
15	2.98	0.0	0.295	1.0	0.780	0.220	1.69E-02	3.66E-01	9.48E-02	4.02E-02	7.99E-03	5.88E-02	1.66E-02	8.69E-01	1.95E-02	4.95E-01	8.60E-01	0.00E+00	-0.108	-1.395	-0.657
14	2.78	0.0	0.275	1.0	0.792	0.208	1.97E-02	3.48E-01	1.10E-01	3.82E-02	7.58E-03	5.97E-02	1.57E-02	8.77E-01	2.24E-02	4.81E-01	8.50E-01	0.00E+00	-0.101	-1.418	-0.682
13	2.58	0.0	0.256	1.0	0.805	0.195	2.30E-02	3.28E-01	1.29E-01	3.60E-02	7.15E-03	6.07E-02	1.47E-02	8.85E-01	2.60E-02	4.66E-01	8.39E-01	0.00E+00	-0.094	-1.444	-0.709
12	2.38	0.0	0.236	1.0	0.818	0.182	2.72E-02	3.07E-01	1.52E-01	3.37E-02	6.68E-03	6.17E-02	1.37E-02	8.93E-01	3.04E-02	4.50E-01	8.26E-01	0.00E+00	-0.087	-1.473	-0.740
11	2.18	0.0	0.216	1.0	0.832	0.168	3.23E-02	2.84E-01	1.81E-01	3.12E-02	6.19E-03	6.27E-02	1.27E-02	9.02E-01	3.59E-02	4.32E-01	8.11E-01	0.00E+00	-0.080	-1.506	-0.774
10	1.99	0.0	0.197	1.0	0.846	0.154	3.88E-02	2.60E-01	2.17E-01	2.86E-02	5.67E-03	6.38E-02	1.16E-02	9.11E-01	4.26E-02	4.13E-01	7.94E-01	0.00E+00	-0.072	-1.544	-0.813
9	1.79	0.0	0.177	1.0	0.862	0.138	4.71E-02	2.35E-01	2.64E-01	2.58E-02	5.12E-03	6.50E-02	1.04E-02	9.20E-01	5.12E-02	3.92E-01	7.74E-01	0.00E+00	-0.065	-1.588	-0.859
8	1.59	0.0	0.157	1.0	0.877	0.123	5.77E-02	2.08E-01	3.23E-01	2.29E-02	4.54E-03	6.62E-02	9.25E-03	9.29E-01	6.21E-02	3.69E-01	7.51E-01	0.00E+00	-0.057	-1.641	-0.911
7	1.39	0.0	0.138	1.0	0.894	0.106	7.16E-02	1.80E-01	4.01E-01	1.98E-02	3.93E-03	6.74E-02	8.02E-03	9.39E-01	7.62E-02	3.44E-01	7.24E-01	0.00E+00	-0.049	-1.704	-0.974
6	1.19	0.0	0.118	1.0	0.911	0.089	9.01E-02	1.51E-01	5.04E-01	1.66E-02	3.29E-03	6.87E-02	6.74E-03	9.49E-01	9.49E-02	3.15E-01	6.92E-01	0.00E+00	-0.041	-1.781	-1.049
5	0.99	0.0	0.098	1.0	0.928	0.072	1.15E-01	1.21E-01	6.46E-01	1.33E-02	2.64E-03	7.00E-02	5.45E-03	9.59E-01	1.20E-01	2.83E-01	6.53E-01	0.00E+00	-0.033	-1.877	-1.142
4	0.79	0.0	0.079	1.0	0.945	0.055	1.50E-01	9.07E-02	8.43E-01	9.96E-03	1.98E-03	7.13E-02	4.14E-03	9.69E-01	1.55E-01	2.47E-01	6.06E-01	0.00E+00	-0.025	-2.002	-1.260
3	0.60	0.0	0.059	1.0	0.962	0.038	2.02E-01	6.13E-02	1.13E+00	6.73E-03	1.34E-03	7.26E-02	2.87E-03	9.79E-01	2.06E-01	2.06E-01	5.46E-01	0.00E+00	-0.017	-2.172	-1.420
2	0.40	0.0	0.039	1.0	0.978	0.022	2.80E-01	3.43E-02	1.57E+00	3.76E-03	7.47E-04	7.36E-02	1.67E-03	9.88E-01	2.84E-01	1.57E-01	4.67E-01	0.00E+00	-0.010	-2.425	-1.654
1	0.20	0.0	0.020	1.0	0.991	0.009	4.18E-01	1.21E-02	2.34E+00	1.32E-03	2.63E-04	7.48E-02	6.42E-04	9.95E-01	4.20E-01	9.72E-02	3.52E-01	0.00E+00	-0.004	-2.878	-2.070

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-13 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		14.07	15.60	1.53	14.26	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table. First measurement assumed to be static.
				0	0.00	
				0	0.00	
				0	0.00	
Measurements After Bailing						
13:24:45	0.00	14.22	14.61	0.39	14.27	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
13:25:15	0.50	14.21	14.64	0.43	14.26	
13:25:50	1.08	14.20	14.67	0.47	14.26	
13:26:15	1.50	14.20	14.69	0.49	14.26	
13:26:40	1.92	14.20	14.69	0.49	14.26	
13:27:20	2.58	14.20	14.70	0.50	14.26	
13:27:45	3.00	14.20	14.70	0.50	14.26	
13:28:10	3.42	14.20	14.71	0.51	14.26	
13:28:25	3.67	14.20	14.72	0.52	14.26	
13:29:15	4.50	14.19	14.73	0.54	14.26	
13:29:40	4.92	14.19	14.75	0.56	14.26	
13:30:20	5.58	14.19	14.76	0.57	14.26	
13:30:45	6.00	14.19	14.76	0.57	14.26	
13:32:00	7.25	14.19	14.77	0.58	14.26	
13:33:10	8.42	14.19	14.81	0.62	14.27	
13:34:20	9.58	14.18	14.82	0.64	14.26	
13:35:30	10.75	14.18	14.84	0.66	14.26	
13:36:20	11.58	14.18	14.87	0.69	14.27	
13:37:30	12.75	14.18	14.88	0.70	14.27	
13:40:00	15.25	14.17	14.90	0.73	14.26	
13:41:20	16.58	14.17	14.92	0.75	14.26	
13:42:45	18.00	14.17	14.95	0.78	14.27	
13:44:00	19.25	14.17	14.97	0.80	14.27	
13:45:40	20.92	14.17	14.98	0.81	14.27	
13:47:00	22.25	14.15	14.99	0.84	14.25	
13:48:30	23.75	14.16	15.01	0.85	14.27	
13:50:20	25.58	14.16	15.03	0.87	14.27	
13:53:00	28.25	14.16	15.04	0.88	14.27	
13:55:40	30.92	14.15	15.06	0.91	14.26	
13:58:00	33.25	14.15	15.08	0.93	14.27	
14:02:00	37.25	14.15	15.10	0.95	14.27	
14:09:10	44.42	14.15	15.11	0.96	14.27	
14:12:15	47.50	14.15	15.12	0.97	14.27	
14:18:40	53.92	14.15	15.17	1.02	14.28	
14:24:10	59.42	14.15	15.18	1.03	14.28	
14:33:40	68.92	14.15	15.19	1.04	14.28	
14:41:10	76.42	14.15	15.21	1.06	14.28	
14:49:00	84.25	14.14	15.22	1.08	14.27	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation
Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8751	(dimensionless)
Dynamic viscosity of free oil	23.27	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	35	dynes/cm
Oil-water interfacial tension:	17.4	dynes/cm
BETA-AO	2.057	
BETA-OW	4.14	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.1	1/feet
van Genuchten n:	2.2	(dimensionless)
van Genuchten m:	0.55	(dimensionless)

Free Oil Thickness in Well	1.53	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.0765	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	3.24E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	2.00E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.04	
Geometric mean water sat'n within free oil layer:	0.90	
Specific Volume of Oil (above & below oil table):	0.09	ft
Specific Volume of Water (above & below oil table):	0.73	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	2.34E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	2.30	0.669	0.287	0.555	0.614	0.075	3.48E-02	1.45E-03	1.95E-01	3.04E-04	2.33E-05	1.78E-02	2.19E-03	7.56E-01	4.60E-02	2.89E-01	7.85E-01	7.15E-01	-0.212	-3.517	-1.123
29	2.22	0.603	0.277	0.596	0.627	0.075	3.92E-02	1.55E-03	2.19E-01	3.26E-04	2.49E-05	1.82E-02	2.19E-03	7.65E-01	5.12E-02	2.89E-01	7.74E-01	7.01E-01	-0.203	-3.487	-1.123
28	2.14	0.536	0.268	0.643	0.641	0.075	4.41E-02	1.66E-03	2.47E-01	3.50E-04	2.68E-05	1.86E-02	2.19E-03	7.75E-01	5.69E-02	2.89E-01	7.61E-01	6.86E-01	-0.193	-3.455	-1.123
27	2.07	0.469	0.258	0.695	0.655	0.075	4.98E-02	1.79E-03	2.79E-01	3.78E-04	2.89E-05	1.90E-02	2.19E-03	7.85E-01	6.34E-02	2.89E-01	7.48E-01	6.69E-01	-0.184	-3.423	-1.123
26	1.99	0.402	0.248	0.751	0.670	0.081	5.63E-02	2.37E-03	3.15E-01	4.99E-04	3.82E-05	1.95E-02	2.36E-03	7.96E-01	7.08E-02	3.00E-01	7.34E-01	6.45E-01	-0.174	-3.302	-1.091
25	1.91	0.335	0.239	0.810	0.685	0.125	6.38E-02	8.76E-03	3.57E-01	1.84E-03	1.41E-04	1.99E-02	3.64E-03	8.06E-01	7.91E-02	3.73E-01	7.19E-01	5.66E-01	-0.164	-2.734	-0.902
24	1.84	0.268	0.229	0.870	0.701	0.169	7.23E-02	2.37E-02	4.05E-01	4.99E-03	3.82E-04	2.04E-02	4.91E-03	8.17E-01	8.84E-02	4.33E-01	7.03E-01	4.69E-01	-0.155	-2.302	-0.772
23	1.76	0.201	0.220	0.924	0.717	0.207	8.20E-02	5.23E-02	4.59E-01	1.10E-02	8.42E-04	2.08E-02	6.02E-03	8.28E-01	9.90E-02	4.80E-01	6.85E-01	3.55E-01	-0.145	-1.958	-0.684
22	1.68	0.134	0.210	0.966	0.733	0.234	9.31E-02	9.73E-02	5.21E-01	2.05E-02	1.57E-03	2.13E-02	6.79E-03	8.39E-01	1.11E-01	5.09E-01	6.67E-01	2.30E-01	-0.135	-1.688	-0.632
21	1.61	0.067	0.201	0.992	0.749	0.243	1.06E-01	1.54E-01	5.92E-01	3.24E-02	2.48E-03	2.18E-02	7.06E-03	8.49E-01	1.25E-01	5.20E-01	6.47E-01	1.03E-01	-0.125	-1.489	-0.614
20	1.53	0.0	0.191	1.0	0.766	0.234	1.20E-01	2.00E-01	6.73E-01	4.21E-02	3.22E-03	2.23E-02	6.80E-03	8.60E-01	1.40E-01	5.10E-01	6.26E-01	0.00E+00	-0.116	-1.376	-0.631
19	1.45	0.0	0.182	1.0	0.783	0.217	1.37E-01	1.79E-01	7.66E-01	3.77E-02	2.88E-03	2.28E-02	6.30E-03	8.71E-01	1.57E-01	4.91E-01	6.04E-01	0.00E+00	-0.106	-1.424	-0.664
18	1.38	0.0	0.172	1.0	0.800	0.200	1.56E-01	1.58E-01	8.71E-01	3.34E-02	2.55E-03	2.33E-02	5.80E-03	8.82E-01	1.76E-01	4.71E-01	5.80E-01	0.00E+00	-0.097	-1.477	-0.700
17	1.30	0.0	0.162	1.0	0.818	0.182	1.77E-01	1.39E-01	9.90E-01	2.92E-02	2.23E-03	2.38E-02	5.30E-03	8.93E-01	1.98E-01	4.50E-01	5.55E-01	0.00E+00	-0.087	-1.535	-0.739
16	1.22	0.0	0.153	1.0	0.835	0.165	2.01E-01	1.20E-01	1.13E+00	2.52E-02	1.93E-03	2.43E-02	4.80E-03	9.04E-01	2.22E-01	4.28E-01	5.28E-01	0.00E+00	-0.078	-1.599	-0.782
15	1.15	0.0	0.143	1.0	0.852	0.148	2.28E-01	1.02E-01	1.28E+00	2.14E-02	1.64E-03	2.48E-02	4.31E-03	9.14E-01	2.50E-01	4.06E-01	5.00E-01	0.00E+00	-0.070	-1.670	-0.829
14	1.07	0.0	0.134	1.0	0.869	0.131	2.59E-01	8.47E-02	1.45E+00	1.78E-02	1.36E-03	2.52E-02	3.82E-03	9.24E-01	2.80E-01	3.82E-01	4.71E-01	0.00E+00	-0.061	-1.749	-0.881
13	0.99	0.0	0.124	1.0	0.885	0.115	2.93E-01	6.92E-02	1.64E+00	1.46E-02	1.12E-03	2.57E-02	3.35E-03	9.34E-01	3.14E-01	3.58E-01	4.40E-01	0.00E+00	-0.053	-1.836	-0.939
12	0.92	0.0	0.115	1.0	0.901	0.099	3.31E-01	5.52E-02	1.85E+00	1.16E-02	8.90E-04	2.62E-02	2.89E-03	9.43E-01	3.51E-01	3.32E-01	4.08E-01	0.00E+00	-0.045	-1.935	-1.003
11	0.84	0.0	0.105	1.0	0.916	0.084	3.73E-01	4.28E-02	2.09E+00	9.02E-03	6.90E-04	2.66E-02	2.45E-03	9.52E-01	3.92E-01	3.06E-01	3.74E-01	0.00E+00	-0.038	-2.045	-1.074
10	0.77	0.0	0.096	1.0	0.930	0.070	4.19E-01	3.22E-02	2.35E+00	6.77E-03	5.18E-04	2.70E-02	2.04E-03	9.60E-01	4.36E-01	2.79E-01	3.40E-01	0.00E+00	-0.032	-2.169	-1.155
9	0.69	0.0	0.086	1.0	0.943	0.057	4.69E-01	2.32E-02	2.63E+00	4.89E-03	3.74E-04	2.74E-02	1.65E-03	9.68E-01	4.84E-01	2.51E-01	3.04E-01	0.00E+00	-0.025	-2.311	-1.245
8	0.61	0.0	0.076	1.0	0.955	0.045	5.23E-01	1.60E-02	2.93E+00	3.37E-03	2.57E-04	2.78E-02	1.30E-03	9.75E-01	5.36E-01	2.23E-01	2.68E-01	0.00E+00	-0.020	-2.473	-1.349
7	0.54	0.0	0.067	1.0	0.966	0.034	5.80E-01	1.04E-02	3.25E+00	2.18E-03	1.67E-04	2.81E-02	9.87E-04	9.81E-01	5.91E-01	1.94E-01	2.31E-01	0.00E+00	-0.015	-2.661	-1.469
6	0.46	0.0	0.057	1.0	0.975	0.025	6.41E-01	6.22E-03	3.59E+00	1.31E-03	1.00E-04	2.84E-02	7.14E-04	9.86E-01	6.50E-01	1.65E-01	1.94E-01	0.00E+00	-0.011	-2.883	-1.610
5	0.38	0.0	0.048	1.0	0.983	0.017	7.04E-01	3.37E-03	3.94E+00	7.09E-04	5.42E-05	2.86E-02	4.84E-04	9.91E-01	7.10E-01	1.36E-01	1.57E-01	0.00E+00	-0.007	-3.149	-1.778
4	0.31	0.0	0.038	1.0	0.990	0.010	7.68E-01	1.57E-03	4.30E+00	3.31E-04	2.53E-05	2.88E-02	2.99E-04	9.94E-01	7.72E-01	1.07E-01	1.21E-01	0.00E+00	-0.004	-3.480	-1.987
3	0.23	0.0	0.029	1.0	0.994	0.006	8.32E-01	5.83E-04	4.66E+00	1.23E-04	9.39E-06	2.89E-02	1.60E-04	9.97E-01	8.35E-01	7.83E-02	8.63E-02	0.00E+00	-0.002	-3.911	-2.259
2	0.15	0.0	0.019	1.0	0.998	0.002	8.95E-01	1.42E-04	5.01E+00	3.00E-05	2.29E-06	2.90E-02	6.60E-05	9.99E-01	8.96E-01	5.02E-02	5.32E-02	0.00E+00	-0.001	-4.523	-2.644
1	0.08	0.0	0.010	1.0	1.000	0.000	9.54E-01	1.27E-05	5.34E+00	2.66E-06	2.04E-07	2.91E-02	1.44E-05	1.00E+00	9.54E-01	2.35E-02	2.32E-02	0.00E+00	0.000	-5.574	-3.305

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-16 **Site:** Quanta

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
Measurements Prior to Bailing						
		17.47	24.75	7.28	18.16	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
9:30:05	0.00	18.10	18.98	0.88	18.18	The first depth-to-fluids measurement after
9:30:30	0.42	18.08	18.86	0.78	18.15	
9:31:10	1.08	18.06	18.94	0.88	18.14	
9:31:40	1.58	18.06	19.02	0.96	18.15	
9:32:10	2.08	18.06	19.18	1.12	18.17	
9:32:55	2.83	18.05	19.17	1.12	18.16	
9:33:49	3.73	18.04	19.23	1.19	18.15	
9:34:28	4.38	18.04	19.18	1.14	18.15	
9:35:00	4.92	18.04	19.02	0.98	18.13	
9:35:40	5.58	18.03	19.08	1.05	18.13	
9:36:20	6.25	18.03	19.20	1.17	18.14	
9:37:30	7.42	18.03	19.22	1.19	18.14	
9:38:00	7.92	18.03	19.38	1.35	18.16	
9:38:50	8.75	18.03	19.37	1.34	18.16	
9:39:50	9.75	18.02	19.42	1.40	18.15	
9:40:12	10.12	18.02	19.38	1.36	18.15	
9:40:35	10.50	18.02	19.43	1.41	18.15	
9:42:40	12.58	18.00	19.46	1.46	18.14	
9:46:50	16.75	17.98	19.57	1.59	18.13	
9:50:20	20.25	17.97	19.78	1.81	18.14	
9:53:50	23.75	17.97	19.87	1.90	18.15	
9:58:05	28.00	17.96	20.02	2.06	18.15	bailer is raised above air-oil interface.
10:04:10	34.08	17.95	20.10	2.15	18.15	
10:09:35	39.50	17.94	20.12	2.18	18.15	
10:14:30	44.42	17.93	20.30	2.37	18.15	
10:20:20	50.25	17.92	20.39	2.47	18.15	
10:37:50	67.75	17.91	20.80	2.89	18.18	
11:03:50	93.75	17.87	21.25	3.38	18.19	
11:23:20	113.25	17.85	21.60	3.75	18.20	
11:59:10	149.08	17.81	21.94	4.13	18.20	
12:40:30	190.42	17.77	22.28	4.51	18.20	
13:54:45	264.67	17.66	22.68	5.02	18.13	
14:50:50	320.75	17.60	22.90	5.30	18.10	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

ES&T

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.9054 (dimensionless)
Dynamic viscosity of free oil:	66.15 centipoise
Air-water surface tension:	72 dynes/cm
Air-oil surface tension:	36.5 dynes/cm
Oil-water interfacial tension:	20.77 dynes/cm
BETA-AO	1.973
BETA-OW	3.47

Soil Properties of Formation

Hydraulic conductivity:	5.6 ft/day
Porosity:	0.38 (dimensionless)
Irreducible water saturation:	0.1 (dimensionless)
van Genuchten alpha:	1.5 1/feet
van Genuchten n:	1.32 (dimensionless)
van Genuchten m:	0.24 (dimensionless)

Free Oil Thickness in Well:	7.28 feet
Elevation at Oil-Wtr Interface:	0 feet
Elevation increment for calculations:	0.364 feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	2.54E-02 ft/day
Oil Transmissivity of free oil layer (below oil table):	2.11E-01 ft2/day
Geometric mean oil saturation within free oil layer:	0.17
Geometric mean water sat'n within free oil layer:	0.79
Specific Volume of Oil (above & below oil table):	0.70 ft
Specific Volume of Water (above & below oil table):	3.08 ft
Estimate of oil storativity:	0.03
Bouwer-Rice Oil Conductivity (below oil table):	7.23E-02 ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	10.92	3.296	1.033	0.529	0.613	0.075	4.61E-04	1.18E-04	2.58E-03	9.03E-06	3.29E-06	8.47E-02	1.04E-02	7.55E-01	6.10E-04	2.89E-01	9.75E-01	9.55E-01	-0.213	-5.044	-1.123
29	10.56	2.966	0.999	0.543	0.618	0.075	5.03E-04	1.26E-04	2.82E-03	9.65E-06	3.51E-06	8.54E-02	1.04E-02	7.58E-01	6.64E-04	2.89E-01	9.74E-01	9.53E-01	-0.209	-5.016	-1.123
28	10.19	2.637	0.964	0.559	0.623	0.075	5.52E-04	1.35E-04	3.09E-03	1.03E-05	3.76E-06	8.61E-02	1.04E-02	7.62E-01	7.24E-04	2.89E-01	9.73E-01	9.52E-01	-0.206	-4.986	-1.123
27	9.83	2.307	0.930	0.578	0.628	0.075	6.06E-04	1.45E-04	3.40E-03	1.11E-05	4.04E-06	8.69E-02	1.04E-02	7.66E-01	7.92E-04	2.89E-01	9.72E-01	9.50E-01	-0.202	-4.955	-1.123
26	9.46	1.977	0.895	0.600	0.634	0.075	6.69E-04	1.56E-04	3.75E-03	1.19E-05	4.34E-06	8.77E-02	1.04E-02	7.70E-01	8.68E-04	2.89E-01	9.71E-01	9.47E-01	-0.198	-4.923	-1.123
25	9.10	1.648	0.861	0.627	0.640	0.075	7.40E-04	1.68E-04	4.14E-03	1.29E-05	4.69E-06	8.85E-02	1.04E-02	7.75E-01	9.56E-04	2.89E-01	9.69E-01	9.45E-01	-0.194	-4.890	-1.123
24	8.74	1.318	0.826	0.661	0.646	0.075	8.22E-04	1.82E-04	4.60E-03	1.40E-05	5.08E-06	8.94E-02	1.04E-02	7.79E-01	1.06E-03	2.89E-01	9.68E-01	9.42E-01	-0.190	-4.855	-1.123
23	8.37	0.989	0.792	0.706	0.653	0.075	9.17E-04	1.98E-04	5.13E-03	1.52E-05	5.53E-06	9.03E-02	1.04E-02	7.84E-01	1.17E-03	2.89E-01	9.66E-01	9.40E-01	-0.185	-4.819	-1.123
22	8.01	0.659	0.758	0.768	0.659	0.109	1.03E-03	6.88E-04	5.75E-03	5.27E-05	1.92E-05	9.12E-02	1.50E-02	7.88E-01	1.30E-03	3.48E-01	9.64E-01	9.19E-01	-0.181	-4.278	-0.963
21	7.64	0.330	0.723	0.864	0.667	0.197	1.16E-03	6.73E-03	6.47E-03	5.16E-04	1.88E-04	9.22E-02	2.73E-02	7.93E-01	1.46E-03	4.68E-01	9.62E-01	8.42E-01	-0.176	-3.287	-0.705
20	7.28	0.0	0.689	1.0	0.674	0.326	1.31E-03	5.54E-01	7.32E-03	4.25E-02	1.55E-02	9.32E-02	4.51E-02	7.99E-01	1.64E-03	6.02E-01	9.60E-01	0.00E+00	-0.171	-1.372	-0.487
19	6.92	0.0	0.654	1.0	0.682	0.318	1.49E-03	5.44E-01	8.32E-03	4.17E-02	1.52E-02	9.44E-02	4.40E-02	8.04E-01	1.85E-03	5.94E-01	9.57E-01	0.00E+00	-0.166	-1.380	-0.498
18	6.55	0.0	0.620	1.0	0.691	0.309	1.70E-03	5.34E-01	9.52E-03	4.09E-02	1.49E-02	9.55E-02	4.28E-02	8.10E-01	2.10E-03	5.86E-01	9.54E-01	0.00E+00	-0.161	-1.388	-0.509
17	6.19	0.0	0.585	1.0	0.699	0.301	1.96E-03	5.23E-01	1.10E-02	4.01E-02	1.46E-02	9.67E-02	4.16E-02	8.16E-01	2.40E-03	5.78E-01	9.51E-01	0.00E+00	-0.155	-1.397	-0.522
16	5.82	0.0	0.551	1.0	0.709	0.291	2.27E-03	5.11E-01	1.27E-02	3.91E-02	1.42E-02	9.81E-02	4.03E-02	8.23E-01	2.76E-03	5.69E-01	9.47E-01	0.00E+00	-0.149	-1.407	-0.536
15	5.46	0.0	0.517	1.0	0.719	0.281	2.65E-03	4.97E-01	1.49E-02	3.81E-02	1.39E-02	9.94E-02	3.89E-02	8.29E-01	3.20E-03	5.59E-01	9.43E-01	0.00E+00	-0.143	-1.419	-0.551
14	5.10	0.0	0.482	1.0	0.730	0.270	3.13E-03	4.83E-01	1.75E-02	3.70E-02	1.35E-02	1.01E-01	3.74E-02	8.36E-01	3.74E-03	5.48E-01	9.39E-01	0.00E+00	-0.137	-1.431	-0.568
13	4.73	0.0	0.448	1.0	0.741	0.259	3.72E-03	4.67E-01	2.09E-02	3.58E-02	1.30E-02	1.03E-01	3.58E-02	8.44E-01	4.41E-03	5.36E-01	9.34E-01	0.00E+00	-0.130	-1.446	-0.587
12	4.37	0.0	0.413	1.0	0.753	0.247	4.49E-03	4.50E-01	2.51E-02	3.45E-02	1.26E-02	1.04E-01	3.41E-02	8.52E-01	5.26E-03	5.23E-01	9.27E-01	0.00E+00	-0.123	-1.462	-0.608
11	4.00	0.0	0.379	1.0	0.767	0.233	5.47E-03	4.31E-01	3.06E-02	3.30E-02	1.20E-02	1.06E-01	3.23E-02	8.61E-01	6.35E-03	5.09E-01	9.20E-01	0.00E+00	-0.115	-1.481	-0.632
10	3.64	0.0	0.344	1.0	0.781	0.219	6.77E-03	4.10E-01	3.79E-02	3.14E-02	1.14E-02	1.08E-01	3.03E-02	8.70E-01	7.78E-03	4.93E-01	9.12E-01	0.00E+00	-0.107	-1.503	-0.660
9	3.28	0.0	0.310	1.0	0.797	0.203	8.51E-03	3.87E-01	4.76E-02	2.96E-02	1.08E-02	1.10E-01	2.81E-02	8.80E-01	9.67E-03	4.75E-01	9.02E-01	0.00E+00	-0.099	-1.528	-0.692
8	2.91	0.0	0.275	1.0	0.813	0.187	1.09E-02	3.60E-01	6.11E-02	2.76E-02	1.00E-02	1.13E-01	2.58E-02	8.90E-01	1.22E-02	4.55E-01	8.89E-01	0.00E+00	-0.090	-1.559	-0.729
7	2.55	0.0	0.241	1.0	0.832	0.168	1.43E-02	3.30E-01	8.01E-02	2.53E-02	9.21E-03	1.15E-01	2.33E-02	9.02E-01	1.59E-02	4.32E-01	8.74E-01	0.00E+00	-0.080	-1.597	-0.774
6	2.18	0.0	0.207	1.0	0.852	0.148	1.93E-02	2.96E-01	1.08E-01	2.27E-02	8.27E-03	1.18E-01	2.05E-02	9.14E-01	2.11E-02	4.06E-01	8.55E-01	0.00E+00	-0.070	-1.644	-0.829
5	1.82	0.0	0.172	1.0	0.874	0.126	2.68E-02	2.58E-01	1.50E-01	1.98E-02	7.19E-03	1.21E-01	1.74E-02	9.27E-01	2.89E-02	3.74E-01	8.30E-01	0.00E+00	-0.059	-1.704	-0.899
4	1.46	0.0	0.138	1.0	0.898	0.102	3.89E-02	2.14E-01	2.18E-01	1.64E-02	5.97E-03	1.24E-01	1.41E-02	9.42E-01	4.13E-02	3.37E-01	7.97E-01	0.00E+00	-0.047	-1.785	-0.991
3	1.09	0.0	0.103	1.0	0.924	0.076	5.97E-02	1.64E-01	3.34E-01	1.26E-02	4.57E-03	1.28E-01	1.05E-02	9.57E-01	6.24E-02	2.91E-01	7.50E-01	0.00E+00	-0.034	-1.901	-1.118
2	0.73	0.0	0.069	1.0	0.951	0.049	9.90E-02	1.08E-01	5.54E-01	8.27E-03	3.01E-03	1.32E-01	6.73E-03	9.73E-01	1.02E-01	2.33E-01	6.81E-01	0.00E+00	-0.022	-2.083	-1.313
1	0.36	0.0	0.034	1.0	0.979	0.021	1.89E-01	4.87E-02	1.06E+00	3.73E-03	1.36E-03	1.35E-01	2.93E-03	9.88E-01	1.91E-01	1.53E-01	5.63E-01	0.00E+00	-0.009	-2.428	-1.674

MULTIPHASE ENVIRONMENTAL, Inc.
Innovations in the Subsurface

ES&T

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-18 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		18.33	20.35	2.02	18.55	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
						First measurement assumed to be static.

Measurements After Bailing

10:28:00	0.00	18.50	19.12	0.62	18.57	The first depth-to-fluids measurement after
10:28:30	0.50	18.48	19.22	0.74	18.56	
10:29:15	1.25	18.48	19.14	0.66	18.55	
10:29:50	1.83	18.48	19.13	0.65	18.55	
10:30:30	2.50	18.48	19.21	0.73	18.56	
10:31:10	3.17	18.47	19.22	0.75	18.55	
10:31:30	3.50	18.47	19.24	0.77	18.55	
10:31:50	3.83	18.47	19.25	0.78	18.55	
10:32:15	4.25	18.47	19.25	0.78	18.55	
10:32:45	4.75	18.47	19.15	0.68	18.54	
10:33:30	5.50	18.47	19.22	0.75	18.55	
10:34:05	6.08	18.47	19.26	0.79	18.56	
10:34:45	6.75	18.47	19.25	0.78	18.55	
10:35:00	7.00	18.47	19.30	0.83	18.56	
10:35:30	7.50	18.47	19.26	0.79	18.56	
10:36:45	8.75	18.47	19.30	0.83	18.56	
10:37:30	9.50	18.47	19.30	0.83	18.56	
10:38:10	10.17	18.47	19.30	0.83	18.56	
10:38:45	10.75	18.47	19.33	0.86	18.56	
10:40:45	12.75	18.47	19.36	0.89	18.57	
10:43:15	15.25	18.47	19.40	0.93	18.57	
10:44:30	16.50	18.47	19.41	0.94	18.57	
10:50:10	22.17	18.47	19.43	0.96	18.57	
10:53:10	25.17	18.47	19.43	0.96	18.57	
10:55:00	27.00	18.47	19.45	0.98	18.58	
10:57:20	29.33	18.46	19.47	1.01	18.57	
11:00:00	32.00	18.45	19.48	1.03	18.56	
11:02:45	34.75	18.45	19.49	1.04	18.56	
11:04:45	36.75	18.45	19.52	1.07	18.57	
11:09:40	41.67	18.45	19.53	1.08	18.57	
11:12:30	44.50	18.45	19.54	1.09	18.57	
11:23:15	55.25	18.44	19.60	1.16	18.57	
11:38:10	70.17	18.43	19.63	1.20	18.56	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8921	(dimensionless)
Dynamic viscosity of free oil:	27.85	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	34.5	dynes/cm
Oil-water interfacial tension:	15.97	dynes/cm
BETA-AO	2.087	
BETA-OW	4.51	

Free Oil Thickness in Well:	2.02	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.101	feet

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	0.8	1/feet
van Genuchten n:	1.92	(dimensionless)
van Genuchten m:	0.48	(dimensionless)

Calculated Results

Geometric mean Oil Conductivity (below oil table):	4.16E-03	ft/day
Oil Transmissivity of free oil layer (below oil table):	2.32E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.04	
Geometric mean water sat'n within free oil layer:	0.92	
Specific Volume of Oil (above & below oil table):	0.10	ft
Specific Volume of Water (above & below oil table):	0.99	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	1.63E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	3.03	0.901	0.327	0.616	0.695	0.075	4.33E-02	1.87E-03	2.42E-01	3.36E-04	3.39E-05	2.67E-02	2.89E-03	8.13E-01	5.32E-02	2.89E-01	7.69E-01	6.89E-01	-0.158	-3.474	-1.123
29	2.93	0.811	0.316	0.651	0.706	0.075	4.76E-02	2.01E-03	2.67E-01	3.60E-04	3.64E-05	2.71E-02	2.89E-03	8.20E-01	5.81E-02	2.89E-01	7.59E-01	6.76E-01	-0.151	-3.443	-1.123
28	2.83	0.721	0.305	0.688	0.717	0.075	5.25E-02	2.17E-03	2.94E-01	3.88E-04	3.92E-05	2.75E-02	2.89E-03	8.28E-01	6.34E-02	2.89E-01	7.48E-01	6.62E-01	-0.145	-3.411	-1.123
27	2.73	0.631	0.294	0.730	0.728	0.075	5.79E-02	2.34E-03	3.24E-01	4.20E-04	4.24E-05	2.79E-02	2.89E-03	8.35E-01	6.93E-02	2.89E-01	7.37E-01	6.47E-01	-0.138	-3.377	-1.123
26	2.63	0.541	0.283	0.775	0.739	0.075	6.40E-02	2.54E-03 –	3.58E-01	4.56E-04	4.60E-05	2.84E-02	2.89E-03	8.43E-01	7.59E-02	2.89E-01	7.25E-01	6.31E-01	-0.131	-3.341	-1.123
25	2.53	0.451	0.272	0.823	0.751	0.075	7.07E-02	2.77E-03	3.96E-01	4.96E-04	5.01E-05	2.88E-02	2.89E-03	8.50E-01	8.32E-02	2.89E-01	7.12E-01	6.14E-01	-0.124	-3.304	-1.123
24	2.42	0.360	0.262	0.872	0.763	0.109	7.83E-02	8.95E-03	4.39E-01	1.61E-03	1.62E-04	2.93E-02	4.20E-03	8.58E-01	9.13E-02	3.49E-01	6.98E-01	5.38E-01	-0.118	-2.794	-0.961
23	2.32	0.270	0.251	0.919	0.775	0.144	8.68E-02	2.42E-02	4.86E-01	4.33E-03	4.38E-04	2.97E-02	5.54E-03	8.66E-01	1.00E-01	4.00E-01	6.83E-01	4.38E-01	-0.111	-2.363	-0.841
22	2.22	0.180	0.240	0.960	0.787	0.173	9.64E-02	5.41E-02	5.40E-01	9.71E-03	9.81E-04	3.02E-02	6.63E-03	8.74E-01	1.10E-01	4.38E-01	6.68E-01	3.16E-01	-0.104	-2.013	-0.762
21	2.12	0.090	0.229	0.989	0.800	0.189	1.07E-01	1.05E-01	6.00E-01	1.88E-02	1.90E-03	3.07E-02	7.27E-03	8.82E-01	1.21E-01	4.59E-01	6.52E-01	1.73E-01	-0.097	-1.725	-0.723
20	2.02	0.0	0.218	1.0	0.812	0.188	1.19E-01	1.84E-01	6.67E-01	3.30E-02	3.33E-03	3.12E-02	7.21E-03	8.90E-01	1.34E-01	4.57E-01	6.34E-01	0.00E+00	-0.090	-1.482	-0.726
19	1.92	0.0	0.207	1.0	0.825	0.175	1.33E-01	1.67E-01	7.42E-01	3.00E-02	3.03E-03	3.17E-02	6.72E-03	8.97E-01	1.48E-01	4.41E-01	6.16E-01	0.00E+00	-0.084	-1.523	-0.757
18	1.82	0.0	0.196	1.0	0.838	0.162	1.48E-01	1.51E-01	8.27E-01	2.71E-02	2.73E-03	3.21E-02	6.23E-03	9.05E-01	1.63E-01	4.25E-01	5.96E-01	0.00E+00	-0.077	-1.567	-0.790
17	1.72	0.0	0.185	1.0	0.850	0.150	1.65E-01	1.35E-01	9.22E-01	2.42E-02	2.45E-03	3.26E-02	5.74E-03	9.13E-01	1.80E-01	4.08E-01	5.75E-01	0.00E+00	-0.070	-1.616	-0.825
16	1.62	0.0	0.174	1.0	0.863	0.137	1.84E-01	1.19E-01	1.03E+00	2.14E-02	2.16E-03	3.31E-02	5.25E-03	9.21E-01	1.99E-01	3.90E-01	5.54E-01	0.00E+00	-0.064	-1.669	-0.864
15	1.52	0.0	0.163	1.0	0.876	0.124	2.05E-01	1.04E-01	1.15E+00	1.87E-02	1.89E-03	3.36E-02	4.76E-03	9.29E-01	2.21E-01	3.71E-01	5.30E-01	0.00E+00	-0.058	-1.728	-0.907
14	1.41	0.0	0.153	1.0	0.889	0.111	2.29E-01	9.00E-02	1.28E+00	1.61E-02	1.63E-03	3.41E-02	4.28E-03	9.36E-01	2.44E-01	3.52E-01	5.06E-01	0.00E+00	-0.051	-1.792	-0.953
13	1.31	0.0	0.142	1.0	0.901	0.099	2.55E-01	7.64E-02	1.43E+00	1.37E-02	1.38E-03	3.46E-02	3.80E-03	9.43E-01	2.71E-01	3.32E-01	4.80E-01	0.00E+00	-0.045	-1.863	-1.004
12	1.21	0.0	0.131	1.0	0.913	0.087	2.85E-01	6.36E-02	1.60E+00	1.14E-02	1.15E-03	3.50E-02	3.34E-03	9.50E-01	3.00E-01	3.11E-01	4.52E-01	0.00E+00	-0.040	-1.942	-1.061
11	1.11	0.0	0.120	1.0	0.925	0.075	3.18E-01	5.19E-02	1.78E+00	9.31E-03	9.41E-04	3.55E-02	2.89E-03	9.57E-01	3.32E-01	2.89E-01	4.24E-01	0.00E+00	-0.034	-2.031	-1.123
10	1.01	0.0	0.109	1.0	0.936	0.064	3.55E-01	4.13E-02	1.99E+00	7.40E-03	7.48E-04	3.59E-02	2.46E-03	9.64E-01	3.68E-01	2.67E-01	3.93E-01	0.00E+00	-0.029	-2.130	-1.194
9	0.91	0.0	0.098	1.0	0.947	0.053	3.95E-01	3.18E-02	2.21E+00	5.71E-03	5.77E-04	3.63E-02	2.05E-03	9.70E-01	4.08E-01	2.43E-01	3.62E-01	0.00E+00	-0.024	-2.243	-1.273
8	0.81	0.0	0.087	1.0	0.957	0.043	4.40E-01	2.37E-02	2.46E+00	4.24E-03	4.29E-04	3.67E-02	1.66E-03	9.76E-01	4.51E-01	2.19E-01	3.28E-01	0.00E+00	-0.019	-2.372	-1.363
7	0.71	0.0	0.076	1.0	0.966	0.034	4.90E-01	1.68E-02	2.74E+00	3.01E-03	3.04E-04	3.71E-02	1.31E-03	9.81E-01	4.99E-01	1.95E-01	2.94E-01	0.00E+00	-0.015	-2.522	-1.467
6	0.61	0.0	0.065	1.0	0.974	0.026	5.44E-01	1.12E-02	3.05E+00	2.01E-03	2.03E-04	3.74E-02	9.88E-04	9.86E-01	5.52E-01	1.69E-01	2.57E-01	0.00E+00	-0.011	-2.698	-1.589
5	0.51	0.0	0.054	1.0	0.982	0.018	6.03E-01	6.87E-03	3.38E+00	1.23E-03	1.24E-04	3.77E-02	7.05E-04	9.90E-01	6.10E-01	1.43E-01	2.19E-01	0.00E+00	-0.008	-2.909	-1.736
4	0.40	0.0	0.044	1.0	0.988	0.012	6.68E-01	3.75E-03	3.74E+00	6.73E-04	6.80E-05	3.79E-02	4.65E-04	9.93E-01	6.73E-01	1.16E-01	1.80E-01	0.00E+00	-0.005	-3.172	-1.917
3	0.30	0.0	0.033	1.0	0.993	0.007	7.39E-01	1.70E-03	4.14E+00	3.05E-04	3.09E-05	3.81E-02	2.70E-04	9.96E-01	7.42E-01	8.84E-02	1.39E-01	0.00E+00	-0.003	-3.515	-2.153
2	0.20	0.0	0.022	1.0	0.997	0.003	8.16E-01	5.54E-04	4.57E+00	9.93E-05	1.00E-05	3.83E-02	1.25E-04	9.98E-01	8.17E-01	6.01E-02	9.60E-02	0.00E+00	-0.001	-4.003	-2.488
1	0.10	0.0	0.011	1.0	0.999	0.001	9.00E-01	8.01E-05	5.04E+00	1.44E-05	1.45E-06	3.83E-02	3.31E-05	1.00E+00	9.01E-01	3.09E-02	5.09E-02	0.00E+00	0.000	-4.843	-3.065

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-20 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		25.61	28.13	2.52	25.87	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table. First measurement assumed to be static.

Measurements After Bailing

10:37:00	0.00	25.93	26.29	0.36	25.97	The first depth-to-fluids measurement after
10:37:30	0.50	25.91	26.28	0.37	25.95	bailer is raised above air-oil interface.
10:38:05	1.08	25.90	26.28	0.38	25.94	
10:38:40	1.67	25.88	26.27	0.39	25.92	
10:39:10	2.17	25.88	26.27	0.39	25.92	
10:39:38	2.63	25.88	26.29	0.41	25.92	
10:40:00	3.00	25.88	26.28	0.4	25.92	
10:40:30	3.50	25.88	26.32	0.44	25.93	
10:41:00	4.00	25.87	26.31	0.44	25.92	
10:41:30	4.50	25.87	26.31	0.44	25.92	
10:42:00	5.00	25.87	26.32	0.45	25.92	
10:42:30	5.50	25.87	26.32	0.45	25.92	
10:43:00	6.00	25.87	26.32	0.45	25.92	
10:43:30	6.50	25.87	26.32	0.45	25.92	
10:44:00	7.00	25.87	26.32	0.45	25.92	
10:44:30	7.50	25.87	26.32	0.45	25.92	
10:45:00	8.00	25.86	26.32	0.46	25.91	
10:45:35	8.58	25.86	26.34	0.48	25.91	
10:46:05	9.08	25.86	26.34	0.48	25.91	
10:47:35	10.58	25.86	26.34	0.48	25.91	
10:48:00	11.00	25.86	26.35	0.49	25.91	
10:49:00	12.00	25.86	26.37	0.51	25.91	
10:50:00	13.00	25.85	26.37	0.52	25.90	
				0	0.00	

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
10:51:00	14.00	25.85	26.37	0.52	25.90	
10:52:00	15.00	25.85	26.38	0.53	25.90	
10:53:00	16.00	25.85	26.38	0.53	25.90	
10:54:00	17.00	25.85	26.39	0.54	25.91	
10:55:00	18.00	25.85	26.39	0.54	25.91	
10:56:00	19.00	25.85	26.39	0.54	25.91	
10:57:00	20.00	25.85	26.39	0.54	25.91	
10:58:00	21.00	25.85	26.39	0.54	25.91	
10:59:00	22.00	25.85	26.39	0.54	25.91	
11:02:00	25.00	25.86	26.39	0.53	25.91	
11:05:00	28.00	25.85	26.41	0.56	25.91	
11:08:00	31.00	25.85	26.41	0.56	25.91	
11:11:00	34.00	25.85	26.42	0.57	25.91	
11:22:00	45.00	25.84	26.44	0.6	25.90	
11:32:00	55.00	25.82	26.44	0.62	25.88	
11:42:00	65.00	25.82	26.5	0.68	25.89	
12:15:00	98.00	25.8	26.58	0.78	25.88	
12:45:00	128.00	25.78	26.6	0.82	25.86	
13:45:00	188.00	25.74	26.7	0.96	25.84	
14:45:00	248.00	25.69	26.83	1.14	25.81	
15:45:00	308.00	25.68	26.94	1.26	25.81	
				0	0.00	
				0	0.00	
				0	0.00	

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8974	(dimensionless)
Dynamic viscosity of free oil:	31.58	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	37	dynes/cm
Oil-water interfacial tension:	28.97	dynes/cm
BETA-AO	1.946	
BETA-OW	2.49	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	3.5	1/feet
van Genuchten n:	1.3	(dimensionless)
van Genuchten m:	0.23	(dimensionless)

Free Oil Thickness in Well:

Free Oil Thickness in Well:	2.52	feet
Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculati	0.126	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	3.84E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	1.15E-01	ft2/day
Geometric mean oil saturation within free oil layer:	0.12	
Geometric mean water sat'n within free oil layer:	0.85	
Specific Volume of Oil (above & below oil table):	0.18	ft
Specific Volume of Water (above & below oil table)	1.17	ft
Estimate of oil storativity:	0.02	
Bouwer-Rice Oil Conductivity (below oil table):	2.69E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	3.78	1.131	0.388	0.580	0.698	0.075	1.46E-03	3.02E-04	8.16E-03	4.80E-05	6.05E-06	3.34E-02	3.61E-03	8.15E-01	1.79E-03	2.89E-01	9.58E-01	9.25E-01	-0.156	-4.318	-1.123
29	3.65	1.018	0.375	0.595	0.704	0.075	1.58E-03	3.23E-04	8.86E-03	5.14E-05	6.48E-06	3.37E-02	3.61E-03	8.19E-01	1.93E-03	2.89E-01	9.56E-01	9.23E-01	-0.153	-4.289	-1.123
28	3.53	0.905	0.362	0.611	0.709	0.075	1.72E-03	3.47E-04	9.65E-03	5.52E-05	6.96E-06	3.39E-02	3.61E-03	8.22E-01	2.10E-03	2.89E-01	9.54E-01	9.20E-01	-0.149	-4.258	-1.123
27	3.40	0.792	0.349	0.630	0.714	0.075	1.88E-03	3.74E-04	1.05E-02	5.95E-05	7.49E-06	3.42E-02	3.61E-03	8.26E-01	2.28E-03	2.89E-01	9.52E-01	9.16E-01	-0.146	-4.226	-1.123
26	3.28	0.678	0.336	0.652	0.720	0.075	2.06E-03	4.04E-04	1.15E-02	6.43E-05	8.10E-06	3.45E-02	3.61E-03	8.30E-01	2.48E-03	2.89E-01	9.50E-01	9.13E-01	-0.143	-4.192	-1.123
25	3.15	0.565	0.323	0.679	0.726	0.075	2.26E-03	4.38E-04	1.27E-02	6.96E-05	8.77E-06	3.47E-02	3.61E-03	8.34E-01	2.71E-03	2.89E-01	9.48E-01	9.09E-01	-0.139	-4.157	-1.123
24	3.02	0.452	0.310	0.712	0.732	0.075	2.49E-03	4.76E-04	1.40E-02	7.57E-05	9.54E-06	3.50E-02	3.61E-03	8.38E-01	2.97E-03	2.89E-01	9.45E-01	9.05E-01	-0.136	-4.121	-1.123
23	2.90	0.339	0.297	0.755	0.738	0.075	2.75E-03	5.20E-04	1.54E-02	8.27E-05	1.04E-05	3.53E-02	3.61E-03	8.42E-01	3.27E-03	2.89E-01	9.43E-01	9.00E-01	-0.132	-4.082	-1.123
22	2.77	0.226	0.284	0.812	0.745	0.075	3.06E-03	5.70E-04	1.71E-02	9.07E-05	1.14E-05	3.57E-02	3.61E-03	8.46E-01	3.61E-03	2.89E-01	9.40E-01	8.96E-01	-0.128	-4.042	-1.123
21	2.65	0.113	0.271	0.895	0.751	0.143	3.40E-03	5.75E-03	1.91E-02	9.15E-04	1.15E-04	3.60E-02	6.87E-03	8.51E-01	4.00E-03	3.99E-01	9.37E-01	8.17E-01	-0.124	-3.038	-0.843
20	2.52	0.0	0.259	1.0	0.759	0.241	3.81E-03	4.51E-01	2.13E-02	7.18E-02	9.04E-03	3.63E-02	1.16E-02	8.55E-01	4.45E-03	5.18E-01	9.33E-01	0.00E+00	-0.120	-1.144	-0.617
19	2.39	0.0	0.246	1.0	0.766	0.234	4.28E-03	4.40E-01	2.39E-02	7.01E-02	8.83E-03	3.67E-02	1.12E-02	8.60E-01	4.97E-03	5.10E-01	9.30E-01	0.00E+00	-0.116	-1.154	-0.631
18	2.27	0.0	0.233	1.0	0.774	0.226	4.83E-03	4.29E-01	2.70E-02	6.83E-02	8.60E-03	3.71E-02	1.08E-02	8.65E-01	5.58E-03	5.01E-01	9.25E-01	0.00E+00	-0.111	-1.166	-0.646
17	2.14	0.0	0.220	1.0	0.782	0.218	5.48E-03	4.17E-01	3.07E-02	6.64E-02	8.36E-03	3.75E-02	1.04E-02	8.71E-01	6.29E-03	4.92E-01	9.21E-01	0.00E+00	-0.107	-1.178	-0.662
16	2.02	0.0	0.207	1.0	0.791	0.209	6.25E-03	4.04E-01	3.50E-02	6.43E-02	8.10E-03	3.79E-02	1.00E-02	8.76E-01	7.14E-03	4.82E-01	9.16E-01	0.00E+00	-0.102	-1.192	-0.680
15	1.89	0.0	0.194	1.0	0.800	0.200	7.19E-03	3.90E-01	4.02E-02	6.21E-02	7.82E-03	3.83E-02	9.58E-03	8.82E-01	8.15E-03	4.72E-01	9.10E-01	0.00E+00	-0.097	-1.207	-0.699
14	1.76	0.0	0.181	1.0	0.809	0.191	8.31E-03	3.75E-01	4.66E-02	5.97E-02	7.53E-03	3.88E-02	9.12E-03	8.88E-01	9.36E-03	4.60E-01	9.03E-01	0.00E+00	-0.092	-1.224	-0.720
13	1.64	0.0	0.168	1.0	0.819	0.181	9.69E-03	3.59E-01	5.43E-02	5.72E-02	7.21E-03	3.92E-02	8.64E-03	8.94E-01	1.08E-02	4.48E-01	8.96E-01	0.00E+00	-0.086	-1.243	-0.743
12	1.51	0.0	0.155	1.0	0.830	0.170	1.14E-02	3.42E-01	6.38E-02	5.45E-02	6.86E-03	3.97E-02	8.14E-03	9.01E-01	1.27E-02	4.35E-01	8.87E-01	0.00E+00	-0.081	-1.264	-0.770
11	1.39	0.0	0.142	1.0	0.841	0.159	1.35E-02	3.24E-01	7.58E-02	5.15E-02	6.49E-03	4.03E-02	7.60E-03	9.08E-01	1.49E-02	4.20E-01	8.78E-01	0.00E+00	-0.075	-1.288	-0.799
10	1.26	0.0	0.129	1.0	0.853	0.147	1.62E-02	3.04E-01	9.10E-02	4.83E-02	6.09E-03	4.08E-02	7.03E-03	9.15E-01	1.78E-02	4.04E-01	8.67E-01	0.00E+00	-0.069	-1.316	-0.833
9	1.13	0.0	0.116	1.0	0.866	0.134	1.97E-02	2.82E-01	1.11E-01	4.48E-02	5.65E-03	4.14E-02	6.44E-03	9.22E-01	2.14E-02	3.86E-01	8.54E-01	0.00E+00	-0.063	-1.349	-0.872
8	1.01	0.0	0.103	1.0	0.879	0.121	2.43E-02	2.58E-01	1.36E-01	4.10E-02	5.17E-03	4.21E-02	5.80E-03	9.30E-01	2.61E-02	3.67E-01	8.38E-01	0.00E+00	-0.056	-1.387	-0.917
7	0.88	0.0	0.090	1.0	0.893	0.107	3.05E-02	2.32E-01	1.71E-01	3.69E-02	4.65E-03	4.27E-02	5.13E-03	9.39E-01	3.25E-02	3.45E-01	8.20E-01	0.00E+00	-0.049	-1.433	-0.970
6	0.76	0.0	0.078	1.0	0.908	0.092	3.89E-02	2.04E-01	2.18E-01	3.24E-02	4.09E-03	4.35E-02	4.43E-03	9.47E-01	4.11E-02	3.21E-01	7.97E-01	0.00E+00	-0.042	-1.489	-1.034
5	0.63	0.0	0.065	1.0	0.923	0.077	5.08E-02	1.73E-01	2.85E-01	2.75E-02	3.47E-03	4.42E-02	3.68E-03	9.56E-01	5.32E-02	2.92E-01	7.69E-01	0.00E+00	-0.035	-1.560	-1.114
4	0.50	0.0	0.052	1.0	0.939	0.061	6.85E-02	1.40E-01	3.83E-01	2.23E-02	2.81E-03	4.50E-02	2.91E-03	9.66E-01	7.09E-02	2.60E-01	7.34E-01	0.00E+00	-0.027	-1.652	-1.216
3	0.38	0.0	0.039	1.0	0.956	0.044	9.59E-02	1.04E-01	5.37E-01	1.66E-02	2.09E-03	4.58E-02	2.11E-03	9.75E-01	9.83E-02	2.21E-01	6.86E-01	0.00E+00	-0.020	-1.760	-1.355
2	0.25	0.0	0.026	1.0	0.973	0.027	1.42E-01	6.71E-02	7.98E-01	1.07E-02	1.34E-03	4.66E-02	1.32E-03	9.85E-01	1.45E-01	1.75E-01	6.20E-01	0.00E+00	-0.012	-1.972	-1.561
1	0.13	0.0	0.013	1.0	0.988	0.012	2.36E-01	2.99E-02	1.32E+00	4.77E-03	6.00E-04	4.73E-02	5.61E-04	9.93E-01	2.38E-01	1.14E-01	5.12E-01	0.00E+00	-0.005	-2.322	-1.932

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-21 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		13.14	16.50	3.36	13.52	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
8:20:00	0.00	13.45	14.59	1.14	13.58	The first depth-to-fluids measurement after
8:20:30	0.50	13.48	14.68	1.2	13.62	bailer is raised above air-oil interface.
8:21:00	1.00	13.47	14.68	1.21	13.61	
8:21:42	1.70	13.47	14.70	1.23	13.61	
8:22:15	2.25	13.46	14.71	1.25	13.60	
8:23:00	3.00	13.46	14.74	1.28	13.61	
8:23:35	3.58	13.45	14.79	1.34	13.60	
8:24:06	4.10	13.44	14.79	1.35	13.59	
8:24:30	4.50	13.44	14.83	1.39	13.60	
8:25:00	5.00	13.43	14.88	1.45	13.59	
8:25:30	5.50	13.43	14.89	1.46	13.60	
8:26:00	6.00	13.43	14.90	1.47	13.60	
8:26:40	6.67	13.43	14.92	1.49	13.60	
8:27:08	7.13	13.42	14.96	1.54	13.59	
8:27:33	7.55	13.42	14.99	1.57	13.60	
8:28:00	8.00	13.42	15.02	1.6	13.60	
8:28:30	8.50	13.41	15.03	1.62	13.59	
8:29:00	9.00	13.41	15.06	1.65	13.60	
8:29:30	9.50	13.40	15.07	1.67	13.59	
8:30:00	10.00	13.40	15.09	1.69	13.59	
8:31:00	11.00	13.40	15.11	1.71	13.59	
8:32:00	12.00	13.39	15.14	1.75	13.59	
8:33:00	13.00	13.38	15.15	1.77	13.58	
				0	0.00	

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
8:34:00	14.00	13.38	15.22	1.84	13.59	
8:35:00	15.00	13.37	15.25	1.88	13.58	
8:36:00	16.00	13.36	15.27	1.91	13.58	
8:37:00	17.00	13.36	15.31	1.95	13.58	
8:38:00	18.00	13.36	15.37	2.01	13.59	
8:39:00	19.00	13.35	15.36	2.01	13.58	
8:42:00	22.00	13.35	15.40	2.05	13.58	
8:45:00	25.00	13.34	15.41	2.07	13.57	
8:48:00	28.00	13.33	15.45	2.12	13.57	
8:52:00	32.00	13.33	15.52	2.19	13.58	
9:02:00	42.00	13.32	15.61	2.29	13.58	
9:12:30	52.50	13.3	15.67	2.37	13.57	
9:22:30	62.50	13.29	15.72	2.43	13.57	
9:52:00	92.00	13.27	15.92	2.65	13.57	
10:22:00	122.00	13.25	15.99	2.74	13.56	
11:22:00	182.00	13.23	16.1	2.87	13.56	
12:22:00	242.00	13.22	16.09	2.87	13.55	
13:20:00	300.00	13.19	16.21	3.02	13.53	
14:25:00	365.00	13.18	16.21	3.03	13.52	
15:20:00	420.00	13.17	16.22	3.05	13.52	
				0	0.00	
				0	0.00	
				0	0.00	

MULTIPHASE ENVIRONMENTAL, Inc.
Innovations in the Subsurface

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8867	(dimensionless)
Dynamic viscosity of free oil	34.68	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	36	dynes/cm
Oil-water interfacial tension:	31.2	dynes/cm
BETA-AO	2.000	
BETA-OW	2.31	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	4.2	1/feet
van Genuchten n:	1.4	(dimensionless)
van Genuchten m:	0.29	(dimensionless)

Free Oil Thickness in Well	3.36	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.168	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	4.94E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	1.95E-01	ft2/day
Geometric mean oil saturation within free oil layer:	0.21	
Geometric mean water sat'n within free oil layer:	0.75	
Specific Volume of Oil (above & below oil table):	0.37	ft
Specific Volume of Water (above & below oil table):	1.33	ft
Estimate of oil storativity:	0.04	
Bouwer-Rice Oil Conductivity (below oil table):	3.96E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	5.04	1.490	0.571	0.425	0.543	0.075	4.25E-04	1.05E-04	2.38E-03	1.51E-05	2.53E-06	3.47E-02	4.81E-03	7.01E-01	6.06E-04	2.89E-01	9.75E-01	9.56E-01	-0.265	-4.822	-1.123
29	4.87	1.341	0.552	0.438	0.548	0.075	4.68E-04	1.12E-04	2.62E-03	1.61E-05	2.70E-06	3.50E-02	4.81E-03	7.06E-01	6.63E-04	2.89E-01	9.74E-01	9.55E-01	-0.261	-4.794	-1.123
28	4.70	1.192	0.533	0.454	0.554	0.075	5.16E-04	1.20E-04	2.89E-03	1.72E-05	2.89E-06	3.54E-02	4.81E-03	7.10E-01	7.27E-04	2.89E-01	9.73E-01	9.53E-01	-0.256	-4.765	-1.123
27	4.54	1.043	0.514	0.473	0.560	0.075	5.72E-04	1.29E-04	3.20E-03	1.84E-05	3.09E-06	3.58E-02	4.81E-03	7.15E-01	8.00E-04	2.89E-01	9.72E-01	9.51E-01	-0.252	-4.735	-1.123
26	4.37	0.894	0.495	0.495	0.566	0.075	6.36E-04	1.38E-04	3.56E-03	1.98E-05	3.33E-06	3.62E-02	4.81E-03	7.20E-01	8.83E-04	2.89E-01	9.70E-01	9.48E-01	-0.247	-4.703	-1.123
25	4.20	0.745	0.476	0.523	0.573	0.075	7.09E-04	1.49E-04	3.97E-03	2.13E-05	3.59E-06	3.66E-02	4.81E-03	7.25E-01	9.78E-04	2.89E-01	9.69E-01	9.46E-01	-0.242	-4.671	-1.123
24	4.03	0.596	0.457	0.559	0.580	0.075	7.94E-04	1.61E-04	4.45E-03	2.31E-05	3.88E-06	3.70E-02	4.81E-03	7.30E-01	1.09E-03	2.89E-01	9.67E-01	9.43E-01	-0.237	-4.636	-1.123
23	3.86	0.447	0.438	0.609	0.587	0.075	8.94E-04	1.75E-04	5.01E-03	2.51E-05	4.21E-06	3.75E-02	4.81E-03	7.36E-01	1.21E-03	2.89E-01	9.65E-01	9.41E-01	-0.231	-4.601	-1.123
22	3.70	0.298	0.419	0.682	0.595	0.087	1.01E-03	2.89E-04	5.66E-03	4.14E-05	6.96E-06	3.80E-02	5.53E-03	7.42E-01	1.36E-03	3.10E-01	9.63E-01	9.33E-01	-0.226	-4.383	-1.063
21	3.53	0.149	0.400	0.803	0.603	0.200	1.15E-03	5.29E-03	6.43E-03	7.57E-04	1.27E-04	3.85E-02	1.28E-02	7.48E-01	1.54E-03	4.72E-01	9.61E-01	8.55E-01	-0.220	-3.121	-0.698
20	3.36	0.0	0.381	1.0	0.612	0.388	1.31E-03	6.03E-01	7.34E-03	8.64E-02	1.45E-02	3.90E-02	2.48E-02	7.54E-01	1.74E-03	6.57E-01	9.58E-01	0.00E+00	-0.214	-1.064	-0.411
19	3.19	0.0	0.362	1.0	0.621	0.379	1.51E-03	5.93E-01	8.44E-03	8.49E-02	1.43E-02	3.96E-02	2.42E-02	7.61E-01	1.98E-03	6.49E-01	9.55E-01	0.00E+00	-0.207	-1.071	-0.421
18	3.02	0.0	0.343	1.0	0.630	0.370	1.74E-03	5.81E-01	9.76E-03	8.32E-02	1.40E-02	4.02E-02	2.36E-02	7.68E-01	2.27E-03	6.41E-01	9.52E-01	0.00E+00	-0.200	-1.080	-0.432
17	2.86	0.0	0.324	1.0	0.641	0.359	2.03E-03	5.69E-01	1.14E-02	8.15E-02	1.37E-02	4.09E-02	2.29E-02	7.75E-01	2.62E-03	6.32E-01	9.49E-01	0.00E+00	-0.193	-1.089	-0.444
16	2.69	0.0	0.305	1.0	0.652	0.348	2.38E-03	5.55E-01	1.33E-02	7.95E-02	1.34E-02	4.16E-02	2.22E-02	7.83E-01	3.04E-03	6.22E-01	9.45E-01	0.00E+00	-0.186	-1.099	-0.458
15	2.52	0.0	0.286	1.0	0.663	0.337	2.82E-03	5.41E-01	1.56E-02	7.74E-02	1.30E-02	4.23E-02	2.15E-02	7.91E-01	3.57E-03	6.12E-01	9.40E-01	0.00E+00	-0.178	-1.111	-0.473
14	2.35	0.0	0.266	1.0	0.676	0.324	3.37E-03	5.25E-01	1.89E-02	7.51E-02	1.26E-02	4.31E-02	2.07E-02	8.00E-01	4.22E-03	6.00E-01	9.35E-01	0.00E+00	-0.170	-1.124	-0.489
13	2.18	0.0	0.247	1.0	0.689	0.311	4.07E-03	5.07E-01	2.28E-02	7.26E-02	1.22E-02	4.40E-02	1.98E-02	8.09E-01	5.04E-03	5.88E-01	9.29E-01	0.00E+00	-0.162	-1.139	-0.508
12	2.02	0.0	0.228	1.0	0.704	0.296	4.98E-03	4.88E-01	2.79E-02	6.98E-02	1.17E-02	4.49E-02	1.89E-02	8.19E-01	6.08E-03	5.74E-01	9.22E-01	0.00E+00	-0.153	-1.156	-0.528
11	1.85	0.0	0.209	1.0	0.720	0.280	6.17E-03	4.66E-01	3.46E-02	6.67E-02	1.12E-02	4.59E-02	1.79E-02	8.30E-01	7.44E-03	5.58E-01	9.14E-01	0.00E+00	-0.143	-1.176	-0.552
10	1.68	0.0	0.190	1.0	0.737	0.263	7.77E-03	4.42E-01	4.35E-02	6.33E-02	1.06E-02	4.70E-02	1.68E-02	8.41E-01	9.24E-03	5.41E-01	9.04E-01	0.00E+00	-0.133	-1.199	-0.580
9	1.51	0.0	0.171	1.0	0.755	0.245	9.95E-03	4.15E-01	5.57E-02	5.94E-02	9.98E-03	4.82E-02	1.56E-02	8.53E-01	1.17E-02	5.21E-01	8.92E-01	0.00E+00	-0.122	-1.226	-0.612
8	1.34	0.0	0.152	1.0	0.776	0.224	1.30E-02	3.84E-01	7.28E-02	5.50E-02	9.24E-03	4.95E-02	1.43E-02	8.67E-01	1.50E-02	4.99E-01	8.78E-01	0.00E+00	-0.110	-1.259	-0.650
7	1.18	0.0	0.133	1.0	0.798	0.202	1.74E-02	3.50E-01	9.74E-02	5.01E-02	8.41E-03	5.10E-02	1.29E-02	8.81E-01	1.98E-02	4.73E-01	8.59E-01	0.00E+00	-0.098	-1.300	-0.695
6	1.01	0.0	0.114	1.0	0.823	0.177	2.39E-02	3.10E-01	1.34E-01	4.44E-02	7.47E-03	5.25E-02	1.13E-02	8.96E-01	2.67E-02	4.44E-01	8.37E-01	0.00E+00	-0.085	-1.352	-0.752
5	0.84	0.0	0.095	1.0	0.850	0.150	3.41E-02	2.66E-01	1.91E-01	3.81E-02	6.39E-03	5.43E-02	9.58E-03	9.13E-01	3.73E-02	4.08E-01	8.07E-01	0.00E+00	-0.071	-1.420	-0.824
4	0.67	0.0	0.076	1.0	0.880	0.120	5.05E-02	2.15E-01	2.83E-01	3.08E-02	5.18E-03	5.62E-02	7.69E-03	9.31E-01	5.43E-02	3.66E-01	7.67E-01	0.00E+00	-0.056	-1.511	-0.919
3	0.50	0.0	0.057	1.0	0.911	0.089	7.90E-02	1.59E-01	4.42E-01	2.27E-02	3.82E-03	5.82E-02	5.65E-03	9.50E-01	8.32E-02	3.14E-01	7.12E-01	0.00E+00	-0.040	-1.643	-1.053
2	0.34	0.0	0.038	1.0	0.945	0.055	1.33E-01	9.82E-02	7.43E-01	1.41E-02	2.36E-03	6.03E-02	3.52E-03	9.69E-01	1.37E-01	2.47E-01	6.30E-01	0.00E+00	-0.025	-1.852	-1.259
1	0.17	0.0	0.019	1.0	0.977	0.023	2.51E-01	3.91E-02	1.41E+00	5.60E-03	9.40E-04	6.24E-02	1.45E-03	9.87E-01	2.54E-01	1.59E-01	4.96E-01	0.00E+00	-0.010	-2.252	-1.643

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

EST

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-22 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		16.81	18.15	1.34	16.96	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
11:00:00	0.00	16.95	17.31	0.36	16.99	The first depth-to-fluids measurement after
11:00:30	0.50	16.94	17.35	0.41	16.99	bailer is raised above air-oil interface.
11:01:00	1.00	16.94	17.36	0.42	16.99	
11:01:30	1.50	16.92	17.36	0.44	16.97	
11:02:00	2.00	16.91	17.37	0.46	16.96	
11:02:30	2.50	16.91	17.36	0.45	16.96	
11:03:00	3.00	16.91	17.42	0.51	16.97	
11:03:30	3.50	16.90	17.41	0.51	16.96	
11:04:00	4.00	16.90	17.44	0.54	16.96	
11:04:30	4.50	16.90	17.46	0.56	16.96	
11:05:00	5.00	16.90	17.47	0.57	16.96	
11:06:00	6.00	16.90	17.47	0.57	16.96	
11:06:30	6.50	16.90	17.48	0.58	16.97	
11:07:00	7.00	16.90	17.49	0.59	16.97	
11:07:38	7.63	16.89	17.49	0.6	16.96	
11:08:15	8.25	16.89	17.50	0.61	16.96	
11:08:45	8.75	16.89	17.51	0.62	16.96	
11:09:30	9.50	16.89	17.51	0.62	16.96	
11:10:00	10.00	16.89	17.52	0.63	16.96	
11:11:00	11.00	16.89	17.52	0.63	16.96	
11:12:00	12.00	16.88	17.53	0.65	16.95	
11:13:00	13.00	16.88	17.53	0.65	16.95	
11:14:00	14.00	16.88	17.53	0.65	16.95	
				0	0.00	

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
11:15:00	15.00	16.88	17.53	0.65	16.95	
11:16:00	16.00	16.88	17.54	0.66	16.95	
11:17:00	17.00	16.88	17.54	0.66	16.95	
11:18:00	18.00	16.88	17.55	0.67	16.96	
11:19:00	19.00	16.88	17.57	0.69	16.96	
11:20:00	20.00	16.88	17.58	0.7	16.96	
11:23:00	23.00	16.88	17.60	0.72	16.96	
11:26:00	26.00	16.88	17.62	0.74	16.96	
11:29:00	29.00	16.88	17.62	0.74	16.96	
11:32:00	32.00	16.87	17.62	0.75	16.95	
11:42:00	42.00	16.88	17.62	0.74	16.96	
11:52:00	52.00	16.87	17.63	0.76	16.96	
12:02:00	62.00	16.87	17.64	0.77	16.96	
12:32:00	92.00	16.86	17.66	0.8	16.95	
13:05:00	125.00	16.86	17.67	0.81	16.95	
14:05:00	185.00	16.84	17.68	0.84	16.93	
15:05:00	245.00	16.84	17.7	0.86	16.94	
				0	0.00	
				0	0.00	
				0	0.00	
				0	0.00	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

ES&T

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation
Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8874 (dimensionless)
Dynamic viscosity of free oil:	22.64 centipoise
Air-water surface tension:	72 dynes/cm
Air-oil surface tension:	35.5 dynes/cm
Oil-water interfacial tension:	28.94 dynes/cm
BETA-AO	2.028
BETA-OW	2.49

Soil Properties of Formation

Hydraulic conductivity:	5.6 ft/day
Porosity:	0.38 (dimensionless)
Irreducible water saturation:	0.1 (dimensionless)
van Genuchten alpha:	4.25 1/feet
van Genuchten n:	1.2 (dimensionless)
van Genuchten m:	0.17 (dimensionless)

Free Oil Thickness in Well:	1.34 feet
Elevation at Oil-Wtr Interfac	0 feet
Elevation increment for calc	0.067 feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	4.13E-02 ft/day
Oil Transmissivity of free oil layer (below oil table):	6.38E-02 ft2/day
Geometric mean oil saturation within free oil layer:	0.06
Geometric mean water sat'n within free oil layer:	0.92
Specific Volume of Oil (above & below oil table):	0.06 ft
Specific Volume of Water (above & below oil table):	0.68 ft
Estimate of oil storativity:	0.01
Bouwer-Rice Oil Conductivity (below oil table):	5.65E-01 ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	2.01	0.595	0.226	0.735	0.819	0.075	2.14E-03	7.87E-04	1.20E-02	1.73E-04	1.16E-05	2.08E-02	1.92E-03	8.94E-01	2.39E-03	2.89E-01	9.51E-01	8.99E-01	-0.087	-3.763	-1.123
29	1.94	0.535	0.219	0.747	0.823	0.075	2.29E-03	8.49E-04	1.28E-02	1.86E-04	1.25E-05	2.09E-02	1.92E-03	8.96E-01	2.56E-03	2.89E-01	9.49E-01	8.95E-01	-0.085	-3.730	-1.123
28	1.88	0.476	0.211	0.760	0.826	0.075	2.47E-03	9.19E-04	1.38E-02	2.02E-04	1.35E-05	2.10E-02	1.92E-03	8.98E-01	2.75E-03	2.89E-01	9.48E-01	8.91E-01	-0.083	-3.695	-1.123
27	1.81	0.416	0.204	0.775	0.830	0.075	2.66E-03	9.99E-04	1.49E-02	2.19E-04	1.47E-05	2.11E-02	1.92E-03	9.01E-01	2.95E-03	2.89E-01	9.46E-01	8.87E-01	-0.081	-3.659	-1.123
26	1.74	0.357	0.196	0.792	0.834	0.075	2.87E-03	1.09E-03	1.61E-02	2.39E-04	1.60E-05	2.12E-02	1.92E-03	9.03E-01	3.18E-03	2.89E-01	9.44E-01	8.82E-01	-0.079	-3.621	-1.123
25	1.68	0.297	0.189	0.812	0.838	0.075	3.11E-03	1.19E-03	1.74E-02	2.62E-04	1.76E-05	2.13E-02	1.92E-03	9.06E-01	3.44E-03	2.89E-01	9.41E-01	8.77E-01	-0.077	-3.581	-1.123
24	1.61	0.238	0.181	0.835	0.842	0.075	3.38E-03	1.31E-03	1.89E-02	2.89E-04	1.93E-05	2.14E-02	1.92E-03	9.08E-01	3.72E-03	2.89E-01	9.39E-01	8.72E-01	-0.075	-3.540	-1.123
23	1.54	0.178	0.174	0.864	0.846	0.075	3.68E-03	1.46E-03	2.06E-02	3.19E-04	2.14E-05	2.16E-02	1.92E-03	9.11E-01	4.04E-03	2.89E-01	9.36E-01	8.66E-01	-0.072	-3.496	-1.123
22	1.47	0.119	0.166	0.900	0.851	0.075	4.01E-03	1.62E-03	2.25E-02	3.56E-04	2.38E-05	2.17E-02	1.92E-03	9.13E-01	4.40E-03	2.89E-01	9.34E-01	8.59E-01	-0.070	-3.449	-1.123
21	1.41	0.059	0.158	0.946	0.856	0.091	4.40E-03	3.72E-03	2.46E-02	8.16E-04	5.47E-05	2.18E-02	2.31E-03	9.16E-01	4.80E-03	3.17E-01	9.31E-01	8.22E-01	-0.068	-3.088	-1.043
20	1.34	0.0	0.151	1.0	0.860	0.140	4.83E-03	3.39E-01	2.71E-02	7.44E-02	4.98E-03	2.19E-02	3.56E-03	9.19E-01	5.26E-03	3.94E-01	9.27E-01	0.00E+00	-0.065	-1.128	-0.855
19	1.27	0.0	0.143	1.0	0.865	0.135	5.33E-03	3.30E-01	2.98E-02	7.25E-02	4.86E-03	2.20E-02	3.43E-03	9.22E-01	5.78E-03	3.87E-01	9.24E-01	0.00E+00	-0.063	-1.140	-0.870
18	1.21	0.0	0.136	1.0	0.870	0.130	5.90E-03	3.21E-01	3.31E-02	7.05E-02	4.73E-03	2.22E-02	3.30E-03	9.25E-01	6.38E-03	3.80E-01	9.20E-01	0.00E+00	-0.060	-1.152	-0.887
17	1.14	0.0	0.128	1.0	0.876	0.124	6.56E-03	3.12E-01	3.68E-02	6.85E-02	4.59E-03	2.23E-02	3.17E-03	9.28E-01	7.07E-03	3.72E-01	9.16E-01	0.00E+00	-0.058	-1.165	-0.905
16	1.07	0.0	0.121	1.0	0.881	0.119	7.33E-03	3.02E-01	4.11E-02	6.63E-02	4.44E-03	2.24E-02	3.03E-03	9.32E-01	7.87E-03	3.63E-01	9.11E-01	0.00E+00	-0.055	-1.179	-0.925
15	1.01	0.0	0.113	1.0	0.887	0.113	8.23E-03	2.91E-01	4.61E-02	6.39E-02	4.28E-03	2.26E-02	2.88E-03	9.35E-01	8.81E-03	3.55E-01	9.06E-01	0.00E+00	-0.052	-1.194	-0.946
14	0.94	0.0	0.106	1.0	0.893	0.107	9.30E-03	2.80E-01	5.21E-02	6.14E-02	4.12E-03	2.27E-02	2.73E-03	9.39E-01	9.91E-03	3.45E-01	9.00E-01	0.00E+00	-0.049	-1.211	-0.969
13	0.87	0.0	0.098	1.0	0.899	0.101	1.06E-02	2.68E-01	5.92E-02	5.88E-02	3.94E-03	2.29E-02	2.57E-03	9.42E-01	1.12E-02	3.35E-01	8.94E-01	0.00E+00	-0.046	-1.230	-0.995
12	0.80	0.0	0.091	1.0	0.905	0.095	1.21E-02	2.55E-01	6.77E-02	5.60E-02	3.75E-03	2.30E-02	2.41E-03	9.46E-01	1.28E-02	3.24E-01	8.87E-01	0.00E+00	-0.043	-1.252	-1.024
11	0.74	0.0	0.083	1.0	0.912	0.088	1.39E-02	2.42E-01	7.80E-02	5.30E-02	3.55E-03	2.32E-02	2.24E-03	9.50E-01	1.47E-02	3.13E-01	8.79E-01	0.00E+00	-0.040	-1.275	-1.055
10	0.67	0.0	0.075	1.0	0.919	0.081	1.62E-02	2.27E-01	9.08E-02	4.98E-02	3.34E-03	2.34E-02	2.07E-03	9.54E-01	1.70E-02	3.00E-01	8.70E-01	0.00E+00	-0.037	-1.302	-1.091
9	0.60	0.0	0.068	1.0	0.926	0.074	1.90E-02	2.11E-01	1.07E-01	4.64E-02	3.11E-03	2.36E-02	1.88E-03	9.58E-01	1.99E-02	2.87E-01	8.59E-01	0.00E+00	-0.033	-1.333	-1.131
8	0.54	0.0	0.060	1.0	0.934	0.066	2.26E-02	1.95E-01	1.27E-01	4.27E-02	2.86E-03	2.38E-02	1.69E-03	9.62E-01	2.35E-02	2.72E-01	8.47E-01	0.00E+00	-0.030	-1.369	-1.178
7	0.47	0.0	0.053	1.0	0.941	0.059	2.73E-02	1.77E-01	1.53E-01	3.88E-02	2.60E-03	2.40E-02	1.49E-03	9.67E-01	2.82E-02	2.55E-01	8.32E-01	0.00E+00	-0.026	-1.412	-1.233
6	0.40	0.0	0.045	1.0	0.950	0.050	3.34E-02	1.57E-01	1.87E-01	3.45E-02	2.31E-03	2.42E-02	1.28E-03	9.72E-01	3.44E-02	2.37E-01	8.15E-01	0.00E+00	-0.022	-1.463	-1.298
5	0.34	0.0	0.038	1.0	0.958	0.042	4.17E-02	1.36E-01	2.34E-01	2.98E-02	2.00E-03	2.44E-02	1.07E-03	9.76E-01	4.27E-02	2.16E-01	7.93E-01	0.00E+00	-0.019	-1.525	-1.377
4	0.27	0.0	0.030	1.0	0.967	0.033	5.36E-02	1.13E-01	3.00E-01	2.48E-02	1.66E-03	2.46E-02	8.48E-04	9.81E-01	5.46E-02	1.92E-01	7.66E-01	0.00E+00	-0.015	-1.606	-1.477
3	0.20	0.0	0.023	1.0	0.976	0.024	7.15E-02	8.81E-02	4.00E-01	1.93E-02	1.30E-03	2.48E-02	6.23E-04	9.86E-01	7.24E-02	1.65E-01	7.31E-01	0.00E+00	-0.011	-1.714	-1.612
2	0.13	0.0	0.015	1.0	0.984	0.016	1.01E-01	6.10E-02	5.66E-01	1.34E-02	8.97E-04	2.51E-02	3.97E-04	9.91E-01	1.02E-01	1.32E-01	6.81E-01	0.00E+00	-0.007	-1.873	-1.807
1	0.07	0.0	0.008	1.0	0.993	0.007	1.61E-01	3.16E-02	9.00E-01	6.94E-03	4.65E-04	2.53E-02	1.79E-04	9.96E-01	1.61E-01	8.83E-02	5.98E-01	0.00E+00	-0.003	-2.159	-2.154

MULTIPHASE
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Innovations in the Subsurface

ES&T

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-23 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		13.18	15.06	1.88	13.39	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
						First measurement assumed to be static.

Measurements After Bailing

11:05:00	0.00	13.39	14.04	0.65	13.46	The first depth-to-fluids measurement after
11:05:30	0.50	13.36	14.06	0.7	13.44	bailer is raised above air-oil interface.
11:06:00	1.00	13.35	14.01	0.66	13.42	
11:06:30	1.50	13.34	14.05	0.71	13.42	
11:07:06	2.10	13.34	14.06	0.72	13.42	
11:07:38	2.63	13.34	14.08	0.74	13.42	
11:08:00	3.00	13.33	14.11	0.78	13.42	
11:08:32	3.53	13.33	14.12	0.79	13.42	
11:09:00	4.00	13.33	14.15	0.82	13.42	
11:09:30	4.50	13.33	14.12	0.79	13.42	
11:10:00	5.00	13.33	14.14	0.81	13.42	
11:10:30	5.50	13.32	14.15	0.83	13.41	
11:11:00	6.00	13.32	14.16	0.84	13.41	
11:11:30	6.50	13.32	14.16	0.84	13.41	
11:12:08	7.13	13.32	14.18	0.86	13.42	
11:12:35	7.58	13.32	14.19	0.87	13.42	
11:13:00	8.00	13.31	14.20	0.89	13.41	
11:13:30	8.50	13.31	14.20	0.89	13.41	
11:14:00	9.00	13.31	14.21	0.9	13.41	
11:14:30	9.50	13.31	14.21	0.9	13.41	
11:15:15	10.25	13.31	14.21	0.9	13.41	
11:16:30	11.50	13.31	14.21	0.9	13.41	
11:17:30	12.50	13.30	14.22	0.92	13.40	
				0	0.00	

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
11:18:40	13.67	13.30	14.23	0.93	13.40	
11:19:30	14.50	13.30	14.25	0.95	13.41	
11:20:00	15.00	13.30	14.25	0.95	13.41	
11:21:00	16.00	13.29	14.25	0.96	13.40	
11:22:15	17.25	13.29	14.25	0.96	13.40	
11:23:20	18.33	13.29	14.25	0.96	13.40	
11:24:20	19.33	13.29	14.26	0.97	13.40	
11:25:30	20.50	13.28	14.26	0.98	13.39	
11:28:00	23.00	13.28	14.28	1	13.39	
11:30:00	25.00	13.28	14.28	1	13.39	
11:32:10	27.17	13.28	14.28	1	13.39	
11:34:15	29.25	13.28	14.3	1.02	13.39	
11:36:00	31.00	13.27	14.3	1.03	13.39	
11:46:00	41.00	13.27	14.32	1.05	13.39	
11:56:00	51.00	13.26	14.34	1.08	13.38	
12:06:00	61.00	13.25	14.37	1.12	13.38	
12:36:00	91.00	13.25	14.41	1.16	13.38	
13:05:00	120.00	13.22	14.49	1.27	13.36	
14:05:00	180.00	13.21	14.53	1.32	13.36	
15:05:00	240.00	13.19	14.57	1.38	13.35	
				0	0.00	
				0	0.00	
				0	0.00	

MULTIPHASE
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Innovations in the Subsurface

EST

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8874	(dimensionless)
Dynamic viscosity of free oil	26.85	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	38	dynes/cm
Oil-water interfacial tension:	31.09	dynes/cm
BETA-AO	1.895	
BETA-OW	2.32	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.12	(dimensionless)
van Genuchten alpha:	2.5	1/feet
van Genuchten n:	1.2	(dimensionless)
van Genuchten m:	0.17	(dimensionless)

Free Oil Thickness in Well	1.88	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.094	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	2.89E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	6.36E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.05	
Geometric mean water sat'n within free oil layer:	0.94	
Specific Volume of Oil (above & below oil table):	0.07	ft
Specific Volume of Water (above & below oil table):	0.98	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	4.24E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	2.82	0.834	0.318	0.769	0.850	0.075	3.66E-03	1.57E-03	2.05E-02	2.91E-04	2.73E-05	3.04E-02	2.69E-03	9.11E-01	4.02E-03	2.93E-01	9.37E-01	8.63E-01	-0.071	-3.537	-1.123
29	2.73	0.751	0.307	0.781	0.853	0.075	3.92E-03	1.71E-03	2.19E-02	3.16E-04	2.97E-05	3.05E-02	2.69E-03	9.13E-01	4.29E-03	2.93E-01	9.34E-01	8.58E-01	-0.069	-3.501	-1.123
28	2.63	0.667	0.296	0.793	0.856	0.075	4.20E-03	1.86E-03	2.35E-02	3.44E-04	3.24E-05	3.06E-02	2.69E-03	9.15E-01	4.59E-03	2.93E-01	9.32E-01	8.53E-01	-0.067	-3.463	-1.123
27	2.54	0.584	0.286	0.808	0.860	0.075	4.50E-03	2.04E-03	2.52E-02	3.77E-04	3.54E-05	3.07E-02	2.69E-03	9.17E-01	4.91E-03	2.93E-01	9.30E-01	8.46E-01	-0.066	-3.424	-1.123
26	2.44	0.500	0.275	0.824	0.864	0.075	4.84E-03	2.24E-03	2.71E-02	4.15E-04	3.90E-05	3.08E-02	2.69E-03	9.19E-01	5.27E-03	2.93E-01	9.27E-01	8.40E-01	-0.064	-3.382	-1.123
25	2.35	0.417	0.265	0.843	0.867	0.075	5.22E-03	2.48E-03	2.92E-02	4.59E-04	4.31E-05	3.10E-02	2.69E-03	9.21E-01	5.67E-03	2.93E-01	9.25E-01	8.33E-01	-0.062	-3.338	-1.123
24	2.26	0.334	0.254	0.864	0.871	0.075	5.64E-03	2.76E-03	3.16E-02	5.11E-04	4.80E-05	3.11E-02	2.69E-03	9.24E-01	6.11E-03	2.93E-01	9.22E-01	8.25E-01	-0.060	-3.292	-1.123
23	2.16	0.250	0.243	0.890	0.875	0.075	6.11E-03	3.10E-03	3.42E-02	5.73E-04	5.39E-05	3.13E-02	2.69E-03	9.26E-01	6.60E-03	2.93E-01	9.19E-01	8.16E-01	-0.058	-3.242	-1.123
22	2.07	0.167	0.233	0.921	0.879	0.075	6.63E-03	3.50E-03	3.72E-02	6.48E-04	6.09E-05	3.14E-02	2.69E-03	9.29E-01	7.14E-03	2.93E-01	9.15E-01	8.06E-01	-0.056	-3.189	-1.123
21	1.97	0.083	0.222	0.959	0.883	0.076	7.22E-03	4.23E-03	4.05E-02	7.82E-04	7.35E-05	3.15E-02	2.73E-03	9.31E-01	7.76E-03	2.95E-01	9.12E-01	7.92E-01	-0.054	-3.107	-1.117
20	1.88	0.0	0.212	1.0	0.887	0.113	7.89E-03	2.95E-01	4.42E-02	5.46E-02	5.14E-03	3.17E-02	4.03E-03	9.34E-01	8.45E-03	3.58E-01	9.08E-01	0.00E+00	-0.052	-1.263	-0.948
19	1.79	0.0	0.201	1.0	0.892	0.108	8.64E-03	2.87E-01	4.84E-02	5.31E-02	4.99E-03	3.18E-02	3.87E-03	9.36E-01	9.23E-03	3.51E-01	9.04E-01	0.00E+00	-0.050	-1.275	-0.965
18	1.69	0.0	0.191	1.0	0.896	0.104	9.50E-03	2.78E-01	5.32E-02	5.14E-02	4.84E-03	3.20E-02	3.71E-03	9.39E-01	1.01E-02	3.44E-01	8.99E-01	0.00E+00	-0.048	-1.289	-0.983
17	1.60	0.0	0.180	1.0	0.901	0.099	1.05E-02	2.69E-01	5.87E-02	4.97E-02	4.67E-03	3.22E-02	3.55E-03	9.42E-01	1.11E-02	3.36E-01	8.95E-01	0.00E+00	-0.045	-1.303	-1.003
16	1.50	0.0	0.169	1.0	0.906	0.094	1.16E-02	2.59E-01	6.50E-02	4.79E-02	4.51E-03	3.23E-02	3.37E-03	9.45E-01	1.23E-02	3.28E-01	8.89E-01	0.00E+00	-0.043	-1.319	-1.025
15	1.41	0.0	0.159	1.0	0.910	0.090	1.29E-02	2.49E-01	7.24E-02	4.61E-02	4.33E-03	3.25E-02	3.20E-03	9.48E-01	1.36E-02	3.19E-01	8.83E-01	0.00E+00	-0.041	-1.337	-1.048
14	1.32	0.0	0.148	1.0	0.916	0.084	1.44E-02	2.38E-01	8.09E-02	4.41E-02	4.14E-03	3.27E-02	3.02E-03	9.51E-01	1.52E-02	3.10E-01	8.77E-01	0.00E+00	-0.038	-1.356	-1.073
13	1.22	0.0	0.138	1.0	0.921	0.079	1.62E-02	2.27E-01	9.09E-02	4.20E-02	3.95E-03	3.29E-02	2.83E-03	9.54E-01	1.70E-02	3.00E-01	8.70E-01	0.00E+00	-0.036	-1.377	-1.101
12	1.13	0.0	0.127	1.0	0.926	0.074	1.84E-02	2.15E-01	1.03E-01	3.98E-02	3.74E-03	3.31E-02	2.64E-03	9.57E-01	1.92E-02	2.90E-01	8.61E-01	0.00E+00	-0.033	-1.400	-1.132
11	1.03	0.0	0.116	1.0	0.932	0.068	2.09E-02	2.02E-01	1.17E-01	3.75E-02	3.52E-03	3.33E-02	2.44E-03	9.60E-01	2.18E-02	2.78E-01	8.52E-01	0.00E+00	-0.031	-1.427	-1.166
10	0.94	0.0	0.106	1.0	0.938	0.062	2.40E-02	1.89E-01	1.34E-01	3.50E-02	3.29E-03	3.35E-02	2.23E-03	9.64E-01	2.49E-02	2.66E-01	8.42E-01	0.00E+00	-0.028	-1.456	-1.204
9	0.85	0.0	0.095	1.0	0.943	0.057	2.77E-02	1.75E-01	1.55E-01	3.24E-02	3.04E-03	3.37E-02	2.02E-03	9.67E-01	2.86E-02	2.54E-01	8.31E-01	0.00E+00	-0.025	-1.490	-1.248
8	0.75	0.0	0.085	1.0	0.950	0.050	3.24E-02	1.60E-01	1.81E-01	2.96E-02	2.78E-03	3.39E-02	1.80E-03	9.71E-01	3.33E-02	2.39E-01	8.17E-01	0.00E+00	-0.022	-1.529	-1.297
7	0.66	0.0	0.074	1.0	0.956	0.044	3.83E-02	1.44E-01	2.14E-01	2.67E-02	2.51E-03	3.41E-02	1.58E-03	9.75E-01	3.92E-02	2.24E-01	8.02E-01	0.00E+00	-0.020	-1.574	-1.355
6	0.56	0.0	0.064	1.0	0.962	0.038	4.58E-02	1.27E-01	2.57E-01	2.35E-02	2.21E-03	3.44E-02	1.35E-03	9.78E-01	4.69E-02	2.07E-01	7.84E-01	0.00E+00	-0.017	-1.628	-1.423
5	0.47	0.0	0.053	1.0	0.969	0.031	5.59E-02	1.09E-01	3.13E-01	2.02E-02	1.90E-03	3.46E-02	1.11E-03	9.82E-01	5.70E-02	1.88E-01	7.61E-01	0.00E+00	-0.014	-1.695	-1.506
4	0.38	0.0	0.042	1.0	0.975	0.025	6.99E-02	8.99E-02	3.91E-01	1.66E-02	1.56E-03	3.48E-02	8.77E-04	9.86E-01	7.09E-02	1.67E-01	7.34E-01	0.00E+00	-0.011	-1.779	-1.610
3	0.28	0.0	0.032	1.0	0.982	0.018	9.02E-02	6.95E-02	5.05E-01	1.29E-02	1.21E-03	3.51E-02	6.38E-04	9.90E-01	9.11E-02	1.43E-01	6.98E-01	0.00E+00	-0.008	-1.891	-1.748
2	0.19	0.0	0.021	1.0	0.989	0.011	1.23E-01	4.77E-02	6.87E-01	8.82E-03	8.29E-04	3.53E-02	4.03E-04	9.94E-01	1.23E-01	1.13E-01	6.49E-01	0.00E+00	-0.005	-2.054	-1.947
1	0.09	0.0	0.011	1.0	0.995	0.005	1.85E-01	2.45E-02	1.04E+00	4.53E-03	4.26E-04	3.55E-02	1.80E-04	9.97E-01	1.86E-01	7.57E-02	5.69E-01	0.00E+00	-0.002	-2.344	-2.298

Fluid Levels Measured Prior to and After Bailing

Well Name: Gal-24 **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		13.65	15.09	1.44	13.83	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times.
				0	0.00	
				0	0.00	
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
9:47:00	0.00	13.82	13.90	0.08	13.83	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
9:47:30	0.50	13.82	13.91	0.09	13.83	
9:48:00	1.00	13.81	13.92	0.11	13.82	
9:48:30	1.50	13.81	13.94	0.13	13.83	
9:49:00	2.00	13.81	13.96	0.15	13.83	
9:49:30	2.50	13.81	13.97	0.16	13.83	
9:50:00	3.00	13.81	13.98	0.17	13.83	
9:50:40	3.67	13.81	13.98	0.17	13.83	
9:51:15	4.25	13.81	13.99	0.18	13.83	
9:51:40	4.67	13.81	13.99	0.18	13.83	
9:52:00	5.00	13.80	13.99	0.19	13.82	
9:52:30	5.50	13.80	14.00	0.2	13.82	
9:53:00	6.00	13.80	14.01	0.21	13.83	
9:53:30	6.50	13.80	14.01	0.21	13.83	
9:54:00	7.00	13.80	14.01	0.21	13.83	
9:54:30	7.50	13.79	14.01	0.22	13.82	
9:55:00	8.00	13.79	14.02	0.23	13.82	
9:55:30	8.50	13.79	14.02	0.23	13.82	
9:56:00	9.00	13.79	14.02	0.23	13.82	
9:56:30	9.50	13.79	14.02	0.23	13.82	
9:57:00	10.00	13.79	14.02	0.23	13.82	
9:58:00	11.00	13.79	14.02	0.23	13.82	
9:59:00	12.00	13.79	14.03	0.24	13.82	
				0	0.00	

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
10:00:00	13.00	13.79	14.03	0.24	13.82	
10:01:00	14.00	13.78	14.04	0.26	13.81	
10:02:00	15.00	13.79	14.04	0.25	13.82	
10:03:00	16.00	13.78	14.05	0.27	13.81	
10:04:00	17.00	13.78	14.05	0.27	13.81	
10:05:00	18.00	13.77	14.05	0.28	13.80	
10:06:00	19.00	13.77	14.05	0.28	13.80	
10:07:00	20.00	13.77	14.06	0.29	13.81	
10:10:00	23.00	13.77	14.06	0.29	13.81	
10:13:00	26.00	13.76	14.07	0.31	13.80	
10:16:00	29.00	13.76	14.08	0.32	13.80	
10:19:00	32.00	13.76	14.08	0.32	13.80	
10:22:00	35.00	13.76	14.09	0.33	13.80	
10:32:00	45.00	13.76	14.09	0.33	13.80	
10:42:00	55.00	13.75	14.1	0.35	13.79	
10:52:00	65.00	13.75	14.11	0.36	13.79	
11:22:00	95.00	13.74	14.14	0.4	13.79	
11:52:00	125.00	13.72	14.14	0.42	13.77	
12:52:00	185.00	13.71	14.15	0.44	13.76	
13:52:00	245.00	13.69	14.16	0.47	13.75	
14:52:00	305.00	13.68	14.17	0.49	13.74	
15:52:00	365.00	13.66	14.18	0.52	13.72	
				0	0.00	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

ES&T

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.8763	(dimensionless)
Dynamic viscosity of free oil:	18.69	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	35	dynes/cm
Oil-water interfacial tension:	31.95	dynes/cm
BETA-AO	2.057	
BETA-OW	2.25	

Free Oil Thickness in Well:	1.44	feet
Elevation at Oil-Wtr Interface	0	feet
Elevation increment for calcu	0.072	feet

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	2.5	1/feet
van Genuchten n:	1.5	(dimensionless)
van Genuchten m:	0.33	(dimensionless)

Calculated Results

Geometric mean Oil Conductivity (below oil table):	2.34E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	5.21E-02	ft2/day
Geometric mean oil saturation within free oil layer:	0.06	
Geometric mean water sat'n within free oil layer:	0.91	
Specific Volume of Oil (above & below oil table):	0.07	ft
Specific Volume of Water (above & below oil table):	0.71	ft
Estimate of oil storativity:	0.01	
Bouwer-Rice Oil Conductivity (below oil table):	2.29E-01	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	2.16	0.631	0.267	0.574	0.735	0.075	1.52E-02	1.32E-03	8.49E-02	3.47E-04	2.50E-05	2.01E-02	2.06E-03	8.40E-01	1.80E-02	2.89E-01	8.66E-01	7.98E-01	-0.134	-3.460	-1.123
29	2.09	0.568	0.258	0.596	0.742	0.075	1.64E-02	1.42E-03	9.21E-02	3.73E-04	2.68E-05	2.03E-02	2.06E-03	8.45E-01	1.95E-02	2.89E-01	8.60E-01	7.90E-01	-0.130	-3.428	-1.123
28	2.02	0.505	0.249	0.620	0.749	0.075	1.79E-02	1.53E-03	1.00E-01	4.02E-04	2.89E-05	2.05E-02	2.06E-03	8.49E-01	2.11E-02	2.89E-01	8.55E-01	7.82E-01	-0.125	-3.396	-1.123
27	1.94	0.442	0.240	0.648	0.756	0.075	1.95E-02	1.66E-03	1.09E-01	4.35E-04	3.13E-05	2.07E-02	2.06E-03	8.54E-01	2.28E-02	2.89E-01	8.49E-01	7.73E-01	-0.121	-3.362	-1.123
26	1.87	0.379	0.232	0.681	0.764	0.075	2.13E-02	1.80E-03	1.19E-01	4.72E-04	3.40E-05	2.09E-02	2.06E-03	8.59E-01	2.47E-02	2.89E-01	8.43E-01	7.64E-01	-0.117	-3.326	-1.123
25	1.80	0.315	0.223	0.719	0.772	0.075	2.32E-02	1.96E-03	1.30E-01	5.14E-04	3.70E-05	2.11E-02	2.06E-03	8.64E-01	2.69E-02	2.89E-01	8.36E-01	7.54E-01	-0.113	-3.289	-1.123
24	1.73	0.252	0.214	0.765	0.780	0.075	2.55E-02	2.14E-03	1.43E-01	5.63E-04	4.05E-05	2.13E-02	2.06E-03	8.69E-01	2.93E-02	2.89E-01	8.29E-01	7.43E-01	-0.108	-3.249	-1.123
23	1.66	0.189	0.205	0.819	0.788	0.075	2.80E-02	2.36E-03	1.57E-01	6.19E-04	4.46E-05	2.16E-02	2.06E-03	8.74E-01	3.20E-02	2.89E-01	8.21E-01	7.31E-01	-0.104	-3.208	-1.123
22	1.58	0.126	0.196	0.882	0.796	0.086	3.08E-02	3.92E-03	1.73E-01	1.03E-03	7.41E-05	2.18E-02	2.35E-03	8.80E-01	3.50E-02	3.09E-01	8.13E-01	7.00E-01	-0.099	-2.987	-1.065
21	1.51	0.063	0.187	0.951	0.805	0.146	3.40E-02	2.84E-02	1.90E-01	7.45E-03	5.37E-04	2.20E-02	3.99E-03	8.85E-01	3.84E-02	4.02E-01	8.04E-01	5.38E-01	-0.094	-2.128	-0.837
20	1.44	0.0	0.178	1.0	0.814	0.186	3.76E-02	2.87E-01	2.11E-01	7.54E-02	5.43E-03	2.23E-02	5.10E-03	8.91E-01	4.23E-02	4.55E-01	7.94E-01	0.00E+00	-0.090	-1.123	-0.730
19	1.37	0.0	0.169	1.0	0.823	0.177	4.18E-02	2.73E-01	2.34E-01	7.16E-02	5.16E-03	2.25E-02	4.85E-03	8.96E-01	4.66E-02	4.44E-01	7.84E-01	0.00E+00	-0.085	-1.145	-0.751
18	1.30	0.0	0.160	1.0	0.832	0.168	4.65E-02	2.58E-01	2.60E-01	6.78E-02	4.88E-03	2.28E-02	4.60E-03	9.02E-01	5.15E-02	4.32E-01	7.73E-01	0.00E+00	-0.080	-1.169	-0.775
17	1.22	0.0	0.151	1.0	0.842	0.158	5.19E-02	2.43E-01	2.90E-01	6.38E-02	4.59E-03	2.30E-02	4.34E-03	9.08E-01	5.71E-02	4.20E-01	7.61E-01	0.00E+00	-0.075	-1.195	-0.800
16	1.15	0.0	0.143	1.0	0.851	0.149	5.81E-02	2.27E-01	3.25E-01	5.97E-02	4.30E-03	2.33E-02	4.07E-03	9.14E-01	6.35E-02	4.07E-01	7.48E-01	0.00E+00	-0.070	-1.224	-0.828
15	1.08	0.0	0.134	1.0	0.861	0.139	6.52E-02	2.11E-01	3.65E-01	5.55E-02	4.00E-03	2.36E-02	3.80E-03	9.20E-01	7.09E-02	3.93E-01	7.34E-01	0.00E+00	-0.065	-1.256	-0.858
14	1.01	0.0	0.125	1.0	0.871	0.129	7.35E-02	1.95E-01	4.11E-01	5.12E-02	3.69E-03	2.38E-02	3.52E-03	9.26E-01	7.94E-02	3.78E-01	7.18E-01	0.00E+00	-0.060	-1.291	-0.890
13	0.94	0.0	0.116	1.0	0.882	0.118	8.31E-02	1.78E-01	4.65E-01	4.69E-02	3.37E-03	2.41E-02	3.24E-03	9.32E-01	8.92E-02	3.63E-01	7.01E-01	0.00E+00	-0.055	-1.329	-0.927
12	0.86	0.0	0.107	1.0	0.892	0.108	9.43E-02	1.62E-01	5.28E-01	4.24E-02	3.05E-03	2.44E-02	2.95E-03	9.38E-01	1.01E-01	3.46E-01	6.83E-01	0.00E+00	-0.050	-1.373	-0.967
11	0.79	0.0	0.098	1.0	0.903	0.097	1.08E-01	1.44E-01	6.02E-01	3.79E-02	2.73E-03	2.47E-02	2.66E-03	9.44E-01	1.14E-01	3.29E-01	6.63E-01	0.00E+00	-0.045	-1.421	-1.011
10	0.72	0.0	0.089	1.0	0.913	0.087	1.23E-01	1.27E-01	6.90E-01	3.34E-02	2.40E-03	2.50E-02	2.37E-03	9.51E-01	1.30E-01	3.10E-01	6.40E-01	0.00E+00	-0.039	-1.476	-1.062
9	0.65	0.0	0.080	1.0	0.924	0.076	1.42E-01	1.10E-01	7.93E-01	2.89E-02	2.08E-03	2.53E-02	2.08E-03	9.57E-01	1.48E-01	2.91E-01	6.15E-01	0.00E+00	-0.034	-1.539	-1.119
8	0.58	0.0	0.071	1.0	0.935	0.065	1.64E-01	9.31E-02	9.18E-01	2.44E-02	1.76E-03	2.56E-02	1.79E-03	9.63E-01	1.70E-01	2.70E-01	5.87E-01	0.00E+00	-0.029	-1.612	-1.184
7	0.50	0.0	0.062	1.0	0.945	0.055	1.91E-01	7.65E-02	1.07E+00	2.01E-02	1.45E-03	2.59E-02	1.50E-03	9.69E-01	1.97E-01	2.47E-01	5.56E-01	0.00E+00	-0.025	-1.697	-1.260
6	0.43	0.0	0.053	1.0	0.955	0.045	2.23E-01	6.06E-02	1.25E+00	1.59E-02	1.15E-03	2.61E-02	1.22E-03	9.75E-01	2.29E-01	2.23E-01	5.21E-01	0.00E+00	-0.020	-1.798	-1.350
5	0.36	0.0	0.045	1.0	0.965	0.035	2.64E-01	4.56E-02	1.48E+00	1.20E-02	8.62E-04	2.64E-02	9.53E-04	9.80E-01	2.69E-01	1.97E-01	4.82E-01	0.00E+00	-0.015	-1.922	-1.458
4	0.29	0.0	0.036	1.0	0.975	0.025	3.14E-01	3.19E-02	1.76E+00	8.37E-03	6.03E-04	2.67E-02	6.97E-04	9.86E-01	3.19E-01	1.68E-01	4.35E-01	0.00E+00	-0.011	-2.077	-1.594
3	0.22	0.0	0.027	1.0	0.983	0.017	3.80E-01	1.98E-02	2.13E+00	5.21E-03	3.75E-04	2.69E-02	4.62E-04	9.91E-01	3.84E-01	1.37E-01	3.81E-01	0.00E+00	-0.007	-2.283	-1.773
2	0.14	0.0	0.018	1.0	0.991	0.009	4.69E-01	1.00E-02	2.63E+00	2.63E-03	1.89E-04	2.71E-02	2.56E-04	9.95E-01	4.71E-01	1.02E-01	3.13E-01	0.00E+00	-0.004	-2.580	-2.030
1	0.07	0.0	0.009	1.0	0.997	0.003	6.02E-01	3.04E-03	3.37E+00	7.97E-04	5.74E-05	2.73E-02	9.16E-05	9.98E-01	6.03E-01	6.10E-02	2.23E-01	0.00E+00	-0.001	-3.098	-2.475

Fluid Levels Measured Prior to and After Bailing

Well Name: MW-4R **Site:** Quanta

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
		11.23	17.12	5.89	11.87	*Clock time in hrs-minutes-m/d/yr format if
				0	0.00	user wants spreadsheet to compute elapsed
				0	0.00	time from these clock times.
				0	0.00	** Water table = "corrected" water table.
Measurements After Bailing						First measurement assumed to be static.
13:24:00	0.00	11.78	12.41	0.63	11.85	The first depth-to-fluids measurement after
13:24:20	0.33	11.77	12.62	0.85	11.86	
13:24:45	0.75	11.75	12.74	0.99	11.86	
13:25:10	1.17	11.71	12.81	1.10	11.83	
13:25:30	1.50	11.73	12.86	1.13	11.85	
13:26:00	2.00	11.71	12.92	1.21	11.84	
13:26:10	2.17	11.71	12.98	1.27	11.85	
13:26:20	2.33	11.71	13.02	1.31	11.85	
13:27:00	3.00	11.69	13.06	1.37	11.84	
13:27:25	3.42	11.69	13.13	1.44	11.85	
13:27:50	3.83	11.69	13.20	1.51	11.85	
13:28:20	4.33	11.68	13.23	1.55	11.85	
13:28:50	4.83	11.68	13.27	1.59	11.85	
13:29:10	5.17	11.67	13.33	1.66	11.85	
13:30:00	6.00	11.67	13.39	1.72	11.86	
13:30:30	6.50	11.67	13.42	1.75	11.86	
13:31:10	7.17	11.66	13.44	1.78	11.85	
13:31:30	7.50	11.66	13.48	1.82	11.86	
13:32:00	8.00	11.66	13.50	1.84	11.86	
13:32:30	8.50	11.66	13.52	1.86	11.86	
13:33:00	9.00	11.66	13.53	1.87	11.86	
13:33:30	9.50	11.65	13.57	1.92	11.86	
13:34:00	10.00	11.65	13.58	1.93	11.86	
13:34:30	10.50	11.65	13.61	1.96	11.86	
13:37:00	13.00	11.64	13.71	2.07	11.86	
13:39:00	15.00	11.61	13.82	2.21	11.85	
13:41:20	17.33	11.61	13.84	2.23	11.85	
13:45:40	21.67	11.60	14.03	2.43	11.86	
13:48:20	24.33	11.58	14.13	2.55	11.86	
13:51:15	27.25	11.58	14.18	2.60	11.86	
13:58:10	34.17	11.56	14.35	2.79	11.86	
14:02:30	38.50	11.53	14.47	2.94	11.85	
14:06:20	42.33	11.53	14.56	3.03	11.86	
				0	0.00	

MULTIPHASE
ENVIRONMENTAL, Inc.
Innovations in the Subsurface

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Formation

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.9001	(dimensionless)
Dynamic viscosity of free oil:	49.5	centipoise
Air-water surface tension:	72	dynes/cm
Air-oil surface tension:	36	dynes/cm
Oil-water interfacial tension:	16.62	dynes/cm
BETA-AO	2.000	
BETA-OW	4.33	

Soil Properties of Formation

Hydraulic conductivity:	5.6	ft/day
Porosity:	0.38	(dimensionless)
Irreducible water saturation:	0.1	(dimensionless)
van Genuchten alpha:	1.07	1/feet
van Genuchten n:	1.67	(dimensionless)
van Genuchten m:	0.40	(dimensionless)

Free Oil Thickness in Well:	5.89	feet
Elevation at Oil-Wtr Interfac	0	feet
Elevation increment for calc	0.2945	feet

Calculated Results

Geometric mean Oil Conductivity (below oil table):	2.64E-02	ft/day
Oil Transmissivity of free oil layer (below oil table):	2.21E-01	ft2/day
Geometric mean oil saturation within free oil layer:	0.21	
Geometric mean water sat'n within free oil layer:	0.71	
Specific Volume of Oil (above & below oil table):	0.77	ft
Specific Volume of Water (above & below oil table):	2.15	ft
Estimate of oil storativity:	0.04	
Bouwer-Rice Oil Conductivity (below oil table):	8.89E-02	ft/day

Table of Calculations:

Bottom-up Order of Row Number	Elevation Above Base of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Saturation	Water Saturation	Oil Saturation	Water Relative Permeability	Oil Relative Permeability	Water Conductivity (ft/day)	Oil Conductivity (ft/day)	Incremental Oil Transmissivity (ft2/day)	Incremental Water Specific Volume (ft3/ft2)	Incremental Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Saturation	Log of Oil Conductivity	Log of Oil Sat'n.
30	8.84	2.651	0.883	0.375	0.438	0.075	7.85E-04	1.73E-04	4.39E-03	1.76E-05	5.18E-06	4.90E-02	8.43E-03	6.13E-01	1.28E-03	2.89E-01	9.64E-01	9.40E-01	-0.359	-4.755	-1.123
29	8.54	2.386	0.853	0.394	0.445	0.075	8.82E-04	1.84E-04	4.94E-03	1.87E-05	5.52E-06	4.98E-02	8.43E-03	6.19E-01	1.42E-03	2.89E-01	9.62E-01	9.37E-01	-0.352	-4.727	-1.123
28	8.25	2.121	0.824	0.417	0.452	0.075	9.94E-04	1.96E-04	5.57E-03	2.00E-05	5.89E-06	5.06E-02	8.43E-03	6.26E-01	1.59E-03	2.89E-01	9.60E-01	9.34E-01	-0.345	-4.699	-1.123
27	7.95	1.856	0.794	0.444	0.460	0.075	1.13E-03	2.10E-04	6.30E-03	2.14E-05	6.30E-06	5.15E-02	8.43E-03	6.32E-01	1.78E-03	2.89E-01	9.58E-01	9.31E-01	-0.337	-4.670	-1.123
26	7.66	1.590	0.765	0.477	0.468	0.075	1.28E-03	2.26E-04	7.16E-03	2.30E-05	6.77E-06	5.24E-02	8.43E-03	6.40E-01	2.00E-03	2.89E-01	9.55E-01	9.27E-01	-0.330	-4.639	-1.123
25	7.36	1.325	0.736	0.520	0.477	0.075	1.46E-03	2.43E-04	8.18E-03	2.47E-05	7.28E-06	5.34E-02	8.43E-03	6.47E-01	2.26E-03	2.89E-01	9.53E-01	9.24E-01	-0.322	-4.607	-1.123
24	7.07	1.060	0.706	0.575	0.486	0.088	1.67E-03	4.15E-04	9.38E-03	4.23E-05	1.25E-05	5.44E-02	9.90E-03	6.55E-01	2.56E-03	3.14E-01	9.49E-01	9.13E-01	-0.313	-4.374	-1.053
23	6.77	0.795	0.677	0.649	0.496	0.153	1.93E-03	2.33E-03	1.08E-02	2.37E-04	6.99E-05	5.55E-02	1.71E-02	6.63E-01	2.91E-03	4.12E-01	9.46E-01	8.71E-01	-0.305	-3.624	-0.815
22	6.48	0.530	0.647	0.752	0.506	0.246	2.24E-03	1.24E-02	1.25E-02	1.26E-03	3.72E-04	5.66E-02	2.75E-02	6.72E-01	3.33E-03	5.22E-01	9.42E-01	7.88E-01	-0.296	-2.898	-0.610
21	6.18	0.265	0.618	0.889	0.517	0.372	2.61E-03	7.36E-02	1.46E-02	7.50E-03	2.21E-03	5.79E-02	4.16E-02	6.81E-01	3.83E-03	6.43E-01	9.38E-01	6.00E-01	-0.286	-2.125	-0.430
20	5.89	0.0	0.588	1.0	0.529	0.471	3.06E-03	6.30E-01	1.71E-02	6.42E-02	1.89E-02	5.92E-02	5.27E-02	6.90E-01	4.43E-03	7.23E-01	9.33E-01	0.00E+00	-0.277	-1.192	-0.327
19	5.60	0.0	0.559	1.0	0.541	0.459	3.61E-03	6.15E-01	2.02E-02	6.26E-02	1.84E-02	6.06E-02	5.13E-02	7.00E-01	5.15E-03	7.14E-01	9.28E-01	0.00E+00	-0.266	-1.203	-0.339
18	5.30	0.0	0.530	1.0	0.555	0.445	4.29E-03	5.98E-01	2.40E-02	6.09E-02	1.79E-02	6.21E-02	4.98E-02	7.11E-01	6.03E-03	7.03E-01	9.22E-01	0.00E+00	-0.256	-1.215	-0.351
17	5.01	0.0	0.500	1.0	0.569	0.431	5.13E-03	5.80E-01	2.87E-02	5.91E-02	1.74E-02	6.37E-02	4.82E-02	7.22E-01	7.11E-03	6.92E-01	9.16E-01	0.00E+00	-0.245	-1.229	-0.366
16	4.71	0.0	0.471	1.0	0.585	0.415	6.20E-03	5.60E-01	3.47E-02	5.71E-02	1.68E-02	6.54E-02	4.65E-02	7.34E-01	8.45E-03	6.79E-01	9.08E-01	0.00E+00	-0.233	-1.244	-0.381
15	4.42	0.0	0.441	1.0	0.601	0.399	7.56E-03	5.38E-01	4.23E-02	5.48E-02	1.61E-02	6.73E-02	4.46E-02	7.46E-01	1.01E-02	6.66E-01	8.99E-01	0.00E+00	-0.221	-1.261	-0.399
14	4.12	0.0	0.412	1.0	0.619	0.381	9.30E-03	5.15E-01	5.21E-02	5.24E-02	1.54E-02	6.93E-02	4.26E-02	7.59E-01	1.22E-02	6.51E-01	8.89E-01	0.00E+00	-0.208	-1.281	-0.419
13	3.83	0.0	0.382	1.0	0.638	0.362	1.16E-02	4.88E-01	6.48E-02	4.97E-02	1.46E-02	7.14E-02	4.05E-02	7.73E-01	1.50E-02	6.34E-01	8.78E-01	0.00E+00	-0.195	-1.303	-0.442
12	3.53	0.0	0.353	1.0	0.659	0.341	1.46E-02	4.60E-01	8.15E-02	4.68E-02	1.38E-02	7.38E-02	3.82E-02	7.88E-01	1.85E-02	6.15E-01	8.64E-01	0.00E+00	-0.181	-1.330	-0.467
11	3.24	0.0	0.324	1.0	0.682	0.318	1.86E-02	4.28E-01	1.04E-01	4.36E-02	1.28E-02	7.63E-02	3.56E-02	8.04E-01	2.31E-02	5.95E-01	8.48E-01	0.00E+00	-0.166	-1.361	-0.497
10	2.95	0.0	0.294	1.0	0.706	0.294	2.40E-02	3.93E-01	1.34E-01	4.00E-02	1.18E-02	7.90E-02	3.29E-02	8.21E-01	2.92E-02	5.71E-01	8.29E-01	0.00E+00	-0.151	-1.398	-0.532
9	2.65	0.0	0.265	1.0	0.733	0.267	3.15E-02	3.54E-01	1.76E-01	3.61E-02	1.06E-02	8.20E-02	2.99E-02	8.38E-01	3.75E-02	5.45E-01	8.06E-01	0.00E+00	-0.135	-1.443	-0.573
8	2.36	0.0	0.235	1.0	0.761	0.239	4.19E-02	3.12E-01	2.35E-01	3.18E-02	9.37E-03	8.52E-02	2.67E-02	8.57E-01	4.89E-02	5.15E-01	7.79E-01	0.00E+00	-0.118	-1.497	-0.622
7	2.06	0.0	0.206	1.0	0.792	0.208	5.69E-02	2.67E-01	3.19E-01	2.72E-02	8.01E-03	8.86E-02	2.33E-02	8.77E-01	6.49E-02	4.81E-01	7.45E-01	0.00E+00	-0.101	-1.566	-0.682
6	1.77	0.0	0.177	1.0	0.825	0.175	7.86E-02	2.19E-01	4.40E-01	2.23E-02	6.56E-03	9.23E-02	1.96E-02	8.97E-01	8.76E-02	4.41E-01	7.04E-01	0.00E+00	-0.084	-1.652	-0.756
5	1.47	0.0	0.147	1.0	0.859	0.141	1.11E-01	1.68E-01	6.20E-01	1.72E-02	5.05E-03	9.62E-02	1.57E-02	9.19E-01	1.21E-01	3.95E-01	6.53E-01	0.00E+00	-0.066	-1.766	-0.852
4	1.18	0.0	0.118	1.0	0.895	0.105	1.59E-01	1.18E-01	8.92E-01	1.21E-02	3.55E-03	1.00E-01	1.18E-02	9.40E-01	1.69E-01	3.42E-01	5.68E-01	0.00E+00	-0.048	-1.919	-0.978
3	0.88	0.0	0.088	1.0	0.930	0.070	2.34E-01	7.17E-02	1.31E+00	7.30E-03	2.15E-03	1.04E-01	7.87E-03	9.60E-01	2.44E-01	2.80E-01	5.07E-01	0.00E+00	-0.032	-2.136	-1.153
2	0.59	0.0	0.059	1.0	0.962	0.038	3.51E-01	3.31E-02	1.97E+00	3.37E-03	9.94E-04	1.08E-01	4.28E-03	9.79E-01	3.59E-01	2.06E-01	4.01E-01	0.00E+00	-0.017	-2.472	-1.418
1	0.29	0.0	0.029	1.0	0.987	0.013	5.44E-01	7.98E-03	3.05E+00	8.13E-04	2.39E-04	1.10E-01	1.41E-03	9.93E-01	5.48E-01	1.19E-01	2.59E-01	0.00E+00	-0.006	-3.090	-1.898

APPENDIX H

DATA USABILITY SUMMARY REPORTS

OCTOBER 2003 THROUGH JANUARY 2004

TABLE OF CONTENTS

1.0 INTRODUCTION

Golder Associates Inc. (Golder Associates) on behalf of the Quanta Site Administrative Group (QSAG) has conducted a Phase I Remedial Investigation (RI) required under the Order On Consent (Consent Order or CO) entered into by the QSAG and the New York State Department of Environmental Conservation (NYSDEC), NYSDEC Index No. W2-0915-03-06 at the Quanta Resources Superfund Site (Site) located in Long Island City, New York. This Data Usability Summary Report (DUSR) presents the findings of the data quality review and data validation performed on the analysis of environmental samples collected. Samples were collected in accordance with the agency-approved Sampling and Analysis Plan (SAP) from October 2003 through January 2004 as part of the Remedial Investigation (RI). This DUSR has been prepared in a manner consistent with the NYSDEC Guidance Memorandum for Data Usability Summary Reports (NYSDEC, 1995). Golder Associates's QA personnel validated the data collected as part of the Phase I RI in accordance with National Functional Guidelines for Data Validation and the USEPA Region II Data Validation Standard Operating Procedures (SOPs) listed in Section 2.

2.0 SAMPLING AND ANALYSIS PROGRAM

2.1 Data Set

The soil sampling program was used to screen areas where potential contamination occurred. Two-hundred twenty-four primary samples and five field duplicates were collected for analysis of Total Petroleum Hydrocarbons (TPH). The samples were submitted to the Severn-Trent Laboratories facility in Edison, New Jersey (STL or Laboratory) for analysis by a modified version of EPA Method 418.1. At locations where contamination was suspected to be present, additional sample was collected for analysis of the Target Compound List (TCL) and Target Analyte List (TAL) parameters defined in the SAP which includes Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), Polychlorinated Biphenyls (PCBs), and metals and cyanide.

Forty-eight soil samples (and one field duplicate) were analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, and TAL Inorganics (metals and cyanide) using the appropriate methods from Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd edition, Final Update III, Revision 6, August 2002. The parameter lists identified as the TCL from the Contract Laboratory Program (CLP) Statement of Work (SOW) OLM04.2 and as the TAL from the CLP SOW ILM04.1 were used.

Eleven Light Non-aqueous Phase Liquid (LNAPL) primary samples (and one field duplicate sample) were collected and analyzed for the TCL/TAL (except for cyanide). The samples were also submitted to the laboratory for analysis of Gasoline Range Organics (GRO), Diesel Range Organics (DRO), Mineral Range Organics (MRO), and GC Fingerprinting. Additionally, the 11 primary samples were submitted to the laboratory for physical properties analysis of density, viscosity, flashpoint, interfacial tension, surface tension, Total Organic Halogens (TOX), percent sulfur, percent sediments, and BTU.

Four groundwater samples (and one field duplicate sample) were collected and analyzed for the TCL/TAL (minus pesticides), Light Hydrocarbons (Methane, Ethane, and Ethene (MEE)), and a number of Natural Attenuation Parameters (NAPs). The NAPs include chloride, total alkalinity, nitrate, carbon dioxide, sulfate, total dissolved solids (TDS), dissolved organic carbon (DOC) and Total Organic Carbon (TOC).

2.2 Analytical Methodologies

Analytical methods for TCL/TAL were primarily taken from Test Methods for Evaluating Solid Waste, SW-846, Revision 6 contained in Final Update III August 2002. VOCs were analyzed using Method 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SVOCs were analyzed by Method 8270C Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry. For VOCs and SVOCs, the TCL list from OLM04.2 was reported. Total metals were analyzed in accordance with Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, except for mercury, which was analyzed by Method 7470A, Mercury in Liquid Waste (Manual Cold-Vapor Technique) or 7471, Mercury in Solid or Semi-solid Waste (Manual Cold-Vapor Technique). The NAPs were analyzed using standard EPA methodology contained in Methods for Chemical Analysis of Water and Wastes, March 1983 or Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, APHA-AWWA-WPCF.

2.3 Data Validation Protocols

The laboratory data were validated to prevent erroneous or otherwise unusable data, from entering the project record. Validation was performed on 100% of the data submitted by the Laboratory. Data validation was performed in accordance with the SAP, the national data validation guidelines specified below as well as the USEPA Region II data validation SOPs and method-specific criteria.

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999.
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.
- USEPA Region II Standard Operating Procedure for Validating Volatile Organic Compounds by SW-846 Method 8260B, Standard Operating Procedure #HW-24, Revision 1, dated June 1999;
- USEPA Region II Standard Operating Procedure for Validating Semivolatile Organic Compounds by SW-846 Method 8270, Standard Operating Procedure #HW-22, Revision 2, dated June 2001;
- USEPA Region II Standard Operating Procedure for Validating PCB Compounds by SW-846 Method 8082, Standard Operating Procedure #HW-23B, Revision 1, dated May 2002; and,
- Evaluation of Metals Data for the Contract Laboratory Program, Standard Operating Procedure #HW-2, Revision 11, dated January 1992.

These documents are hereafter referred to as the "functional guidelines". If there was a conflict between the functional guidelines and the quality control criteria specified in the analytical method, the method-specific criteria were used.

Section 3 summarizes the specific instances where quality control criteria in the functional guidelines were not met. As specified in the functional guidelines, if the non-adherence to quality control criteria is slight, professional judgment was used in qualification of the data. However, if the non-adherence is significant, qualification and rejection of the data was necessary.

3.0 QUALITY CONTROL (QC) DATA AND REVIEW

3.1 Holding Times

The holding times associated with these sampling events were within method QC limits.

3.2 QC Blanks

Laboratory method blanks, rinsate blanks, and trip blanks were evaluated for target compound contamination. Toluene and methylene chloride were detected as VOC contaminants in the rinsate blank RB-01 associated with groundwater SDG W286. For common laboratory contaminants, like toluene and methylene chloride, an action limit of 10 times the concentration found in the associated blank was calculated. For samples where any of these compounds were detected as a positive result below the action limit, the result was qualified as not present (U). If the compound was detected as a positive result above the action limit, no qualification was warranted. Similarly, analysis for total organic carbon (TOC) and dissolved organic carbon (DOC) associated with SDG W286 also required qualification of data based on rinsate blank RB-01. Since the DOC and TOC concentrations in these samples were deemed wholly attributable to the blank contamination, all associated sample data were rejected (R).

3.3 Initial and Continuing Calibrations

ICV/CCV for Metals Analysis

The acceptance criteria for ICV/CCV associated with metal analysis is 90-110%. This criterion was exceeded for zinc in four soil samples associated with SDG T085. In accordance with the guidelines, since the ICV/CCV exceeded 125%, the positive results were rejected (R).

Initial Calibration for Organics Analyses

The percent Relative Standard Deviation (%RSD) from the initial calibration must be less than or equal to 15%. The %RSD exceeded this criterion for various parameters in the initial calibrations associated with the VOC and SVOC soil samples in SDGs R184, R675, R965, S200, S427, S598, S927, T085, V201, V392, V580 and V836. Similarly, this criterion was not achieved for various parameters in the initial calibrations associated with the VOC and SVOC groundwater and LNAPL samples in SDGs W286, T627, V860, and W578. Consequently, positive results were qualified as estimated values (J) and qualification was not required for non-detected results below 30% RSD. Non-detected results for parameters that exceeded 30% RSD were qualified with estimated reporting limits (UJ).

Continuing Calibration for Organics Analyses

Requirements for acceptable instrument calibration are established to ensure the instrument is capable of generating satisfactory data. The functional guidelines require that the percent difference (%D) between the initial calibration relative response factors (RRFs) and the continuing calibration RRFs be within 20%. The %D between the initial and continuing calibration RRFs exceeded this criterion for various parameters in the continuing calibrations associated with the VOC and SVOC soil samples in SDGs R184, R965, S200, S427, S927, V201, V392, V580, V836, S598, T085 and V580. Similarly, this criterion was not achieved for 2-butanone and benzaldehyde in the continuing calibrations associated with the VOC and SVOC groundwater and LNAPL samples in SDGs W286, T627, and W578. Consequently, positive results were qualified as estimated values (J) and the non-detected results were qualified with estimated reporting limits (UJ).

The relative response factors (RRFs) from the VOC and SVOC initial and continuing calibration analyses must not be less than 0.05. This criterion was not achieved for 2-butanone in the initial calibrations associated with the VOC soil samples in SDGs R675, V580 and S927. Similarly, this criterion was not achieved for acetone, 2-butanone, bromomethane and 2-hexanone in the continuing calibrations associated with all matrixes of several SDGs. In accordance with the functional guidelines, non-detected results were rejected (R).

3.4 Internal Standard Recoveries (VOCs and SVOCs)

A known quantity of internal standard compounds is added to every primary and QA/QC sample. All criteria were met for VOC samples using Method 8260B. Method 8270B requires that the area counts for the internal standard be within -50% to +100% of the areas for the corresponding internal standards in the daily calibration confirmation standards. This criterion was not achieved for the SVOC analysis associated with soil samples SBGAL020407, SB100411, SB120107, and SB120617. Positive results for affected compounds were qualified as estimated values (J) and non-detected results were qualified with estimated reporting limits (UJ) in accordance with the functional guidelines.

3.5 Surrogate Recoveries (Organics)

Surrogate analytes not commonly found in nature are added to every sample to assess method performance. These surrogates must recover within the laboratory's specific QC limits. The criteria for surrogate recoveries were not achieved for LNAPL samples DLNGAL07B and

LNGAL04 for GRO analysis. For these samples, positive results were qualified as estimated values (J).

3.6 Matrix Spike Recoveries/Matrix Spike Duplicates

One or more samples in every SDG are spiked with a known amount of target analytes to check the accuracy of the method and to assess any matrix effects on sample analysis. For metals analysis, the functional guidelines require that these matrix spikes recover within ±25% of their true value. This criterion was not met for potassium in the matrix spikes associated with the LNAPL samples in SDG T627 and antimony in the matrix spikes associated with the soil samples in SDGs S200, R184, R965, S427, S598, S927, T085, V201, V392, V580 and V836. Likewise, the criterion was sporadically not achieved for other metals such as manganese (SDG V392, V580, and V201), potassium (SDG T085) In accordance with the functional guidelines, when the %R is between 30% and 75%, detected results were qualified as estimated values (J) and non-detected results were qualified as estimated reporting limits (UJ). When the spike recovery is greater than 125%, positive results are qualified as estimated values (J) and non-detected results do not require qualification.

Similarly, the recovery of toluene in the matrix spike associated with the LNAPL VOC analysis in SDG W578 exceeded the laboratory's recovery limits. In accordance with the guidelines, the positive results were qualified as estimated values (J). Qualification was not deemed necessary for non-detected results.

The MS/MSD recovery of chloride in groundwater SDG W286 exceeded the recovery limits of 86% to 118%. In accordance with the guidelines, the positive results were qualified as estimated values (J). Qualification was not deemed necessary for non-detected results.

3.7 Field Duplicates

Duplicate samples were collected to assess taken individually from LNAPL sample LNGAL07B and soil sample SBGAL021225 were found to be outside the limits of ±20% recovery. A comparison between the affected samples and the corresponding duplicate indicates general inconsistencies between the samples. For the LNAPL sample and its duplicate, the results for benzo(a)pyrene and n-nitrosodiphenylamine, and iron did not exhibit acceptable precision. For the soil sample and its duplicate, total petroleum hydrocarbon (TPH) did not exhibit acceptable precision. Positive sample results were qualified as estimated values, (J) and non-detected results were qualified with estimated reporting limits, (UJ).

3.8 Laboratory Control Samples (LCS)/Blank Spikes

The organic and inorganic LCS/blank spikes associated with these sampling events were within method QC limits.

3.9 Serial Dilutions

The serial dilutions associated with these sampling events were within method QC limits.

3.10 PCBs Quantification

PCBs are analyzed on a gas chromatograph with two dissimilar analytical columns to confirm detections of target analytes. When the percent difference (%D) of the positive results on these two columns is greater than 25% but less than 100%, the quantification of the compound is questionable. When the %D is greater than 25% but less than 70%, the data are qualified as estimated values (J). Sample results associated with SDG S427, T627, R965, S200, V392, V580 and V836 were qualified in accordance with this criteria.

3.10 Spectral Criteria

Spectral criteria was not fully achieved for various water, soil and LNAPL samples associated with SDG S200, R184, T627, V836, V392, R675, S598, S927, V580, W286, W578, R965, S427, T085, V201 and V860. Based upon professional judgment of the data validation specialist, these results were qualified. If the criteria were largely met with some smaller ions missing in the sample spectra or a disparity in ion ratios, the result was qualified as JN indicating that the compound was tentatively identified and the reported result should be considered an estimated value. If there were ions missing in the spectra such that the compound could not be considered present, the result was changed to the CRQL and qualified as undetected (U). Review of some spectra indicated interference for certain compounds. Based upon professional judgment, the validation specialist qualified these results as estimated values (J).

4.0 SUMMARY

Golder Associates validated sample data from multiple sampling events at the Quanta Resources Site in accordance with USEPA National and Regional data validation guidelines, as applicable, and the criteria specified by the specific methods and the SAP.

Although some data required qualification due to quality control criteria that were not achieved, the majority of the data was deemed usable in terms of the objectives of the investigation. Where a positive result was qualified as estimated, the analyte should be considered present. Similarly, a non-detected result, which was qualified as an estimated reporting limit, should be considered not present for the purposes of this program, although the limit itself may not be precise. Rejected data that were assigned the "R" qualifier should not be used. There were relatively few data that were rejected for this project and the completeness for the project was 98.9% which exceeds the completeness goal of 85% specified in the SAP.

GOLDER ASSOCIATES INC.

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JUNE 2004 THROUGH AUGUST 2004

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1.0 INTRODUCTION

Golder Associates Inc. (Golder Associates) on behalf of the Quanta Site Administrative Group (QSAG) has conducted a Phase I Remedial Investigation (RI) required under the Order On Consent (Consent Order or CO) entered into by the QSAG and the New York State Department of Environmental Conservation (NYSDEC), NYSDEC Index No. W2-0915-03-06 at the Quanta Resources Superfund Site (Site) located in Long Island City, New York. This Data Usability Summary Report (DUSR) presents the findings of the data quality review and data validation performed on the analysis of environmental samples collected during the Phase I RI. Samples were collected in accordance with the agency-approved Sampling and Analysis Plan (SAP) from June through August 2004 as part of the Phase I Remedial Investigation (RI). This DUSR has been prepared in a manner consistent with the NYSDEC Guidance Memorandum for Data Usability Summary Reports (NYSDEC, 1995). Golder Associates's QA personnel validated the data collected as part of the RI in accordance with National Functional Guidelines for Data Validation and the USEPA Region II Data Validation Standard Operating Procedures (SOPs) listed in Section 2.

2.0 SAMPLING AND ANALYSIS PROGRAM

2.1 Data Set

The soil sampling program was used to screen areas where potential contamination occurred. One-hundred twenty-two primary soil samples and eight field duplicates were collected for analysis of Total Petroleum Hydrocarbons (TPH). The samples were submitted to the Severn-Trent Laboratories facility in Edison, New Jersey (STL or Laboratory) for analysis by a modified version of EPA Method 418.1. At locations where contamination was suspected to be present, additional soil samples were collected for analysis of the Target Compound List (TCL) volatile organic compounds (VOCs) as defined in the SAP.

Six soil samples (and one field duplicate) were analyzed for TCL VOCs, using the appropriate methods from Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd edition, Final Update III, Revision 6, August 2002.

Twenty-four Light Non-aqueous Phase Liquid (LNAPL) primary samples (and three field duplicate samples) were collected and analyzed for the TCL/TAL (except for cyanide). The samples were also submitted to the laboratory for analysis of Gasoline Range Organics (GRO), Diesel Range Organics (DRO), Mineral Range Organics (MOR), and GC Fingerprinting. Additionally, the majority of the primary samples were submitted to the laboratory for physical properties analysis of density, viscosity, flashpoint, interfacial tension, surface tension, Total Organic Halogens (TOX), percent sulfur, percent sediments, and BTU.

Four groundwater samples (and one field duplicate sample) were collected and analyzed for the TCL VOCs and SVOCs, TAL Inorganics, Light Hydrocarbons (Methane, Ethane, and Ethene (MEE)), and a number of Natural Attenuation Parameters (NAPs). The NAPs include chloride, total alkalinity, nitrate, carbon dioxide, sulfate, total dissolved solids (TDS), dissolved organic carbon (DOC) and Total Organic Carbon (TOC).

The parameter lists identified as the TCL from the Contract Laboratory Program (CLP) Statement of Work (SOW) OLM04.2 and as the TAL from the CLP SOW ILM04.1 were used for this program.

2.2 Analytical Methodologies

Analytical methods for TCL/TAL were primarily taken from Test Methods for Evaluating Solid Waste, SW-846, Revision 6 contained in Final Update III August 2002. VOCs were analyzed using Method 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SVOCs were analyzed by Method 8270C Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry. PCBs were analyzed by Method 8082 Polychlorinated Biphenyls (PCBs) by Gas Chromatography. For VOCs, SVOCs, and PCBs, the TCL list from OLM04.2 was reported. Total metals were analyzed in accordance with Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry, except for mercury, which was analyzed by Method 7470A, Mercury in Liquid Waste (Manual Cold-Vapor Technique) or 7471, Mercury in Solid or Semi-solid Waste (Manual Cold-Vapor Technique). The NAPs were analyzed using standard EPA methodology contained in Methods for Chemical Analysis of Water and Wastes, March 1983 or Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, APHA-AWWA-WPCF.

2.3 Data Validation Protocols

The laboratory data were validated to prevent erroneous or otherwise unusable data, from entering the project record. Validation was performed on 100% of the data submitted by the Laboratory. Data validation was performed in accordance with the Site-specific SAP, the national data validation guidelines specified below as well as the USEPA Region II data validation SOPs and method-specific criteria.

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999.
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.
- USEPA Region II Standard Operating Procedure for Validating Volatile Organic Compounds by SW-846 Method 8260B, Standard Operating Procedure #HW-24, Revision 1, dated June 1999;
- USEPA Region II Standard Operating Procedure for Validating Semivolatile Organic Compounds by SW-846 Method 8270, Standard Operating Procedure #HW-22, Revision 2, dated June 2001;

- USEPA Region II Standard Operating Procedure for Validating PCB Compounds by SW-846 Method 8082, Standard Operating Procedure #HW-23B, Revision 1, dated May 2002; and,
- Evaluation of Metals Data for the Contract Laboratory Program, Standard Operating Procedure #HW-2, Revision 11, dated January 1992.

These documents are hereafter referred to as the "functional guidelines". If there was a conflict between the functional guidelines and the quality control criteria specified in the analytical method, the method-specific criteria were used.

Section 3 summarizes the specific instances where quality control criteria in the functional guidelines were not met. As specified in the functional guidelines, if the non-adherence to quality control criteria is slight, professional judgment was used in qualification of the data. However, if the non-adherence is significant, qualification and rejection of the data was necessary.

3.0 QUALITY CONTROL (QC) DATA AND REVIEW

3.1 Holding Times

The holding times associated with these sampling events were generally within method QC limits. The holding time for carbon dioxide was exceeded an all groundwater sample results were qualified as estimated values (J).

Due to a scheduling error at the laboratory, a number of the LNAPL samples collected for SVOC analysis were extracted 2 to 3 days after expiration of the extraction holding time. In accordance with SW846, Chapter 4, Table 4-1, the extraction holding time for SVOCs in concentrated waste samples is 14 days from sample collection. This is consistent with the soil holding time. As indicated on Table 4-1 of SW846, there are no preservation requirements for concentrated waste samples (e.g., cool to 4°C).

Samples are preserved to minimize any chemical or physical changes that might occur between the time of sample collection and analysis. Preservation can be by physical means (e.g., kept at a certain temperature) or chemical means (e.g., with the addition of chemical preservatives). If a sample is not preserved properly, the levels of constituents of concern in the sample may be altered through chemical, biological, or photo-degradation, or by leaching, sorption, or other chemical or physical reactions within the sample container.

The appropriate method for preserving a sample will depend on the physical characteristics of the sample (such as soil, waste, water, etc.), the concentration of constituents in the sample, and the analysis to be performed on the sample. Addition of chemical preservatives may be required for samples to be analyzed for certain parameters. However, one should not chemically preserve highly concentrated samples. The addition of some chemical preservatives to highly concentrated waste samples could result in a dangerous reaction.

Regardless of preservation measures, the concentrations of constituents within a sample can degrade over time. Therefore, one also should adhere to sample holding times (time from sample collection to analysis), particularly if the constituents of concern are volatiles in low concentrations. Analytical data generated outside of the specified holding times may be used to demonstrate that a waste is hazardous where the value of a constituent-of-concern is above the regulatory threshold, but you cannot use the data to demonstrate that a waste is not hazardous. Exceeding a holding time when the results are above a decision level does not invalidate the data.

Although extraction holding times may have been exceeded for the LNAPL samples in question, the degree of degradation that may have occurred would not significantly impact the sample data for several reasons.

- While preservation is not required for concentrated waste samples, the laboratory stores the samples at 4°C in a walk-in cooler. Storage at near freezing conditions would minimize whatever little degradation one would expect to see in organic phase liquid.
- The concentrations in the LNAPL samples collected during the Phase I RI have been in the parts-per-million (ppm) to parts-per-thousand (ppt) range. What ever small degree of degradation could occur would not adversely affect the results due to the degree of contamination present in the sample.
- NAPL samples are "extracted" differently than aqueous or soil samples. NAPL samples are prepared for analysis using a technique called waste dilution. In this procedure, an aliquot of sample is dissolved in/diluted with an organic solvent to the extent where the analytical system would not be overloaded.
- The waste dilution technique is not as time critical as typical extraction methods because one would not expect degradation of the organic contaminants in the organic matrix. Typically once one extracts organic constituents from aqueous or soil samples, the extract holding time is 40 days. One could argue that the organic constituents in the organic matrix are no less subject to degradation than organic constituents in sample extracts.

While it is certainly understandable that exceeded holding times are a critical issue for trace level analysis of organic constituents in environmental samples, it should be recognized that these samples are organic liquid which do not have the same properties as aqueous and soil samples. The degree of biological activity in organic matrices is significantly less than one would find in aqueous and soil media. The samples are chilled and kept in the dark to prevent photo degradation or reaction with the sample containers. And the organic contaminants in the LNAPL matrix are not at trace level concentrations. To be conservative, the SVOC data from these samples were qualified as estimated values (J) for detected compounds and estimated reporting limits (UJ) for undetected compounds. However, the data are usable and the qualification of the data would not negate the presence of the contaminants in the sample at the ppm to ppt range.

3.2 QC Blanks

Laboratory method blanks, rinsate blanks, and trip blanks were evaluated for target compound contamination. For the most part, the blanks were contaminant free. However, there were some issues related to instrument blanks for metals analyses. Chromium and iron were detected in the Initial calibration Blank (ICB) at concentrations in excess of three times the Instrument Detection

Limit (IDL). In accordance with the data validation guidelines, detected results less than this action level are qualified as estimated values (J).

The ICB associated with analysis of the LNAPL samples exhibited a large negative response for sodium during analysis. The non-detected results for sodium in the associated samples were rejected (R).

3.3 Initial and Continuing Calibrations

Initial Calibration for Organics Analyses

The relative response factors (RRFs) from the VOC and SVOC initial and continuing calibration analyses must not be less than 0.05. This criterion was not achieved for 2-butanone in the initial calibrations associated with the VOC soil samples in SDGs G189, G430 and H473. Similarly, this criterion was not achieved for acetone and 2-butanone, in the continuing calibrations associated with LNAPL and/or groundwater samples in SDGs H161, H219, H597, and J113. In accordance with the functional guidelines, non-detected results were rejected (R).

The percent Relative Standard Deviation (%RSD) from the initial calibration must be less than or equal to 15%. The %RSD exceeded this criterion for acetone in the initial calibrations associated with the VOC soil samples in SDG G430. Similarly, this criterion was not achieved for various parameters in the initial calibrations associated with the SVOC LNAPL samples in SDGs H219 and H597. Consequently, positive results were qualified as estimated values (J) and qualification was not required for non-detected results below 30% RSD.

Continuing Calibration for Organics Analyses

Requirements for acceptable instrument calibration are established to ensure the instrument is capable of generating satisfactory data. The functional guidelines require that the percent difference (%D) between the initial calibration relative response factors (RRFs) and the continuing calibration RRFs be within 20%. The %D between the initial and continuing calibration RRFs exceeded this criterion for various parameters in the continuing calibrations associated with the VOC soil samples in SDGs G189, G430, and H473. Similarly, this criterion was not achieved for several compounds in the continuing calibrations associated with the VOC and SVOC groundwater and LNAPL samples in SDGs H161, H219, H597, and J113. Consequently, positive results were qualified as estimated values (J) and the non-detected results were qualified with estimated reporting limits (UJ).

The continuing calibration standards for PCB analysis must meet a percent difference or percent drift (%D) criterion of 15% or less. This criterion was not achieved for Aroclor 1260 in one of the continuing calibration standards. For the associated LNAPL samples, positive results were qualified as estimated values (J) and non-detected results were qualified with estimated reporting limits (UJ).

3.4 Internal Standard Recoveries (VOCs and SVOCs)

A known quantity of internal standard compounds is added to every primary and QA/QC sample. All criteria were met for VOC samples using Method 8260B. Method 8270B requires that the area counts for the internal standard be within -50% to +100% of the areas for the corresponding internal standards in the daily calibration confirmation standards. This criterion was achieved for the all analyses.

3.5 Surrogate Recoveries (Organics)

Surrogate analytes not commonly found in nature are added to every sample to assess method performance. These surrogates must recover within the laboratory's specific QC limits. The criteria for surrogate recoveries were achieved for all samples.

3.5 Matrix Spike Recoveries/Matrix Spike Duplicates

One or more samples in every SDG are spiked with a known amount of target analytes to check the accuracy of the method and to assess any matrix effects on sample analysis. For metals analysis, the functional guidelines require that these matrix spikes recover within ±25% of their true value. This criterion was not met for potassium or mercury in the matrix spikes associated with the LNAPL samples. In accordance with the functional guidelines, when the %R is between 30% and 75%, detected results were qualified as estimated values (J) and non-detected results were qualified as estimated reporting limits (UJ).

3.6 Field Duplicates

Duplicate samples that were collected to assess precision were collected individually from LNAPL samples LNGAL-4 and LN-GAL-01R and were found to be outside the limits of ±20% recovery. A comparison between the affected samples and the corresponding duplicate indicates some inconsistencies in the SVOC results. Positive sample results were qualified as estimated values (J) and non-detected results were qualified with estimated reporting limits (UJ). The field duplicates for soil and groundwater samples yielded acceptable precision results.

3.7 Laboratory Control Samples (LCS)/Blank Spikes

The organic and inorganic LCS/blank spikes associated with these sampling events were within method QC limits.

3.8 Serial Dilutions

The serial dilutions associated with these sampling events were within method QC limits.

3.9 PCBs Identification and Quantification

PCBs are analyzed on a gas chromatograph with two dissimilar analytical columns to confirm detections of target analytes. When the percent difference (%D) of the positive results on these two columns is greater than 25% but less than 100%, the quantification of the compound is questionable. When the %D is greater than 25% but less than 70%, the data are qualified as estimated values (J). Sample results associated with LN-GAL-01R, DLNGAL-01R, LNMW-4R, LNMW-10, DLNGAL-10, and LNGAL-12 were qualified in accordance with this criterion.

During PCB analysis, identification of aroclors is based upon pattern recognition and retention time criteria. For sample LN-GAL-18, peaks were present in the chromatograms that matched the pattern for Aroclor 1260. However, the retention times of the peaks fell slightly outside the established retention time windows. Consequently, the Aroclor 1260 result was qualified as tentatively identified at an estimated value (JN) based upon professional judgment.

3.10 Spectral Criteria

Spectral criteria were not fully achieved for soil samples GAGW-070211, and GAGW-070516 and LNAPL samples DLN-GAL-01R, LN-GAL-01R and LNMW-4R. Based upon professional judgment of the data validation specialist, these results were qualified. If the criteria were largely met with some smaller ions missing in the sample spectra or a disparity in ion ratios, the result was qualified as JN indicating that the compound was tentatively identified and the reported result should be considered an estimated value. If there were ions missing in the spectra such that the compound could not be considered present, the result was changed to the CRQL and qualified as undetected (U). Review of some spectra indicated interference for certain compounds. Based upon professional judgment, the validation specialist qualified these results as estimated values (J).

4.0 SUMMARY

Golder Associates validated sample data from multiple sampling events at the Quanta Resources Superfund Site in accordance with USEPA National and Regional data validation guidelines, as applicable, and the criteria specified by the specific methods and the SAP.

Although some data required qualification due to quality control criteria that were not achieved, the majority of the data was deemed usable in terms of the objectives of the investigation. Where a positive result was qualified as estimated, the analyte should be considered present. Similarly, a non-detected result, which was qualified as an estimated reporting limit, should be considered not present for the purposes of this program, although the limit itself may not be precise. Rejected data that were assigned the "R" qualifier should not be used. There were relatively few data that were rejected for this project and the completeness for the project was 99.5% which exceeds the completeness goal of 85% specified in the SAP.

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APRIL 2005

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1.0 INTRODUCTION

Golder Associates Inc. (Golder), on behalf of the Quanta Site Administrative Group (QSAG), conducted a Phase II Remedial Investigation (RI) to address data gaps identified during the implementation of the Phase I RI activities, as described in the approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Golder, 2003) and subsequent approved Work Plan addenda (Golder, 2004 and 2005). This Data Usability Summary Report (DUSR) presents the findings of the data quality review and data validation performed on the analysis of environmental samples collected during the Phase II RI.

This DUSR has been prepared in a manner consistent with the NYSDEC Guidance Memorandum for Data Usability Summary Reports (NYSDEC, 1995). Golder Associates QA personnel validated the data collected as part of the Phase II RI following guidance provided in the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic and Inorganic Data Review (USEPA 1999 and 2004, respectively), and the USEPA Region II Data Validation Standard Operating Procedures (SOPs) listed in Section 2, as applicable to USEPA SW-846 methodology.

2.0 SAMPLING AND ANALYSIS PROGRAM

The Phase II RI data collection effort was developed to address data gaps related to the nature and extent of light non-aqueous phase liquid (LNAPL) contamination on and in the capillary zone of the shallow water table. The data collection effort included the sampling and analysis of surface and subsurface soil samples, and installation and sampling of LNAPL monitoring wells, to complete the requirements of the overall RI/FS Work Plan (Golder, 2003). Sample collection and analysis was performed consistent with the methods and procedures employed as part of the Phase I RI, as outlined in the approved RI/FS Work Plan (Golder, 2003) and subsequent Work Plan addenda (Golder, 2004 and 2005).

2.1 Data Set

Five surface soil locations and ten soil borings and subsequent LNAPL well locations were completed as part of this Phase II RI sampling effort. Samples collected and submitted for chemical analysis included 86 soil boring samples, five surface soil samples, seven LNAPL samples and ten rinsate blanks. Additionally, six soil samples, one LNAPL sample, and one surface soil sample were collected and submitted in duplicate for quality control (QC) analysis. The sample identification, matrix, collection date, chemical analysis and associated sample delivery groups (SDGs) are presented in Table H-1.

All samples were submitted to Severn Trent Laboratories (STL) of Edison, New Jersey for chemical analysis. STL subcontracted a subset of the chemical analyses (i.e. physical characteristics) to Texas OilTech Laboratories, L.P. of Houston, Texas. All samples were analyzed following applicable USEPA (i.e. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Ed.*, SW-846, Final Update III; and, *Methods for Chemical Analysis of Water and Wastes (MCAWW)*, EPA-600/4-79-020) and American Society for Testing and Materials (ASTM) test methods (*Annual Book of ASTM Standards*, American Society for Testing and Materials, 1986). Analytical methods, method references and data validation procedures are identified in the following sections.

2.2 Analytical Methodologies

All samples submitted for chemical analysis to STL were completed using one or more of the following methods. Samples submitted for VOC analysis were completed following USEPA SW-846 Method 8260B, *Volatile Organic Compounds by Gas Chromatography/Mass*

Spectrometry. SVOCs were analyzed following USEPA SW-846 Method 8270C, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*. Surface soil samples analyzed for the semi-volatile compound class polynuclear aromatic hydrocarbons (PAHs) were also completed following Method 8270C. PCBs were analyzed following USEPA SW-846 Method 8082A, *Polychlorinated Biphenyls by Gas Chromatography*. For VOCs, SVOCs, and PCBs, the target compounds list (TCL) from USEPA CLP Method OLM04.2 was reported.

The target analyte list metals (TAL) were analyzed following USEPA SW-846 Method 6010B, *Inductively Coupled Plasma-Atomic Emission Spectrometry*, except for mercury, which was analyzed by USEPA SW-846 Method 7470A, *Mercury in Liquid Waste (Manual Cold-Vapor Technique)* or Method 7471B, *Mercury in Solid or Semi-solid Waste (Manual Cold-Vapor Technique)*. The TAL parameter list was derived from USEPA CLP Method ILM04.1. Additional USEPA SW-846 methods employed in the analysis of the data set included a modified SW-846 Method 8015 for the GC fingerprint, gas range organics (GRO), diesel range organics (DRO) and mineral range organics (MRO). USEPA MCAWW Methods 418.1 and 335.3 were followed for total petroleum hydrocarbon and cyanide analysis, respectively.

The remaining analyses, referred to as physical parameters, were performed by Texas OilTech following USEPA SW-846 and ASTM standard methods. USEPA SW-846 Method 1020A was followed for flash point analysis, and Method 9020B for total organic halogen (TOX) analysis. The ASTM methods included D445 for viscosity, D1298 for specific gravity and density, D4007 for water and sediment in crude oil, D4294 for sulfur content by X-ray, D240 for gross heat of combustion by bomb method, and D971 for surface and interfacial tension.

2.3 Data Validation Protocols

The laboratory data were validated to prevent erroneous or otherwise unusable data from entering the project record. Validation was performed on 100% of the data submitted by STL. Data validation was performed in accordance with the Site-specific Sample and Analysis Plan (SAP) (Golder, 2002), and employed procedures and guidelines from the following documents, as applicable to USEPA method specific performance criteria.

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999.

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004.
- USEPA Region II Standard Operating Procedure for Validating Volatile Organic Compounds by SW-846 Method 8260B, Standard Operating Procedure #HW-24, Revision 1, dated June 1999;
- USEPA Region II Standard Operating Procedure for Validating Semivolatile Organic Compounds by SW-846 Method 8270, Standard Operating Procedure #HW-22, Revision 2, dated June 2001;
- USEPA Region II Standard Operating Procedure for Validating PCB Compounds by SW-846 Method 8082, Standard Operating Procedure #HW-23B, Revision 1, dated May 2002; and,
- Evaluation of Metals Data for the Contract Laboratory Program, Standard Operating Procedure #HW-2, Revision 11, dated January 1992.

Where the validation guidelines and associated performance criteria conflicted with QC criteria specified in the USEPA analytical method, the method-specific criteria and professional judgment were used. A summary of the general method performance criteria and data validation results are presented in Section 3.

3.0 QUALITY CONTROL (QC) DATA AND REVIEW

Overall, the data generated during this Phase II RI met quality criteria established in the Site-specific SAP (Golder, 2002) and associated analytical methods. Chemical results for the samples collected during this RI were qualified on the basis of outlying precision or accuracy parameters, or on the basis of professional judgment. Qualification definitions identified in Table H-2 provide brief explanations of the qualifiers which may have been assigned to data during the validation process. Although these qualifications were applied to some of the samples collected as part of this RI, the qualifications may have not been required or applied to all samples collected. Summaries of the data qualifications applied, based on the data validation procedures, are identified by parameter type (i.e. VOCs, SVOCs, etc.) in Tables H-3 through H-8.

3.1 Sample Preservation and Holding Times

Sample preservation and holding times are used to minimize any chemical or physical changes that might occur between the time of sample collection and analysis. Sample holding times are method specific and depend on the chemical class (e.g. volatile, semi-volatile, metal) and sample preservation. Sample preservation can be by physical means (e.g., kept at a certain temperature) or chemical means (e.g., with the addition of chemical preservatives). If a sample is not preserved properly, or if the samples are not analyzed within established method holding times, the levels of constituents of concern in the sample may be altered through chemical, biological, or photo-degradation, or by leaching, sorption, or other chemical or physical reactions within the sample container.

Review of the sample preservation and holding time compliance involved comparing the laboratory sample receipt forms and the sample chain-of-custody, the laboratory data summary forms, the raw data forms, the laboratory extraction and analytical bench sheets, and the sample chromatograms for accuracy and consistency. All the samples submitted for chemical analysis were properly preserved and analyzed within holding time requirements.

3.2 QC Blanks

Laboratory method blanks, preparation blanks, field rinsate blanks, and trip blanks were evaluated for target compound contamination. In general, all analytical blanks were contaminant free with the exception of an instrument preparation and calibration blank for metals analyses. Beryllium and potassium were detected in blanks above the Instrument Detection Limit (IDL). In accordance with the data validation guidelines, results detected in field samples less than five times the blank contamination level were qualified as either estimated (J) or non-detect (U), depending on the severity of blank contamination and level of analyte detection in the associated field sample (refer to Table H-7).

3.3 Initial Calibration and Calibration Verifications

Initial calibration criteria were established to assess whether the analytical instruments used were capable of producing acceptable qualitative and quantitative data. A calibration verification sample establishes the 12-hour relative response on which the quantitations are based for each chemical compound, and checks satisfactory performance of the instrument on a day-to-day basis.

Initial Calibrations

Method specific ICAL criteria were met for all analyses with the following exceptions. The minimum relative response factor (RRF) for 2-butanone and tertiary butyl alcohol (TBA) was not met during VOC analysis for several SDGs. In accordance with the data validation guidelines, samples results identified in Table H-3 were rejected (R) for 2-butanone and TBA.

Additionally, the percent Relative Standard Deviation (%RSD) from the initial calibration, indicating linearity of the ICAL, did not meet method specific criteria in several SDGs for the VOC compounds acetone, methyl cyclohexane, and xylenes, and for the SVOC compounds benzo(g,h,i)perylene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. Consequently, results for associated field samples were qualified as estimated values (J) following validation guidelines (see Tables H-3 and H-4).

Calibration Verifications

Method specific calibration verification criteria were met for all analyses with the following exceptions. The percent difference (%D) between the ICAL and one or more corresponding daily calibration verifications exceeded method criteria for various VOC and SVOC compounds, and for PCB 1260. As a result, the VOC, SVOC and PCB compounds (see Tables H-3 through H-5) outside evaluation criteria were qualified as estimated (J) at the reported value, or estimated non-detect (UJ) at the reporting limit in associated field samples.

3.4 Internal Standard Recoveries (VOCs and SVOCs)

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during each analytical run. IS areas must be within -50 percent to +100 percent, and the IS retention times must be within 30 seconds of the IS continuing calibration retention time. IS areas and retention times for the validated samples met method specific evaluation criteria for all analyses.

3.5 Surrogate Recoveries (Organics)

Surrogate compounds are non-target compounds with similar physical properties to the analytes of interest, which are used to evaluate the overall laboratory sample preparation efficiency on a per sample basis. Surrogate compounds are spiked into every field and QC sample. The surrogate compounds must recover within specific QC limits for each method in which they are analyzed. In general the surrogate percent recoveries (%R) were within evaluation criteria for all samples and analyses, with the exception of the VOC and GRO/DRO/MRO surrogates spiked in the LNAPL samples, and the PCB surrogate in one rinsate blank sample. Therefore, the VOC, GRO/DRO/MRO and PCB results in the affected field samples (see Tables H-3, H-5 and H-8) were qualified as estimated (J) at the reported value, or estimated non-detect (UJ) at the reporting limit.

3.6 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

Matrix spike and matrix spike duplicate (MS/MSD) samples are analyzed according to each method to assess the accuracy and precision for the analyses, and to assess any matrix effects on sample analysis. MS/MSD method specific %R criteria were not met for metals and GRO/DRO/MRO analysis. (MS/MSD results were also outside criteria for select VOC and TPH analyses; however, this was due to large sample dilutions which effectively removed the spike from the sample). In accordance with the validation guidelines, the affected metals compounds were qualified as estimated (J) at the reported value, or estimated non-detect (UJ) at the reporting limit in all associated field samples (see Tables H-7 and H-8).

3.7 Laboratory and Field Duplicates

Overall precision for the sampling event was measured using field duplicate samples, and laboratory duplicate samples were analyzed to assess method precision by the laboratory at the time of analysis. The %D between the initial and duplicate analysis were within evaluation criteria for each method and each duplicate sample pair, with the exception of metals and TPH analysis. Following validation guidelines the affected samples were qualified as estimated (J) at the reported value, or estimated non-detect (UJ) at the reporting limit for TPH and metals (see Tables H-6 and H-7).

3.8 Laboratory Control Samples (LCS)/Blank Spikes

Laboratory control samples and blank spike samples are used to assess the accuracy of the analytical process. The organic and inorganic LCS/blank spikes associated with this sampling event were within method QC limits with the exception of the SVOC compounds 2-methylnaphthalene and 4-chloroaniline for a blank spike in SDG U103. Consequently, results for associated field samples were qualified as estimated non-detect (UJ) at the reporting limit following validation guidelines (see Table H-4).

3.9 Interference Check Samples (ICS)

Interference check samples (ICS) were analyzed during metals analysis to verify the laboratory's interelement and background correction factors for ICP analysis. The ICS associated with this sampling event were within method QC limits with the exception of potassium in SDG U103. Following validation guidelines, the affected samples were qualified as estimated (J) for potassium at the reported concentration (see Table H-7).

3.10 Serial Dilutions

The serial dilution of metals samples was analyzed to determine whether or not significant physical or chemical interferences exist due to sample matrix. The serial dilutions associated with this sampling event were within method QC limits for all metals analytes with the exception of cobalt in SDG W472. The associated field samples were qualified as estimated (J) for cobalt at the reported concentration (see Table H-7) following validation guidelines.

3.11 PCBs Identification and Quantification

Identification of PCB compounds is based upon pattern recognition and retention time criteria. Therefore, PCBs are analyzed on a gas chromatograph with two dissimilar analytical columns to confirm detections of target analytes. Since all PCB compounds were reported, and verified by single column retention time comparison, as non-detect for the LNAPL samples analyzed for this RI, the laboratory did not confirm the non-detects on a secondary column. While this practice is technically acceptable, interferences were present in the sample chromatograms which indicated the presence of potentially halogenated compounds or may have been matrix related. Consequently, professional judgment was used to qualify all Aroclor results as estimated non-detect (UJ) at the reporting limits for the LNAPL samples (see Table H-5).

3.12 GC/MS Spectral Criteria (VOCs and SVOCs)

Spectral criteria were verified for VOC and SVOC analysis by analyzing GC/MS instrument performance checks to ensure compound mass resolution, identification, and instrument sensitivity. Criteria for evaluation of instrument performance check samples included possible transcription/calculation errors, adherence to instrument tuning frequency requirements, mass assignments, and ion abundance criteria. The instrument performance check samples were within evaluation criteria for all masses, and all VOC and SVOC compound identifications were determined to be valid.

4.0 SUMMARY

Golder Associates validated sample data from the March and April 2005 Phase II RI sampling event at the Quanta Resources Site in accordance with USEPA National and Regional data validation guidelines, as applicable to USEPA SW-846 methods.

Although some data required qualification due to quality control criteria that were not achieved, the majority of the data was deemed usable in terms of the objectives of the investigation. Where a positive result was qualified as estimated, the analyte should be considered present. Similarly, a non-detected result, which was qualified as an estimated reporting limit, should be considered not present for the purposes of this program, although the limit itself may not be precise. Rejected data that were assigned the "R" qualifier should not be used. There were relatively few data that were rejected for this project and the completeness for the project was determined to exceed 99%, which meets the completeness goal specified in the Site-specific SAP (Golder, 2002).

GOLDER ASSOCIATES INC.

Peter Guy
Senior Environmental Scientist/Chemist

TABLE H-1
SAMPLE SUMMARY FOR CHEMICAL ANALYSIS
QUANTA RESOURCES SITE PHASE II RI SAMPLING EVENT
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

SAMPLE ID	DATE SAMPLED	SAMPLE DELIVERY GROUP NUMBERS								
		TCL VOCs	TCL SVOCs	PCBs	TAL METALS	CYANIDE	TPH	GRO/DRO/MRO	GC FINGERPRINT	PHYSICAL CHARACT.
SOIL SAMPLES										
SB16GAL19-0117	2/24/2005	T927	T927	T927	T927	T927	T927			
SB16GAL19-0219	2/24/2005						T927			
SB16GAL19-0423	2/24/2005						T927			
SB16GAL19-0525	2/24/2005						T927			
SB16GAL19-0627	2/24/2005						T927			
SB16GAL19-0831	2/24/2005						T927			
SB16GAL19-0933	2/24/2005						T928			
SB16GAL19-1035	2/24/2005						T928			
GAL-270110	2/25/2005						T959			
GAL-270314	2/25/2005						T959			
GAL-270416	2/25/2005						T959			
GAL-270518	2/25/2005						T959			
GAL-270620	2/25/2005						T959			
GAL-270724	2/25/2005						T959			
GAL-270826	2/25/2005						T959			
SB17GAL20-0115	3/1/2005						U103			
SB17GAL20-0217	3/1/2005	U103	U103	U103	U103	U103	U103			
SB17GAL20-0320	3/1/2005						U103			
SB17GAL20-0422	3/1/2005						U103			
SB17GAL20-0525	3/1/2005						U103			
GAL-280110	2/28/2005						U144			
GAL-280212	2/28/2005						U144			
GAL-280314	2/28/2005						U144			
GAL-280416	2/28/2005						U144			
GAL-280518	2/28/2005						U144			
GAL-280620	2/28/2005						U144			
GAL-280823	2/28/2005						U144			
GAL-280925	2/28/2005						U144			
GAL-240107	3/29/2005						V623			
GAL-240209	3/29/2005						V623			
GAL-240312	3/29/2005						V623			
GAL-240414	3/29/2005						V623			

TABLE H-1
SAMPLE SUMMARY FOR CHEMICAL ANALYSIS
QUANTA RESOURCES SITE PHASE II RI SAMPLING EVENT
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

SAMPLE ID	DATE SAMPLED	SAMPLE DELIVERY GROUP NUMBERS								
		TCL VOCs	TCL SVOCs	PCBs	TAL METALS	CYANIDE	TPH	GRO/DRO/ MRO	GC FINGERPRINT	PHYSICAL CHARACT.
GAL-240516	3/29/2005						V623			
GAL-240719	3/29/2005						V623			
GAL-240821	3/29/2005						V623			
GAL-241026	3/29/2005						V623			
GAL-241230	3/29/2005						V623			
GAL-210106	3/30/2005						V771			
GAL-210209	3/30/2005						V771			
GAL-210311	3/30/2005						V771			
GAL-210413	3/30/2005						V771			
GAL-210515	3/30/2005						V771			
GAL-210617	3/30/2005						V771			
GAL-210719	3/30/2005						V771			
GAL-210821	3/30/2005						V771			
GAL-210923	3/30/2005						V771			
GAL-211127	3/30/2005						V771			
GAL-211433	3/30/2005						V771			
GAL-220107	3/31/2005						V858			
GAL-220208	3/31/2005						V858			
GAL-220311	3/31/2005						V858			
GAL-220514	3/31/2005						V858			
GAL-220617	3/31/2005						V858			
GAL-220719	3/31/2005						V858			
GAL-220923	3/31/2005						V858			
GAL-221025	3/31/2005						V858			
GAL-221229	3/31/2005						V858			
GAL-221331	3/31/2005						V858			
GAL-230109	3/31/2005						V944			
GAL-230211	3/31/2005						V944			
GAL-230313	3/31/2005						V944			
GAL-230414	3/31/2005						V944			
GAL-230517	3/31/2005						V944			
GAL-230619	3/31/2005						V944			
GAL-230721	3/31/2005						V944			

TABLE H-1
SAMPLE SUMMARY FOR CHEMICAL ANALYSIS
QUANTA RESOURCES SITE PHASE II RI SAMPLING EVENT
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

SAMPLE ID	DATE SAMPLED	SAMPLE DELIVERY GROUP NUMBERS								
		TCL VOCs	TCL SVOCs	PCBs	TAL METALS	CYANIDE	TPH	GRO/DRO/ MRO	GC FINGERPRINT	PHYSICAL CHARACT.
GAL-230925	3/31/2005						V944			
GAL-231026	3/31/2005						V944			
GAL-250107	4/3/2005						V997			
GAL-250209	4/3/2005						V997			
GAL-250311	4/3/2005						V997			
GAL-250415	4/3/2005						V997			
GAL-250517	4/3/2005						V997			
GAL-250619	4/3/2005						V997			
GAL-250722	4/3/2005						V997			
GAL-250925	4/3/2005						V997			
GAL-251129	4/3/2005						V997			
GAL-251231	4/3/2005						V997			
GAL-260110	4/3/2005						V997			
GAL-260212	4/3/2005						V997			
GAL-260314	4/3/2005						V997			
GAL-260416	4/3/2005						V997			
GAL-260518	4/3/2005						V997			
GAL-260622	4/3/2005						V997			
GAL-260826	4/3/2005						V997			
GAL-261030	4/3/2005						V997			
GAL-261132	4/3/2005						V997			
SS-01	4/9/2005		W472	W472	W472					
SS-02	4/9/2005		W472	W472	W472					
SS-03	4/9/2005		W472	W472	W472					
SS-04	4/9/2005		W472	W472	W472					
SS-05	4/9/2005		W472	W472	W472					
LNAPL SAMPLES										
LNGAL-19	4/5/2005	W087	W087	W087	W087			W087	W087	W087
LNGAL-21	4/5/2005	W087	W087	W087	W087			W087	W087	W087
LNGAL-22	4/5/2005	W087	W087	W087	W087			W087	W087	W087
LNGAL-23	4/5/2005	W087	W087	W087	W087			W087	W087	W087
LNGAL-24	4/5/2005	W087	W087	W087	W087			W087	W087	W087
LNGAL-20	4/6/2005	W266	W266	W266	W266			W266	W266	W266

TABLE H-1
SAMPLE SUMMARY FOR CHEMICAL ANALYSIS
QUANTA RESOURCES SITE PHASE II RI SAMPLING EVENT
37-80 REVIEW AVENUE
LONG ISLAND CITY, NEW YORK

SAMPLE ID	DATE SAMPLED	SAMPLE DELIVERY GROUP NUMBERS								
		TCL VOCs	TCL SVOCs	PCBs	TAL METALS	CYANIDE	TPH	GRO/DRO/MRO	GC FINGERPRINT	PHYSICAL CHARACT.
LNGAL-26	4/9/2005	W473	W473	W473	W473			W473	W473	
LNGAL-26	4/17/2005									W893
QUALITY CONTROL SAMPLES										
Field Duplicates										
DSB16GAL19-0423	2/24/2005						T927			
DGAL-270518	2/25/2005						T959			
DGAL-240516	3/29/2005						V623			
DGAL-220923	3/31/2005						V858			
DGAL-230619	3/31/2005						V944			
DGAL-260416	4/3/2005						V997			
DLNGAL-21	4/5/2005	W087	W087	W087	W087			W087	W087	W087
DSS-01	4/9/2005		W472	W472	W472					
Blanks										
RB-01	2/24/2005	T928	T928	T928	T928	T928	T928			
RB-02	2/25/2005						T959			
RB-04	3/1/2005	U103	U103	U103	U103	U103	U103			
RB-03	2/28/2005						U144			
RB-05	3/29/2005						V623			
RB-06	3/30/2005						V771			
RB-07	3/31/2005						V858			
RB-08	3/31/2005						V944			
RB-09	4/3/2005						V997			
RB-12	4/9/2005		W472	W472	W472					

Notes:
NA = Not Applicable
TCL VOCs = Target Compound List Volatile Organic Compounds
TAL = Target Analyte List
TCL SVOCs = Target Compound List Semivolatile Organic Compounds
PCB = Polychlorinated Biphenyls
TPH = Total Petroleum Hydrocarbons
Physical Charact. = TOX, %Sulfur, % Sediment, Flash Pt, BTU, Density, Viscosity, Surface Tension, Interfacial Tension
Blank spaces in table indicate the sample was not analyzed for the given parameter.

TABLE H-2
DATA VALIDATION QUALIFIER DEFINITIONS
QUANTA PHASE II RI SAMPLING EVENT

Organics

Qualifier	Definition
U	- The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	- The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	- The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	- The sample results are unusable and the analyte may or may not be present in the sample.

Inorganics

Qualifier	Definition
U	- The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	- The result is an estimated quantity. The numerical value is the approximate concentration of the analyte in the sample.
UJ	- The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
R	- The data are unusable. Sample results were rejected due to serious deficiencies in meeting QC criteria. Tha sample may or may not be present in the sample.

TABLE H-3
VOLATILE ORGANIC COMPOUNDS (VOC)
DATA QUALIFIER SUMMARY TABLE
QUANTA PHASE II RI SAMPLING EVENT

DATE: April 2005
MATRIX: Soil, Water, NAPL
SAMPLE DELIVERY GROUP NUMBERS: T927, U103, W087, W266, W473
REVIEWER: Peter Guy

QUALITY CONTROL ISSUE	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Initial Calibration relative response factor (RRF) below acceptance criteria	2-butanone, TBA	R	SB16GAL19-0117, RB-01, RB-04, SB17GAL20-0217, LNGAL-19, LNGAL-22, LNGAL-24, LNGAL-23, LNGAL-21, LNGAL-20, LNGAL-26, DLNGAL-21
Initial Calibration percent relative standard deviation (%RSD) outside evaluation criteria	acetone	J	RB-01, RB-04
Initial Calibration percent relative standard deviation (%RSD) outside evaluation criteria	methyl cyclohexane	J	SB17GAL20-0217
Initial Calibration percent relative standard deviation (%RSD) outside evaluation criteria	xylenes	J	LNGAL-20
Calibration Verification percent difference (%D) outside evaluation criteria	carbon disulfide, chloromethane, cyclohexane, dichlorodifluoromethane	UJ	SB16GAL19-0117, SB17GAL20-0217
Calibration Verification percent difference (%D) outside evaluation criteria	carbon disulfide	UJ	RB-01
Calibration Verification percent difference (%D) outside evaluation criteria	methyl cyclohexane	UJ	RB-04
Surrogate percent recoveries (%R) and Matrix Spike %R outside evaluation criteria	All volatile organic compounds	J - detects UJ - non-detects	LNGAL-19, LNGAL-21, DLNGAL-21, LNGAL-22, LNGAL-23, LNGAL-24

TABLE H-4
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOC)
DATA QUALIFIER SUMMARY TABLE
QUANTA PHASE II RI SAMPLING EVENT

DATE: April 2005
MATRIX: Soil, Water, NAPL
SAMPLE DELIVERY GROUP NUMBERS: T927, U103, W087, W266, W472, W473
REVIEWER: Peter Guy

QUALITY CONTROL ISSUE	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Initial Calibration percent relative standard deviation (%RSD) outside evaluation criteria	benzo(b)fluoranthene	J	LNGAL-19, LNGAL-21, DLNGAL-21, LNGAL-22, LNGAL-23, LNGAL-24, LNGAL-20, LNGAL-26, SS-01, SS-02, SS-03, SS-04, SS-05, DSS-01
Initial Calibration percent relative standard deviation (%RSD) outside evaluation criteria	benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenz(a,h)anthracene	J	LNGAL-21, DLNGAL-21, LNGAL-26
Initial Calibration percent relative standard deviation (%RSD) outside evaluation criteria	benzo(k)fluoranthene	J	SB17GAL20-0217
Calibration Verification percent difference (%D) outside evaluation criteria	2,4-dinitrophenol	UJ	SB16GAL19-0117, RB-01, RB-04, SB17GAL20-0217
Calibration Verification percent difference (%D) outside evaluation criteria	4,6-dinitro-2-methylphenol	UJ	SB17GAL20-0217, RB-04
Calibration Verification percent difference (%D) outside evaluation criteria	benzaldehyde	UJ	RB-01, RB-04, LNGAL-19, LNGAL-22, LNGAL-23, LNGAL-24, LNGAL-20, LNGAL-21, DLNGAL-21, LNGAL-26
Calibration Verification percent difference (%D) outside evaluation criteria	benzo(g,h,i)perylene, hexachlorocyclopentadiene, indeno(1,2,3-cd)pyrene	UJ	RB-04
Laboratory Control Spike percent recovery (%R) outside evaluation criteria	2-methylnaphthalene	UJ	RB-04
Laboratory Control Spike percent recovery (%R) outside evaluation criteria	4-chloroaniline	UJ	SB17GAL20-0217

TABLE H-5
POLYCHLORINATED BIPHENYLS (PCBs)
DATA QUALIFIER SUMMARY TABLE
QUANTA PHASE II RI SAMPLING EVENT

DATE: April 2005
MATRIX: Soil, Water, NAPL
SAMPLE DELIVERY GROUP NUMBERS: T927, U103, W087, W266, W472, W473
REVIEWER: Peter Guy

QUALITY CONTROL ISSUE	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Calibration Verification percent difference (%D) outside evaluation criteria	Aroclor-1260	J	RB-04, SS-01, SS-02, SS-03, DSS-01
Surrogate percent recovery (%R) outside evaluation criteria	All Aroclors	UJ	RB-12
Target compound dual column identification verification	All Aroclors	UJ	LNGAL-19, LNGAL-22, LNGAL-23, LNGAL-24, LNGAL-20, LNGAL-21, DLNGAL-21, LNGAL-26

TABLE H-6
TOTAL PETROLEUM HYDROCARBONS (TPH)
DATA QUALIFIER SUMMARY TABLE
QUANTA PHASE II RI SAMPLING EVENT

DATE OF REVIEW: May 2005
MATRIX: Soil
SAMPLE DELIVERY GROUP NUMBERS: T927, T928, T959, U103, U144, V623, V771, V858, V944, V997
REVIEWER: Peter Guy

QUALITY CONTROL ISSUE	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Field Duplicate percent difference (%D) outside evaluation criteria	TPH	J	GAL-270518, DGAL-270518

TABLE H-7
METALS AND CYANIDE
DATA QUALIFIER SUMMARY TABLE
QUANTA PHASE II RI SAMPLING EVENT

DATE: April 2005
MATRIX: Soil, Water, NAPL
SAMPLE DELIVERY GROUP NUMBERS: T927, U103, W087, W266, W472, W473
REVIEWER: Peter Guy

QUALITY CONTROL ISSUE	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Serial Dilution percent difference (%D) outside evaluation criteria	cobalt	J	SS-01, SS-02, SS-03, SS-04, SS-05, DSS-01
Calibration blank contamination	beryllium	U	SB16GAL19-0117
Preparation blank contamination	potassium	J	SB16GAL19-0117
Interference Check Sample percent recovery (%R) outside evaluation criteria	potassium	J	SB17GAL20-0217
Laboratory Duplicate relative percent difference (RPD) outside evaluation criteria	cadmium, mercury, vanadium	J	SB16GAL19-0117
Laboratory Duplicate relative percent difference (RPD) outside evaluation criteria	cadmium, chromium, copper, iron, nickel, zinc	J - detects UJ - non-detects	SS-01, SS-02, SS-03, SS-04, SS-05, DSS-01
Matrix spike %R outside evaluation criteria	antimony, lead	J - detects UJ - non-detects	SS-01, SS-02, SS-03, SS-04, SS-05, DSS-01
Matrix spike %R outside evaluation-criteria	antimony, chromium, zinc	J - detects UJ - non-detects	SB16GAL19-0117, SB17GAL20-0217

TABLE H-8
GAS, DIESEL AND MINERAL RANGE ORGANICS
DATA QUALIFIER SUMMARY TABLE
QUANTA PHASE II RI SAMPLING EVENT

DATE OF REVIEW: May 2005
MATRIX: NAPL
SAMPLE DELIVERY GROUP NUMBERS: W087, W266, W473
REVIEWER: Peter Guy

QUALITY CONTROL ISSUE	COMPOUND(S)	QUALIFIER	SAMPLES AFFECTED
Surrogate percent recoveries (%R) and Matrix Spike %R outside evaluation criteria	GRO, DRO, MRO	J	LNGAL-19, LNGAL-20, LNGAL-21, DLNGAL-21, LNGAL-22, LNGAL-23, LNGAL-24, LNGAL-26

APPENDIX I

SLUG TEST DATA AND ANALYSIS

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-01

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

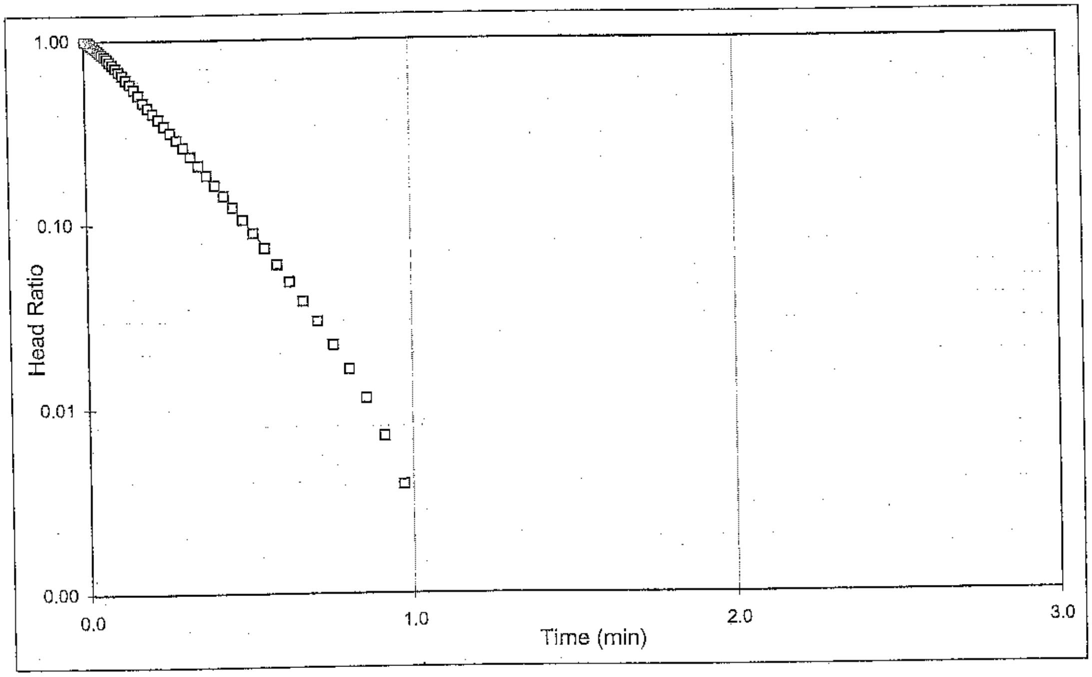
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 10.0
t_1 = 0.03
t_2 = 0.56
$h_{1(t1)}$ = 1.00
$h_{2(t2)}$ = 0.072

RESULTS

K= 3.22E-03 cm/sec
K= 9.13E+00 ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-01

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

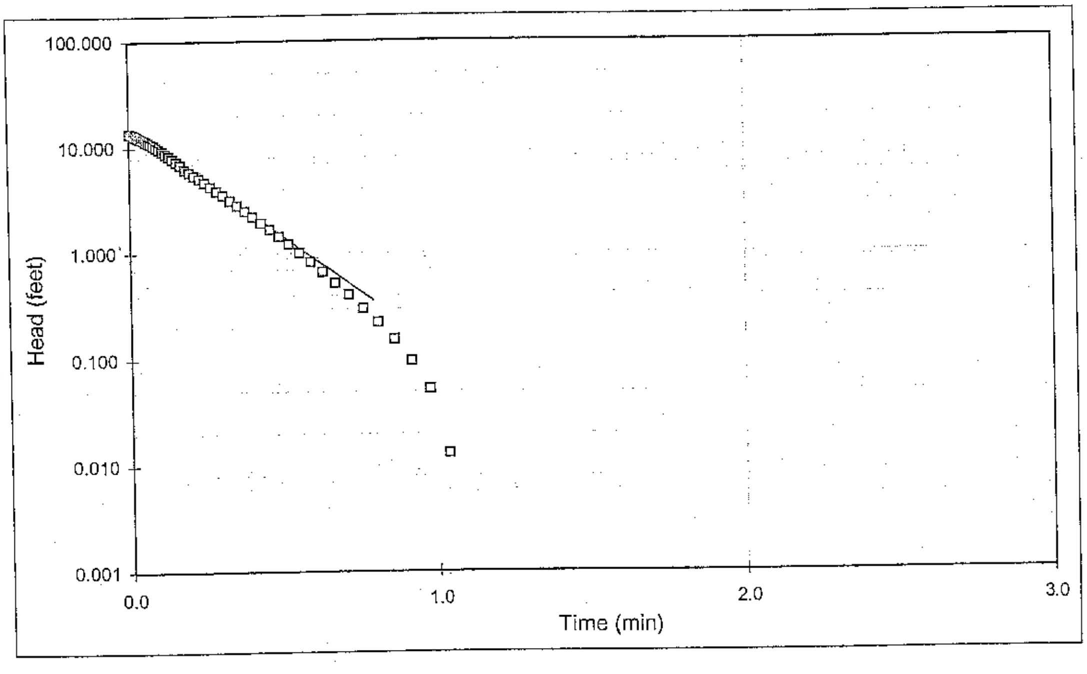
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.25
L_e = 10
$\ln(R_e/r_w)$= 3.38
y_0 = 15.14
y_t = 0.355
t = 0.8

RESULTS

K=	2.82E-03	cm/sec
K=	8.01E+00	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

RISING HEAD TEST GAGW-01

WELL NO. GAGW-01

DATE	8/4/2004	
INITIAL DEPTH TO WATER	18.69	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	64.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	74.00	FEET (btoc)
SATURATED THICKNESS	58.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	55.31	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	13.56	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	7:52	0.07	32.25	0.000	13.56	1.00
8/4/2004	7:52	0.08	32.22	0.005	13.53	1.00
8/4/2004	7:52	0.08	32.09	0.010	13.40	0.99
8/4/2004	7:52	0.09	31.91	0.015	13.22	0.97
8/4/2004	7:52	0.09	31.70	0.020	13.01	0.96
8/4/2004	7:52	0.10	31.47	0.025	12.78	0.94
8/4/2004	7:52	0.10	31.21	0.030	12.52	0.92
8/4/2004	7:52	0.11	30.96	0.036	12.27	0.90
8/4/2004	7:52	0.11	30.69	0.042	12.00	0.89
8/4/2004	7:52	0.12	30.41	0.049	11.72	0.86
8/4/2004	7:52	0.13	30.12	0.056	11.43	0.84
8/4/2004	7:52	0.13	29.78	0.063	11.09	0.82
8/4/2004	7:52	0.14	29.45	0.071	10.76	0.79
8/4/2004	7:52	0.15	29.08	0.079	10.39	0.77
8/4/2004	7:52	0.16	28.69	0.088	10.00	0.74
8/4/2004	7:52	0.17	28.29	0.097	9.60	0.71
8/4/2004	7:52	0.18	27.87	0.107	9.18	0.68
8/4/2004	7:52	0.19	27.42	0.118	8.73	0.64
8/4/2004	7:52	0.20	26.97	0.129	8.28	0.61
8/4/2004	7:52	0.21	26.50	0.140	7.81	0.58
8/4/2004	7:52	0.22	26.02	0.153	7.33	0.54
8/4/2004	7:52	0.24	25.52	0.166	6.83	0.50
8/4/2004	7:52	0.25	24.89	0.180	6.20	0.46
8/4/2004	7:52	0.26	24.50	0.195	5.81	0.43
8/4/2004	7:52	0.28	24.10	0.210	5.41	0.40
8/4/2004	7:52	0.30	23.71	0.227	5.02	0.37
8/4/2004	7:52	0.31	23.31	0.245	4.62	0.34
8/4/2004	7:52	0.33	22.94	0.263	4.25	0.31
8/4/2004	7:52	0.35	22.56	0.283	3.87	0.28

RISING HEAD TEST GAGW-01

WELL NO. GAGW-01

DATE	8/4/2004	
INITIAL DEPTH TO WATER	18.69	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	64.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	74.00	FEET (btoc)
SATURATED THICKNESS	58.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	55.31	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	13.56	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	7:52	0.37	22.21	0.304	3.52	0.26
8/4/2004	7:52	0.40	21.84	0.326	3.15	0.23
8/4/2004	7:52	0.42	21.50	0.350	2.81	0.21
8/4/2004	7:52	0.44	21.18	0.375	2.49	0.18
8/4/2004	7:52	0.47	20.88	0.400	2.19	0.16
8/4/2004	7:52	0.50	20.61	0.426	1.92	0.14
8/4/2004	7:52	0.52	20.35	0.455	1.66	0.12
8/4/2004	7:52	0.55	20.12	0.485	1.43	0.11
8/4/2004	7:52	0.59	19.90	0.516	1.21	0.09
8/4/2004	7:52	0.62	19.69	0.551	1.00	0.07
8/4/2004	7:52	0.66	19.51	0.588	0.82	0.06
8/4/2004	7:52	0.70	19.35	0.626	0.66	0.05
8/4/2004	7:52	0.74	19.21	0.668	0.52	0.04
8/4/2004	7:52	0.78	19.09	0.711	0.40	0.03
8/4/2004	7:52	0.83	18.99	0.758	0.30	0.02
8/4/2004	7:52	0.88	18.91	0.806	0.22	0.02
8/4/2004	7:52	0.93	18.84	0.858	0.15	0.01
8/4/2004	7:53	0.98	18.79	0.913	0.10	0.01
8/4/2004	7:53	1.04	18.74	0.971	0.05	0.00
8/4/2004	7:53	1.10	18.70	1.033	0.01	0.00
8/4/2004	7:53	1.17	18.68	1.098	-0.01	0.00
8/4/2004	7:53	1.24	18.66	1.168	-0.03	0.00
8/4/2004	7:53	1.31	18.64	1.241	-0.05	0.00
8/4/2004	7:53	1.39	18.64	1.320	-0.05	0.00
8/4/2004	7:53	1.47	18.63	1.403	-0.06	0.00
8/4/2004	7:53	1.56	18.63	1.491	-0.07	0.00
8/4/2004	7:53	1.65	18.62	1.585	-0.07	-0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-01

$$K = \frac{r_c^2}{2\,L_e}\,ln\,\frac{L_e}{R_e}\left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)}\right]$$

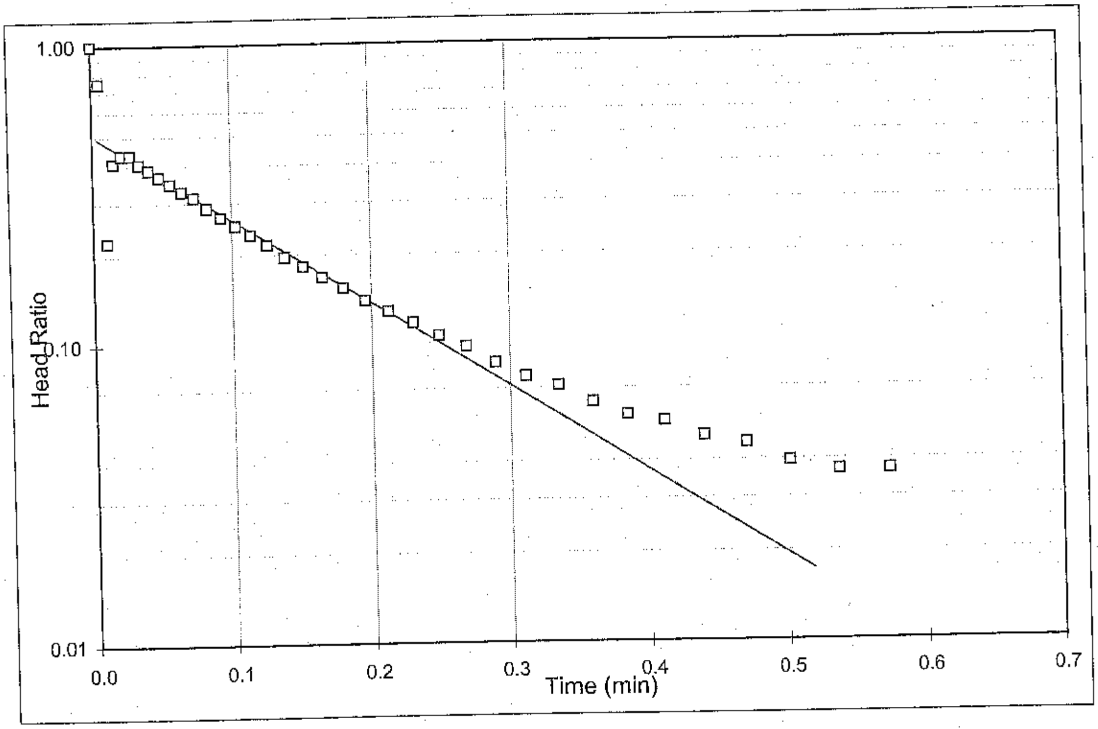
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 0.52
$h_{1(t1)}$ = 0.49
$h_{2(t2)}$ = 0.017

RESULTS

K=	3.98E-03	cm/sec
K=	1.13E+01	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-01

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

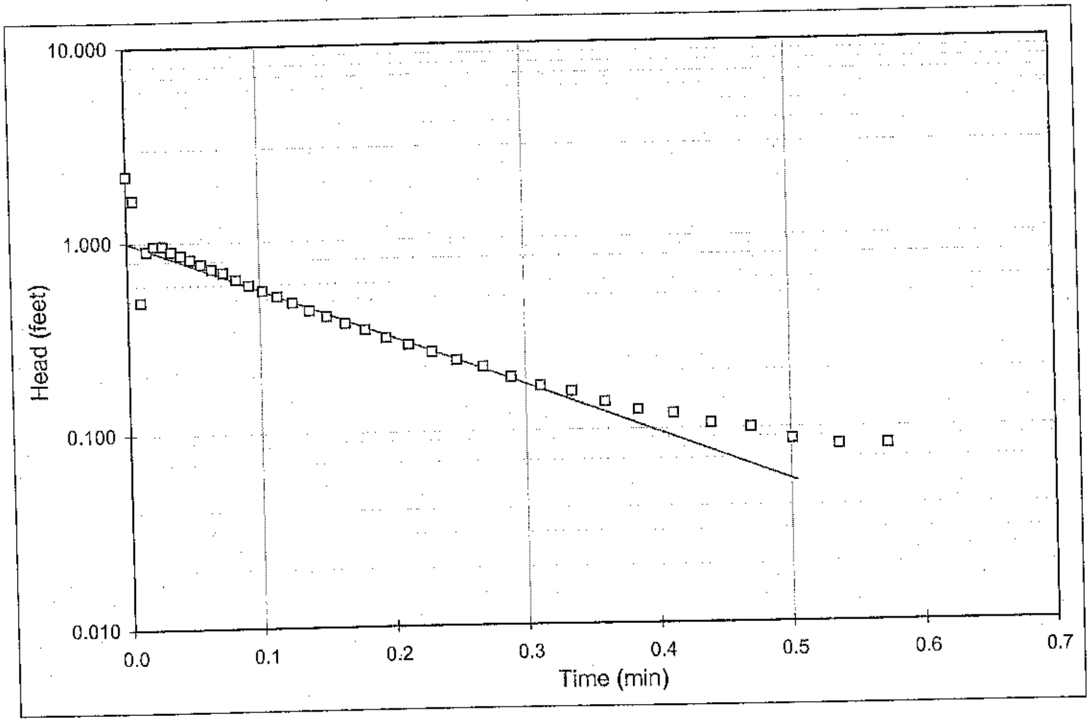
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c =	0.08
r_w =	0.31
L_e =	10
$ln(R_e/r_w)$=	3.52
y_0 =	1.00
y_t =	0.053
t =	0.5

RESULTS

K=	3.62E-03	cm/sec
K=	1.03E+01	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

FALLING HEAD TEST GAGW-01

WELL NO. GAGW-01

DATE	4/13/2005	
INITIAL DEPTH TO WATER	18.44	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	66.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	76.9	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.21	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	9:35:11	0.09	16.23	0.000	2.21	1.00
4/13/2005	9:35:11	0.09	16.78	0.005	1.66	0.75
4/13/2005	9:35:11	0.10	17.95	0.010	0.49	0.22
4/13/2005	9:35:12	0.10	17.54	0.015	0.90	0.41
4/13/2005	9:35:12	0.11	17.48	0.021	0.96	0.43
4/13/2005	9:35:13	0.11	17.48	0.027	0.96	0.43
4/13/2005	9:35:13	0.12	17.55	0.034	0.89	0.40
4/13/2005	9:35:13	0.13	17.58	0.041	0.86	0.39
4/13/2005	9:35:14	0.13	17.63	0.048	0.81	0.37
4/13/2005	9:35:14	0.14	17.67	0.056	0.77	0.35
4/13/2005	9:35:15	0.15	17.72	0.064	0.72	0.33
4/13/2005	9:35:15	0.16	17.75	0.073	0.69	0.31
4/13/2005	9:35:16	0.17	17.80	0.082	0.64	0.29
4/13/2005	9:35:16	0.18	17.85	0.092	0.59	0.27
4/13/2005	9:35:17	0.19	17.89	0.103	0.55	0.25
4/13/2005	9:35:18	0.20	17.92	0.114	0.52	0.23
4/13/2005	9:35:18	0.21	17.96	0.125	0.48	0.22
4/13/2005	9:35:19	0.22	18.01	0.138	0.43	0.20
4/13/2005	9:35:20	0.24	18.04	0.151	0.40	0.18
4/13/2005	9:35:21	0.25	18.07	0.165	0.37	0.17
4/13/2005	9:35:22	0.26	18.10	0.180	0.34	0.15
4/13/2005	9:35:23	0.28	18.13	0.195	0.31	0.14
4/13/2005	9:35:24	0.30	18.16	0.212	0.28	0.13
4/13/2005	9:35:25	0.31	18.18	0.230	0.26	0.12
4/13/2005	9:35:26	0.33	18.21	0.248	0.23	0.11
4/13/2005	9:35:27	0.35	18.23	0.268	0.21	0.10
4/13/2005	9:35:28	0.37	18.25	0.289	0.19	0.09
4/13/2005	9:35:30	0.40	18.27	0.311	0.17	0.08
4/13/2005	9:35:31	0.42	18.28	0.335	0.16	0.07
4/13/2005	9:35:32	0.44	18.30	0.360	0.14	0.06
4/13/2005	9:35:34	0.47	18.32	0.385	0.13	0.06
4/13/2005	9:35:36	0.50	18.32	0.411	0.12	0.05
4/13/2005	9:35:37	0.52	18.33	0.440	0.11	0.05
4/13/2005	9:35:39	0.55	18.34	0.470	0.10	0.05
4/13/2005	9:35:41	0.59	18.35	0.501	0.09	0.04
4/13/2005	9:35:43	0.62	18.36	0.536	0.08	0.04
4/13/2005	9:35:45	0.66	18.36	0.573	0.08	0.04

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-01

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

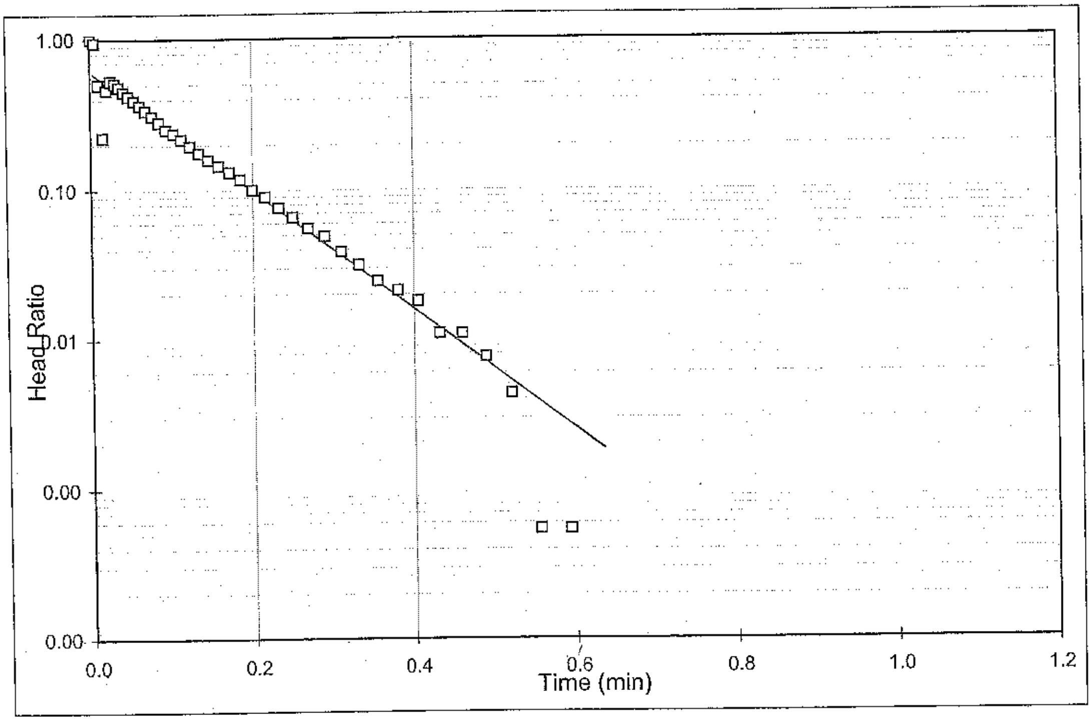
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 0.64
$h_{1(t1)}$ = 0.59
$h_{2(t2)}$ = 0.002

RESULTS

K= 5.58E-03 cm/sec
K= 1.58E+01 ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-01

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e}\frac{1}{t}\ln\frac{y_0}{y_t}$$

where:

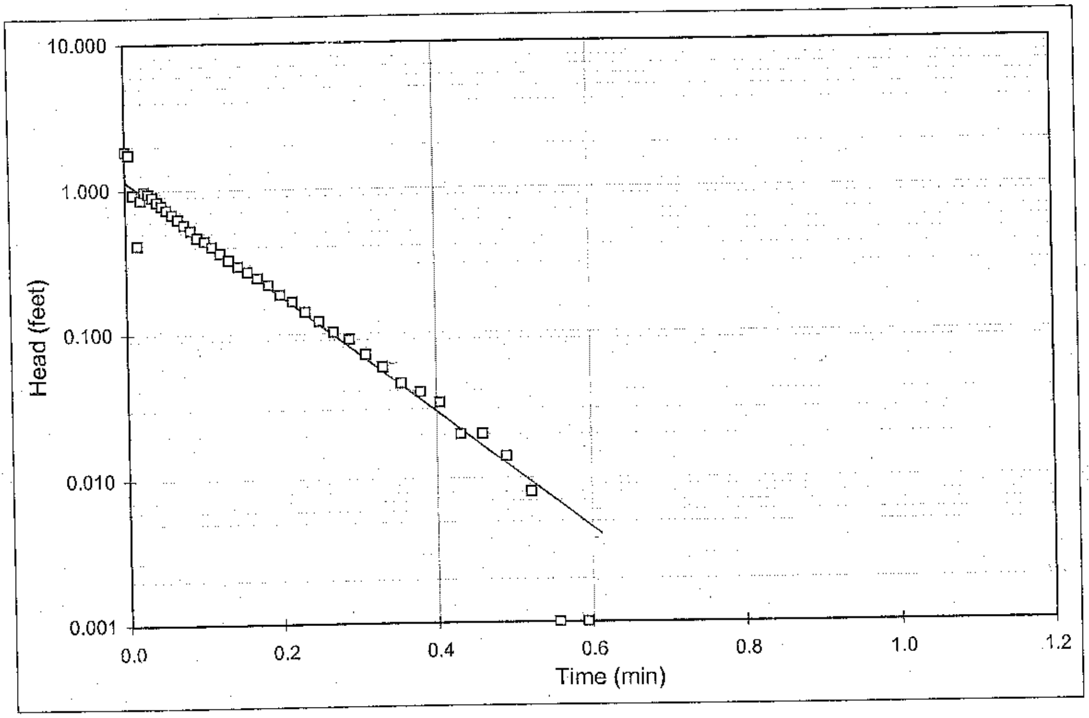
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.31
L_e = 10
$ln(R_e/r_w)$= 3.52
y_0 = 1.15
y_t = 0.004
t = 0.6

RESULTS

K=	5.72E-03	cm/sec
K=	1.62E+01	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

RISING HEAD TEST GAGW-01

WELL NO. GAGW-01

DATE	4/13/2005	
INITIAL DEPTH TO WATER	18.44	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	66.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	76.9	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.85	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	9:54:35	0.07	20.29	0.000	1.85	1.00
4/13/2005	9:54:35	0.07	20.19	0.005	1.75	0.95
4/13/2005	9:54:35	0.08	19.37	0.010	0.92	0.50
4/13/2005	9:54:35	0.08	18.85	0.015	0.41	0.22
4/13/2005	9:54:36	0.09	19.29	0.020	0.85	0.46
4/13/2005	9:54:36	0.09	19.42	0.025	0.98	0.53
4/13/2005	9:54:36	0.10	19.38	0.030	0.94	0.51
4/13/2005	9:54:37	0.10	19.33	0.035	0.89	0.48
4/13/2005	9:54:37	0.11	19.26	0.041	0.82	0.45
4/13/2005	9:54:37	0.11	19.21	0.047	0.77	0.42
4/13/2005	9:54:38	0.12	19.16	0.054	0.72	0.39
4/13/2005	9:54:38	0.13	19.11	0.061	0.67	0.36
4/13/2005	9:54:39	0.13	19.06	0.068	0.62	0.34
4/13/2005	9:54:39	0.14	19.01	0.076	0.57	0.31
4/13/2005	9:54:40	0.15	18.96	0.084	0.52	0.28
4/13/2005	9:54:40	0.16	18.90	0.093	0.46	0.25
4/13/2005	9:54:41	0.17	18.88	0.102	0.44	0.24
4/13/2005	9:54:41	0.18	18.84	0.112	0.40	0.22
4/13/2005	9:54:42	0.19	18.80	0.123	0.36	0.20
4/13/2005	9:54:43	0.20	18.76	0.134	0.32	0.18
4/13/2005	9:54:43	0.21	18.73	0.145	0.29	0.16
4/13/2005	9:54:44	0.22	18.71	0.158	0.27	0.14
4/13/2005	9:54:45	0.24	18.68	0.171	0.24	0.13
4/13/2005	9:54:46	0.25	18.66	0.185	0.22	0.12
4/13/2005	9:54:47	0.26	18.63	0.200	0.18	0.10
4/13/2005	9:54:47	0.28	18.61	0.215	0.17	0.09
4/13/2005	9:54:48	0.30	18.58	0.232	0.14	0.08
4/13/2005	9:54:50	0.31	18.56	0.250	0.12	0.07
4/13/2005	9:54:51	0.33	18.54	0.268	0.10	0.06
4/13/2005	9:54:52	0.35	18.53	0.288	0.09	0.05
4/13/2005	9:54:53	0.37	18.51	0.309	0.07	0.04
4/13/2005	9:54:54	0.40	18.50	0.331	0.06	0.03
4/13/2005	9:54:56	0.42	18.49	0.355	0.04	0.02
4/13/2005	9:54:57	0.44	18.48	0.380	0.04	0.02
4/13/2005	9:54:59	0.47	18.47	0.405	0.03	0.02
4/13/2005	9:55:00	0.50	18.46	0.431	0.02	0.01
4/13/2005	9:55:02	0.52	18.46	0.460	0.02	0.01
4/13/2005	9:55:04	0.55	18.45	0.490	0.01	0.01
4/13/2005	9:55:06	0.59	18.45	0.521	0.01	0.00
4/13/2005	9:55:08	0.62	18.44	0.556	0.00	0.00
4/13/2005	9:55:10	0.66	18.44	0.593	0.00	0.00
4/13/2005	9:55:12	0.70	18.44	0.631	-0.01	0.00
4/13/2005	9:55:15	0.74	18.44	0.673	-0.01	0.00
4/13/2005	9:55:18	0.78	18.43	0.716	-0.01	0.00
4/13/2005	9:55:20	0.83	18.44	0.763	-0.01	0.00
4/13/2005	9:55:23	0.88	18.43	0.811	-0.01	0.00
4/13/2005	9:55:26	0.93	18.43	0.863	-0.01	0.00
4/13/2005	9:55:30	0.98	18.43	0.918	-0.01	0.00
4/13/2005	9:55:33	1.04	18.43	0.976	-0.01	0.00
4/13/2005	9:55:37	1.10	18.43	1.038	-0.01	0.00

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-02

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

where:

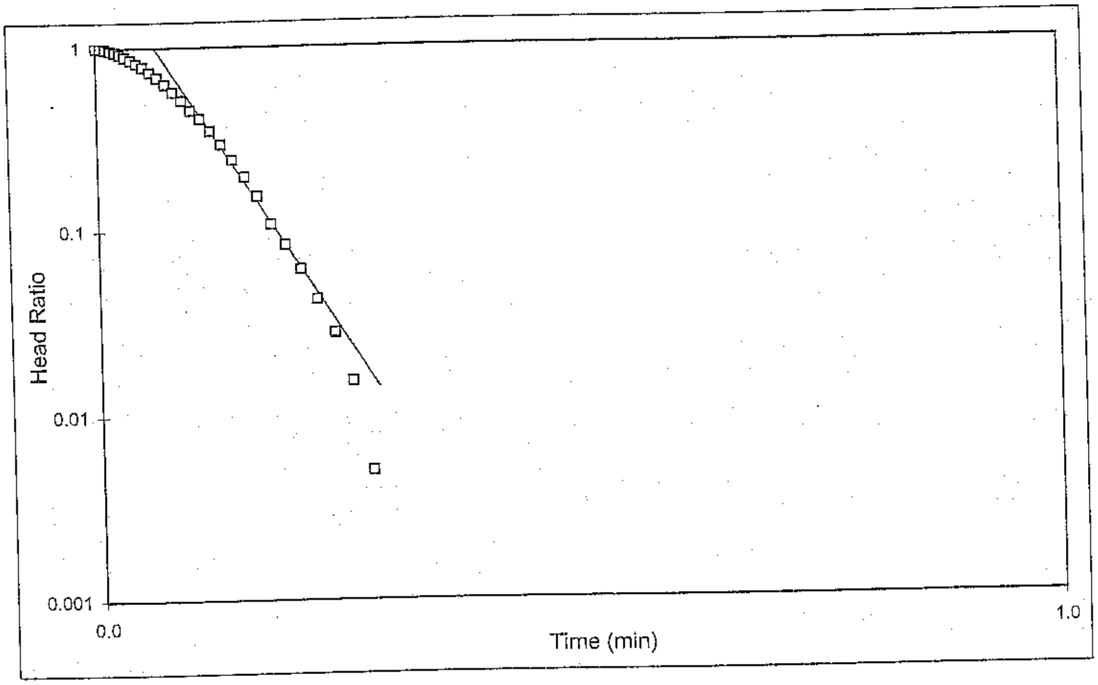
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c =	0.08
R_e =	0.25
L_e =	10.0
t_1 =	0.06
t_2 =	0.29
$h_{1(t1)}$ =	1.00
$h_{2(t2)}$ =	0.014

RESULTS

K=	1.20E-02	cm/sec
K=	3.41E+01	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-02

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

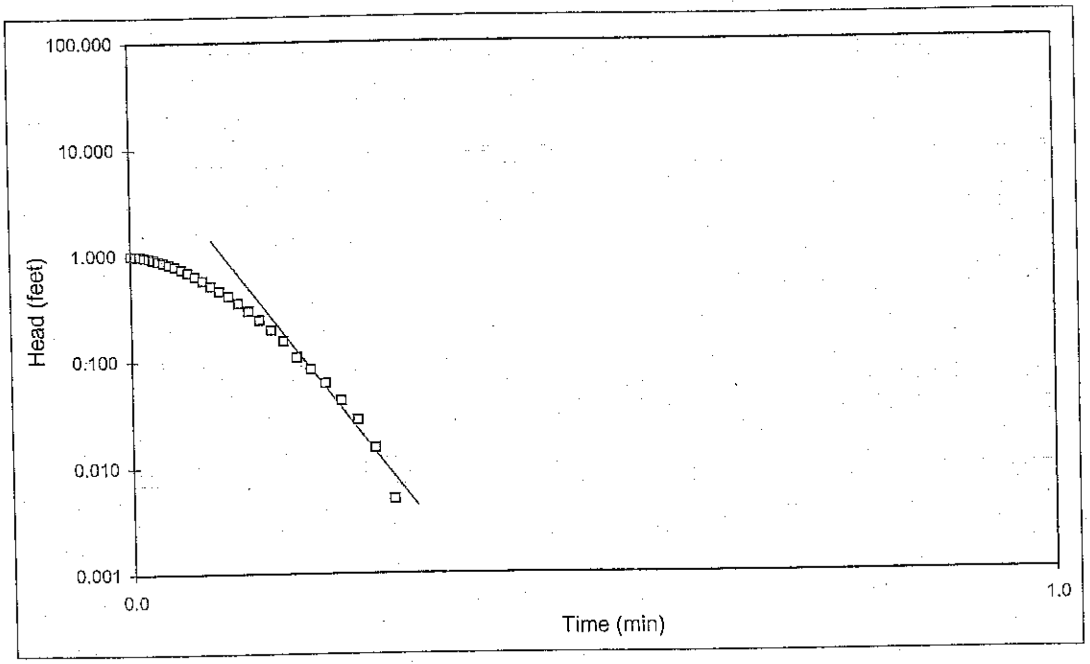
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.25
L_e = 10
$ln(R_e/r_w)$= 3.36
y_0 = 1.94
y_t = 0.004
t = 0.3

RESULTS

K=	1.17E-02	cm/sec
K=	3.33E+01	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

RISING HEAD TEST GAGW-02

WELL NO. GAGW-02

DATE	8/4/2004	
INITIAL DEPTH TO WATER	16.92	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	63.50	FEET (btoc)
BOTTOM OF OPEN INTERVAL	73.50	FEET (btoc)
SATURATED THICKNESS	60.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	56.58	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	10.54	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	7:26	0.07	27.46	0.000	10.54	1.00
8/4/2004	7:26	0.08	27.41	0.005	10.49	0.99
8/4/2004	7:26	0.08	27.29	0.010	10.37	0.98
8/4/2004	7:26	0.09	27.10	0.015	10.18	0.97
8/4/2004	7:26	0.09	26.87	0.020	9.95	0.94
8/4/2004	7:26	0.10	26.60	0.025	9.68	0.92
8/4/2004	7:26	0.10	26.31	0.030	9.39	0.89
8/4/2004	7:26	0.11	25.97	0.036	9.05	0.86
8/4/2004	7:26	0.11	25.59	0.042	8.67	0.82
8/4/2004	7:26	0.12	25.17	0.049	8.25	0.78
8/4/2004	7:26	0.13	24.68	0.056	7.76	0.74
8/4/2004	7:26	0.13	24.15	0.063	7.23	0.69
8/4/2004	7:26	0.14	23.57	0.071	6.65	0.63
8/4/2004	7:26	0.15	22.96	0.079	6.04	0.57
8/4/2004	7:26	0.16	22.35	0.088	5.43	0.52
8/4/2004	7:26	0.17	21.73	0.097	4.81	0.46
8/4/2004	7:26	0.18	21.23	0.107	4.31	0.41
8/4/2004	7:26	0.19	20.62	0.118	3.70	0.35
8/4/2004	7:26	0.20	20.04	0.129	3.12	0.30
8/4/2004	7:26	0.21	19.49	0.140	2.57	0.24
8/4/2004	7:26	0.22	18.99	0.153	2.07	0.20
8/4/2004	7:26	0.24	18.54	0.166	1.62	0.15
8/4/2004	7:26	0.25	18.06	0.180	1.14	0.11
8/4/2004	7:26	0.26	17.80	0.195	0.88	0.08
8/4/2004	7:26	0.28	17.57	0.210	0.65	0.06
8/4/2004	7:26	0.30	17.37	0.227	0.44	0.04
8/4/2004	7:26	0.31	17.22	0.245	0.29	0.03
8/4/2004	7:26	0.33	17.08	0.263	0.16	0.02
8/4/2004	7:26	0.35	16.97	0.283	0.05	0.01
8/4/2004	7:26	0.37	16.91	0.304	-0.01	0.00
8/4/2004	7:26	0.40	16.84	0.326	-0.08	-0.01
8/4/2004	7:26	0.42	16.79	0.350	-0.13	-0.01
8/4/2004	7:27	0.44	16.76	0.375	-0.16	-0.02
8/4/2004	7:27	0.47	16.74	0.400	-0.18	-0.02
8/4/2004	7:27	0.50	16.72	0.426	-0.20	-0.02
8/4/2004	7:27	0.52	16.70	0.455	-0.22	-0.02
8/4/2004	7:27	0.55	16.69	0.485	-0.23	-0.02
8/4/2004	7:27	0.59	16.67	0.516	-0.25	-0.02

RISING HEAD TEST GAGW-02

WELL NO. GAGW-02

DATE	8/4/2004	
INITIAL DEPTH TO WATER	16.92	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	63.50	FEET (btoc)
BOTTOM OF OPEN INTERVAL	73.50	FEET (btoc)
SATURATED THICKNESS	60.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	56.58	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	10.54	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	7:27	0.62	16.67	0.551	-0.25	-0.02
8/4/2004	7:27	0.66	16.66	0.588	-0.26	-0.02
8/4/2004	7:27	0.70	16.67	0.626	-0.25	-0.02
8/4/2004	7:27	0.74	16.67	0.668	-0.25	-0.02
8/4/2004	7:27	0.78	16.67	0.711	-0.25	-0.02
8/4/2004	7:27	0.83	16.68	0.758	-0.24	-0.02
8/4/2004	7:27	0.88	16.66	0.806	-0.26	-0.02
8/4/2004	7:27	0.93	16.65	0.858	-0.27	-0.03
8/4/2004	7:27	0.98	16.66	0.913	-0.26	-0.02
8/4/2004	7:27	1.04	16.65	0.971	-0.27	-0.03
8/4/2004	7:27	1.10	16.65	1.033	-0.27	-0.03
8/4/2004	7:27	1.17	16.65	1.098	-0.27	-0.03
8/4/2004	7:27	1.24	16.65	1.168	-0.27	-0.03
8/4/2004	7:27	1.31	16.65	1.241	-0.27	-0.03
8/4/2004	7:27	1.39	16.65	1.320	-0.27	-0.03
8/4/2004	7:28	1.47	16.64	1.403	-0.28	-0.03
8/4/2004	7:28	1.56	16.64	1.491	-0.28	-0.03
8/4/2004	7:28	1.65	16.64	1.585	-0.28	-0.03

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-03

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

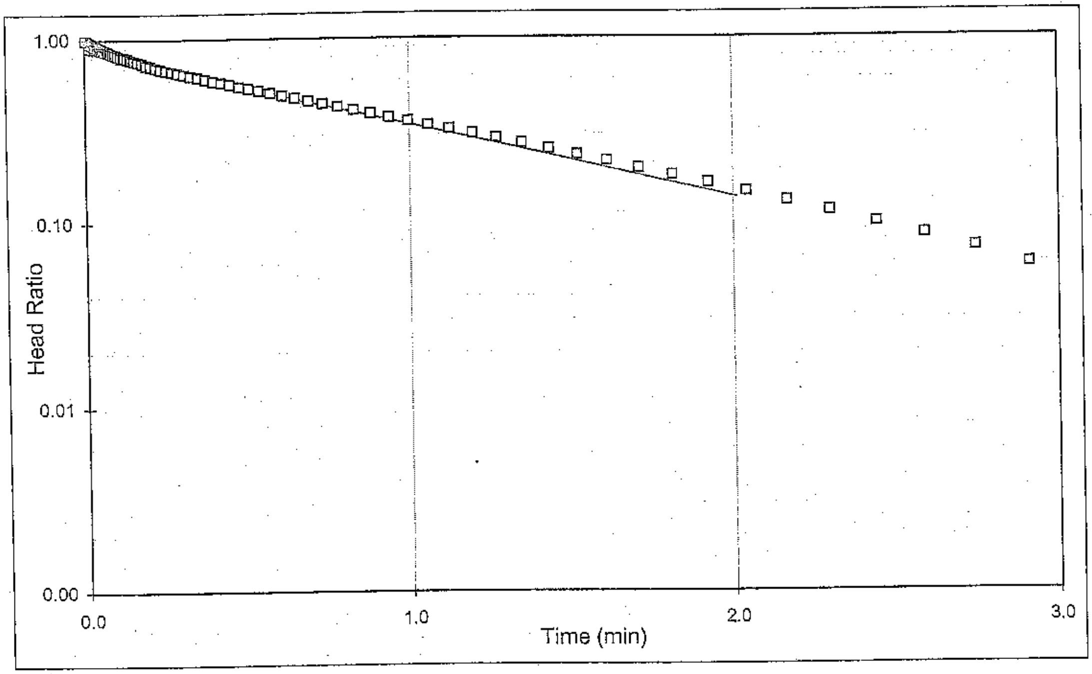
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 10.0
t_1 = 0.00
t_2 = 2.01
$h_{1(t1)}$ = 0.86
$h_{2(t2)}$ = 0.135

RESULTS

K= 5.98E-04 cm/sec
K= 1.69E+00 ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-03

$$K = \frac{r_c^2 \, ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);

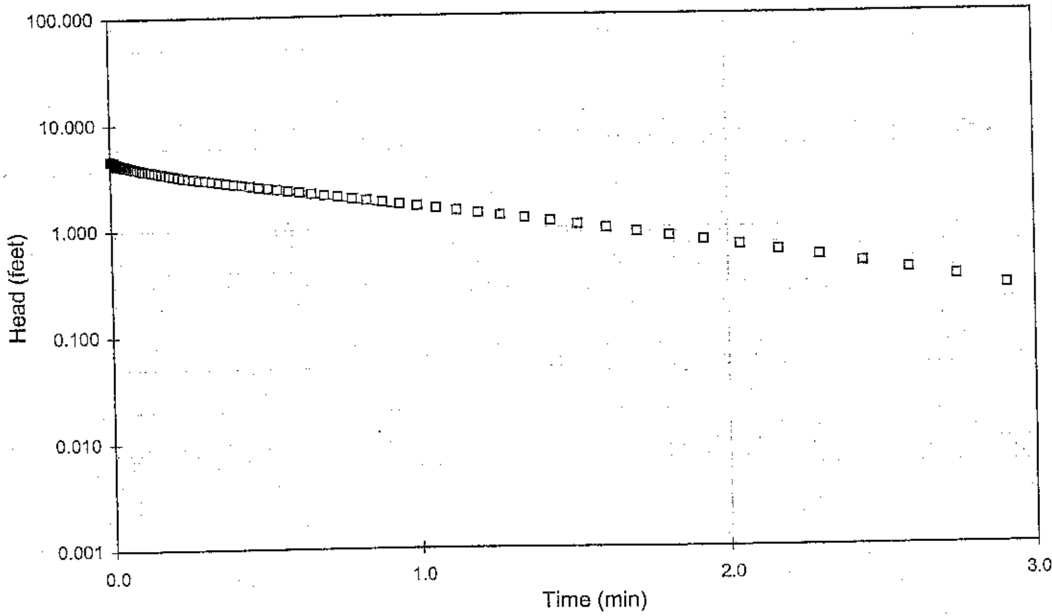
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c =	0.08
r_w =	0.25
L_e =	10
$ln(R_e/r_w)$=	3.20
y_0 =	3.80
y_t =	1.549
t =	0.9

RESULTS

K=	5.42E-04	cm/sec
K=	1.54E+00	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

RISING HEAD TEST GAGW-03

WELL NO. GAGW-03

DATE	8/4/2004	
INITIAL DEPTH TO WATER	22.80	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	65.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	75.00	FEET (btoc)
SATURATED THICKNESS	64.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	52.2	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.58	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	8:44	0.05	27.38	0.000	4.58	1.00
8/4/2004	8:44	0.05	27.35	0.005	4.55	0.99
8/4/2004	8:44	0.06	27.30	0.010	4.50	0.98
8/4/2004	8:44	0.06	27.23	0.015	4.43	0.97
8/4/2004	8:44	0.07	27.16	0.020	4.36	0.95
8/4/2004	8:44	0.07	27.10	0.025	4.30	0.94
8/4/2004	8:44	0.08	27.05	0.030	4.25	0.93
8/4/2004	8:44	0.08	26.99	0.035	4.19	0.91
8/4/2004	8:44	0.09	26.95	0.040	4.15	0.90
8/4/2004	8:44	0.09	26.90	0.045	4.10	0.89
8/4/2004	8:44	0.10	26.86	0.050	4.06	0.89
8/4/2004	8:44	0.10	26.82	0.055	4.02	0.88
8/4/2004	8:44	0.11	26.78	0.061	3.98	0.87
8/4/2004	8:44	0.11	26.75	0.067	3.95	0.86
8/4/2004	8:44	0.12	26.71	0.074	3.91	0.85
8/4/2004	8:44	0.13	26.67	0.081	3.87	0.84
8/4/2004	8:44	0.13	26.62	0.088	3.82	0.83
8/4/2004	8:44	0.14	26.59	0.096	3.79	0.83
8/4/2004	8:44	0.15	26.52	0.104	3.72	0.81
8/4/2004	8:44	0.16	26.45	0.113	3.65	0.80
8/4/2004	8:44	0.17	26.46	0.122	3.66	0.80
8/4/2004	8:44	0.18	26.41	0.132	3.61	0.79
8/4/2004	8:44	0.19	26.35	0.143	3.55	0.77
8/4/2004	8:44	0.20	26.30	0.154	3.50	0.76
8/4/2004	8:44	0.21	26.25	0.165	3.45	0.75
8/4/2004	8:44	0.22	26.19	0.178	3.39	0.74
8/4/2004	8:44	0.24	26.12	0.191	3.32	0.72
8/4/2004	8:44	0.25	26.07	0.205	3.27	0.71
8/4/2004	8:44	0.26	26.00	0.220	3.20	0.70
8/4/2004	8:44	0.28	25.94	0.235	3.14	0.69
8/4/2004	8:44	0.30	25.91	0.252	3.11	0.68
8/4/2004	8:44	0.31	25.85	0.270	3.05	0.67
8/4/2004	8:44	0.33	25.80	0.288	3.00	0.65
8/4/2004	8:44	0.35	25.74	0.308	2.94	0.64
8/4/2004	8:44	0.37	25.68	0.329	2.88	0.63
8/4/2004	8:44	0.40	25.63	0.351	2.83	0.62
8/4/2004	8:44	0.42	25.56	0.375	2.76	0.60
8/4/2004	8:44	0.44	25.50	0.400	2.70	0.59
8/4/2004	8:44	0.47	25.46	0.425	2.66	0.58

RISING HEAD TEST GAGW-03

WELL NO.	GAGW-03	
DATE	8/4/2004	
INITIAL DEPTH TO WATER	22.80	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	65.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	75.00	FEET (btoc)
SATURATED THICKNESS	64.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	52.2	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.58	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	8:44	0.50	25.39	0.451	2.59	0.56
8/4/2004	8:44	0.52	25.31	0.480	2.51	0.55
8/4/2004	8:44	0.55	25.26	0.510	2.46	0.54
8/4/2004	8:44	0.59	25.19	0.541	2.39	0.52
8/4/2004	8:44	0.62	25.12	0.576	2.32	0.51
8/4/2004	8:44	0.66	25.05	0.613	2.25	0.49
8/4/2004	8:45	0.70	24.98	0.651	2.18	0.48
8/4/2004	8:45	0.74	24.90	0.693	2.10	0.46
8/4/2004	8:45	0.78	24.83	0.736	2.03	0.44
8/4/2004	8:45	0.83	24.75	0.783	1.95	0.43
8/4/2004	8:45	0.88	24.67	0.831	1.87	0.41
8/4/2004	8:45	0.93	24.59	0.883	1.79	0.39
8/4/2004	8:45	0.98	24.51	0.938	1.71	0.37
8/4/2004	8:45	1.04	24.43	0.996	1.63	0.36
8/4/2004	8:45	1.10	24.35	1.058	1.55	0.34
8/4/2004	8:45	1.17	24.27	1.123	1.47	0.32
8/4/2004	8:45	1.24	24.19	1.193	1.39	0.30

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-03

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

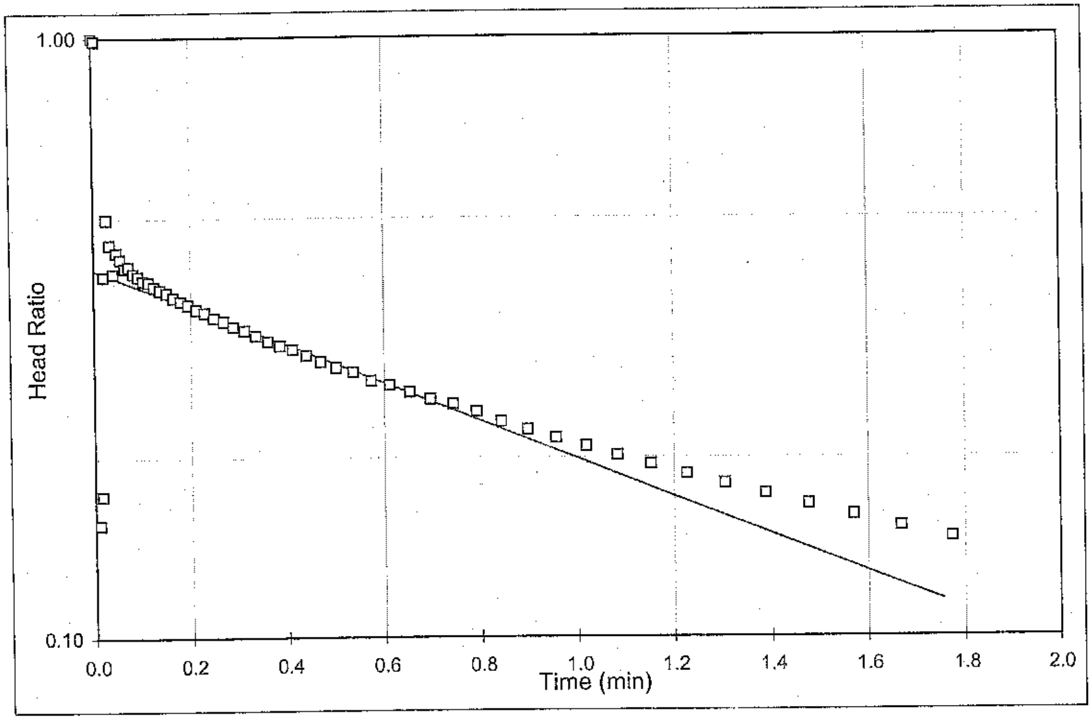
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 1.76
$h_{1(t1)}$ = 0.41
$h_{2(t2)}$ = 0.115

RESULTS

K= 4.43E-04 cm/sec
K= 1.26E+00 ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-03

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

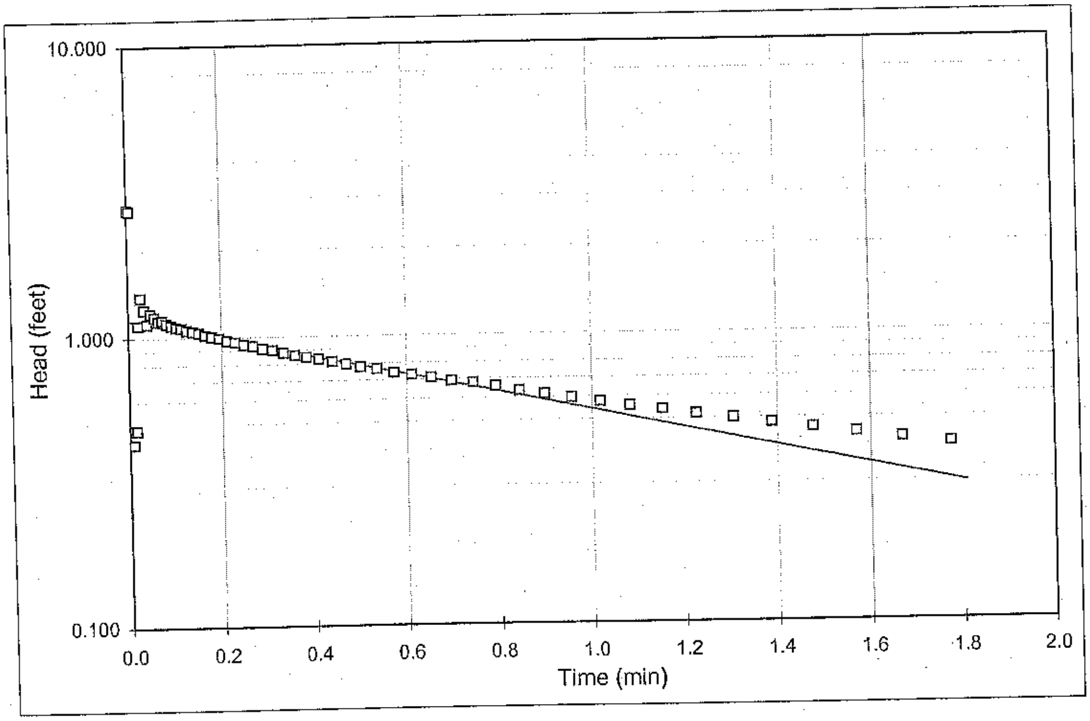
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.31
L_e = 10
$ln(R_e/r_w)$= 3.52
y_0 = 1.15
y_t = 0.296
t = 1.8

RESULTS

K=	4.65E-04	cm/sec
K=	1.32E+00	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

FALLING HEAD TEST GAGW-03

WELL NO. GAGW-03

DATE	4/13/2005	
INITIAL DEPTH TO WATER	22.63	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	67.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	77.5	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.76	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	10:13:08	0.09	19.87	0.000	2.76	1.00
4/13/2005	10:13:08	0.09	19.90	0.005	2.73	0.99
4/13/2005	10:13:08	0.10	22.20	0.010	0.43	0.15
4/13/2005	10:13:09	0.10	22.15	0.015	0.48	0.17
4/13/2005	10:13:09	0.11	21.53	0.021	1.10	0.40
4/13/2005	10:13:09	0.11	21.26	0.027	1.38	0.50
4/13/2005	10:13:10	0.12	21.38	0.034	1.25	0.45
4/13/2005	10:13:10	0.13	21.51	0.041	1.12	0.40
4/13/2005	10:13:11	0.13	21.42	0.048	1.21	0.44
4/13/2005	10:13:11	0.14	21.45	0.056	1.18	0.43
4/13/2005	10:13:11	0.15	21.49	0.064	1.14	0.41
4/13/2005	10:13:12	0.16	21.48	0.073	1.15	0.42
4/13/2005	10:13:13	0.17	21.51	0.082	1.12	0.40
4/13/2005	10:13:13	0.18	21.53	0.092	1.10	0.40
4/13/2005	10:13:14	0.19	21.55	0.103	1.09	0.39
4/13/2005	10:13:14	0.20	21.55	0.114	1.08	0.39
4/13/2005	10:13:15	0.21	21.57	0.125	1.06	0.38
4/13/2005	10:13:16	0.22	21.58	0.138	1.05	0.38
4/13/2005	10:13:17	0.24	21.60	0.151	1.04	0.38
4/13/2005	10:13:18	0.25	21.61	0.165	1.02	0.37
4/13/2005	10:13:18	0.26	21.63	0.180	1.00	0.36
4/13/2005	10:13:19	0.28	21.64	0.195	0.99	0.36
4/13/2005	10:13:20	0.30	21.66	0.212	0.97	0.35
4/13/2005	10:13:21	0.31	21.67	0.230	0.96	0.35
4/13/2005	10:13:23	0.33	21.69	0.248	0.94	0.34
4/13/2005	10:13:24	0.35	21.70	0.268	0.93	0.34
4/13/2005	10:13:25	0.37	21.72	0.289	0.91	0.33
4/13/2005	10:13:26	0.40	21.73	0.311	0.90	0.32
4/13/2005	10:13:28	0.42	21.75	0.335	0.88	0.32
4/13/2005	10:13:29	0.44	21.77	0.360	0.86	0.31
4/13/2005	10:13:31	0.47	21.79	0.385	0.84	0.31
4/13/2005	10:13:32	0.50	21.80	0.411	0.83	0.30
4/13/2005	10:13:34	0.52	21.82	0.440	0.81	0.29
4/13/2005	10:13:36	0.55	21.84	0.470	0.79	0.29
4/13/2005	10:13:38	0.59	21.85	0.501	0.78	0.28
4/13/2005	10:13:40	0.62	21.87	0.536	0.76	0.28
4/13/2005	10:13:42	0.66	21.89	0.573	0.74	0.27
4/13/2005	10:13:44	0.70	21.90	0.611	0.73	0.26
4/13/2005	10:13:47	0.74	21.92	0.653	0.71	0.26
4/13/2005	10:13:49	0.78	21.94	0.696	0.69	0.25
4/13/2005	10:13:52	0.83	21.96	0.743	0.68	0.24
4/13/2005	10:13:55	0.88	21.97	0.791	0.66	0.24
4/13/2005	10:13:58	0.93	22.00	0.843	0.63	0.23
4/13/2005	10:14:02	0.98	22.02	0.898	0.61	0.22
4/13/2005	10:14:05	1.04	22.04	0.956	0.59	0.21
4/13/2005	10:14:09	1.10	22.06	1.018	0.57	0.21
4/13/2005	10:14:13	1.17	22.08	1.083	0.56	0.20
4/13/2005	10:14:17	1.24	22.09	1.153	0.54	0.19
4/13/2005	10:14:21	1.31	22.11	1.226	0.52	0.19
4/13/2005	10:14:26	1.39	22.13	1.305	0.50	0.18
4/13/2005	10:14:31	1.47	22.15	1.388	0.48	0.17
4/13/2005	10:14:36	1.56	22.17	1.476	0.46	0.17
4/13/2005	10:14:42	1.65	22.19	1.570	0.44	0.16
4/13/2005	10:14:48	1.75	22.21	1.668	0.42	0.15
4/13/2005	10:14:54	1.86	22.23	1.773	0.40	0.15

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-03

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

where:

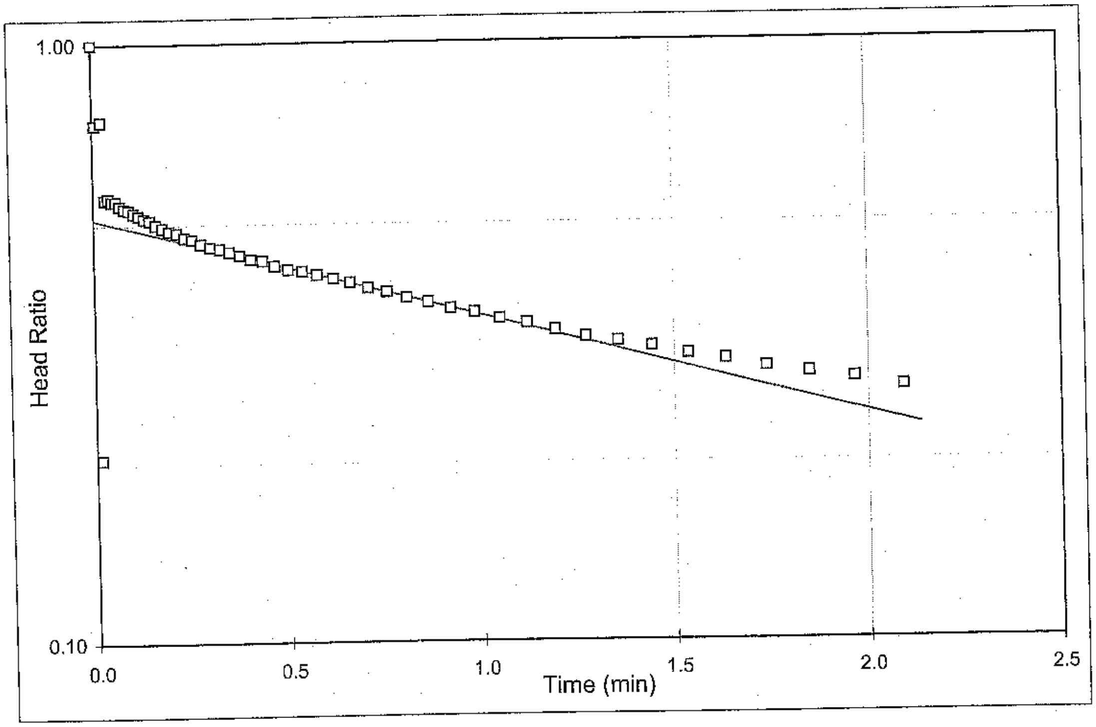
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 2.13
$h_{1(t1)}$ = 0.51
$h_{2(t2)}$ = 0.229

RESULTS

K= 2.31E-04 cm/sec
K= 6.54E-01 ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-03

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e}\frac{1}{t}\ln\frac{y_0}{y_t}$$

where:

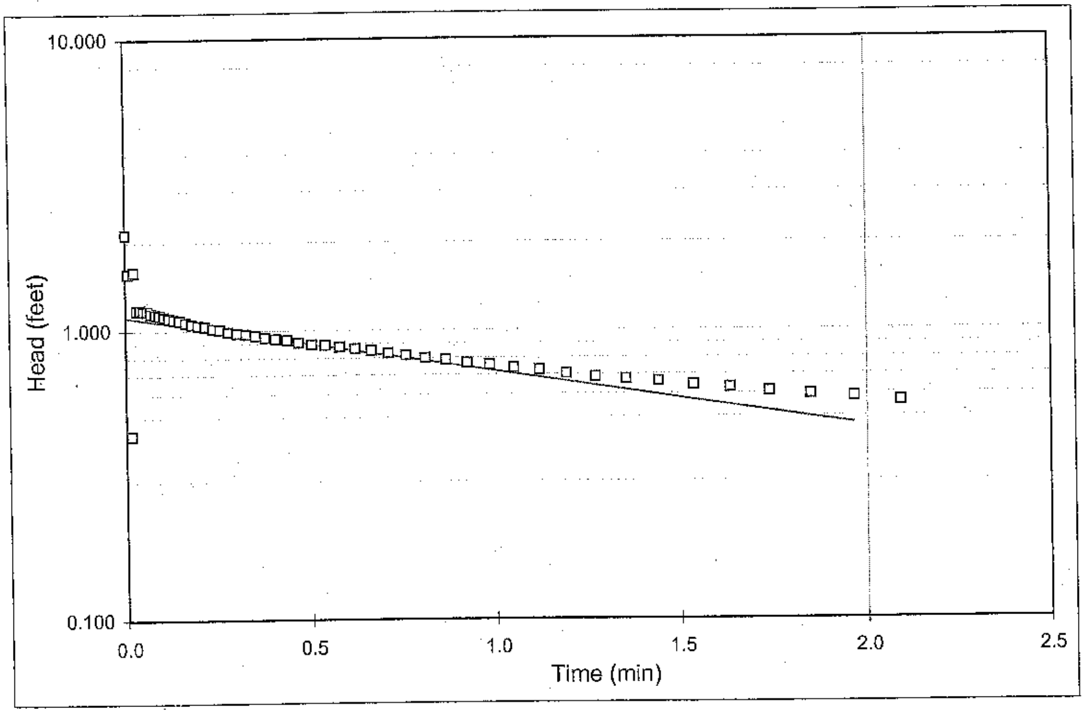
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.31
L_e = 10
$ln(R_e/r_w)$= 3.52
y_0 = 1.11
y_t = 0.471
t = 2.0

RESULTS

K=	2.71E-04	cm/sec
K=	7.68E-01	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

RISING HEAD TEST GAGW-03

WELL NO. GAGW-03

DATE	4/13/2005	
INITIAL DEPTH TO WATER	22.63	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	67.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	77.5	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.13	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	10:17:38	0.12	24.76	0.000	2.13	1.00
4/13/2005	10:17:39	0.13	24.19	0.007	1.56	0.74
4/13/2005	10:17:39	0.13	23.06	0.014	0.43	0.20
4/13/2005	10:17:40	0.14	24.21	0.022	1.58	0.74
4/13/2005	10:17:40	0.15	23.80	0.031	1.17	0.55
4/13/2005	10:17:41	0.16	23.81	0.039	1.18	0.55
4/13/2005	10:17:41	0.17	23.80	0.049	1.17	0.55
4/13/2005	10:17:42	0.18	23.80	0.059	1.17	0.55
4/13/2005	10:17:42	0.19	23.78	0.069	1.15	0.54
4/13/2005	10:17:43	0.20	23.76	0.080	1.13	0.53
4/13/2005	10:17:44	0.21	23.76	0.092	1.13	0.53
4/13/2005	10:17:44	0.22	23.74	0.104	1.11	0.52
4/13/2005	10:17:45	0.24	23.73	0.117	1.10	0.52
4/13/2005	10:17:46	0.25	23.72	0.131	1.09	0.51
4/13/2005	10:17:47	0.26	23.71	0.146	1.08	0.51
4/13/2005	10:17:48	0.28	23.69	0.162	1.06	0.50
4/13/2005	10:17:49	0.30	23.68	0.179	1.05	0.49
4/13/2005	10:17:50	0.31	23.67	0.196	1.04	0.49
4/13/2005	10:17:51	0.33	23.66	0.215	1.03	0.48
4/13/2005	10:17:52	0.35	23.64	0.235	1.01	0.48
4/13/2005	10:17:54	0.37	23.64	0.256	1.01	0.47
4/13/2005	10:17:55	0.40	23.62	0.278	0.99	0.46
4/13/2005	10:17:56	0.42	23.61	0.301	0.98	0.46
4/13/2005	10:17:58	0.44	23.60	0.326	0.97	0.46
4/13/2005	10:17:59	0.47	23.59	0.351	0.96	0.45
4/13/2005	10:18:01	0.50	23.57	0.378	0.94	0.44
4/13/2005	10:18:03	0.52	23.56	0.406	0.93	0.44
4/13/2005	10:18:04	0.55	23.55	0.436	0.92	0.43
4/13/2005	10:18:06	0.59	23.54	0.468	0.91	0.43
4/13/2005	10:18:08	0.62	23.52	0.503	0.89	0.42
4/13/2005	10:18:11	0.66	23.52	0.540	0.89	0.42
4/13/2005	10:18:13	0.70	23.50	0.578	0.87	0.41
4/13/2005	10:18:15	0.74	23.49	0.620	0.86	0.40
4/13/2005	10:18:18	0.78	23.48	0.663	0.85	0.40
4/13/2005	10:18:21	0.83	23.46	0.710	0.83	0.39
4/13/2005	10:18:24	0.88	23.45	0.758	0.82	0.38
4/13/2005	10:18:27	0.93	23.43	0.810	0.80	0.37
4/13/2005	10:18:30	0.98	23.41	0.865	0.78	0.37
4/13/2005	10:18:34	1.04	23.40	0.923	0.77	0.36
4/13/2005	10:18:37	1.10	23.38	0.985	0.75	0.35
4/13/2005	10:18:41	1.17	23.36	1.050	0.73	0.35
4/13/2005	10:18:45	1.24	23.35	1.120	0.72	0.34
4/13/2005	10:18:50	1.31	23.33	1.193	0.70	0.33
4/13/2005	10:18:55	1.39	23.31	1.271	0.68	0.32
4/13/2005	10:19:00	1.47	23.30	1.355	0.67	0.32
4/13/2005	10:19:05	1.56	23.29	1.443	0.66	0.31
4/13/2005	10:19:10	1.65	23.27	1.536	0.64	0.30
4/13/2005	10:19:16	1.75	23.26	1.635	0.63	0.29
4/13/2005	10:19:23	1.86	23.24	1.740	0.61	0.29
4/13/2005	10:19:29	1.97	23.22	1.850	0.59	0.28
4/13/2005	10:19:36	2.08	23.21	1.966	0.58	0.27
4/13/2005	10:19:44	2.21	23.19	2.091	0.56	0.26

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-05

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

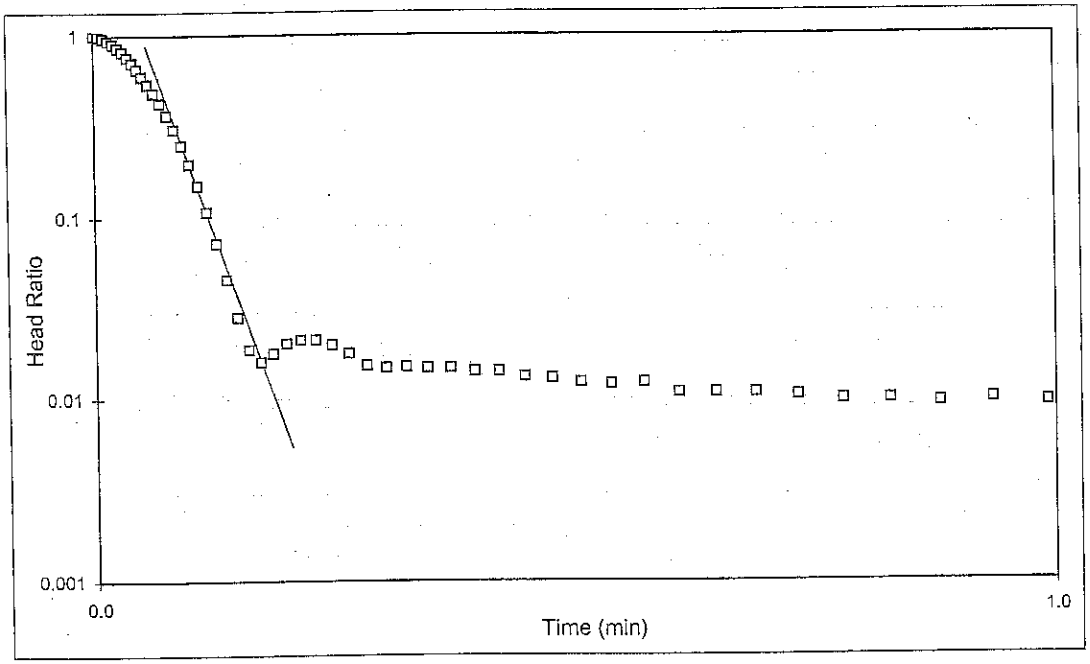
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 10.0
t_1 = 0.06
t_2 = 0.21
$h_{1(t1)}$ = 0.87
$h_{2(t2)}$ = 0.005

RESULTS

K= 2.20E-02 cm/sec
K= 6.25E+01 ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-05

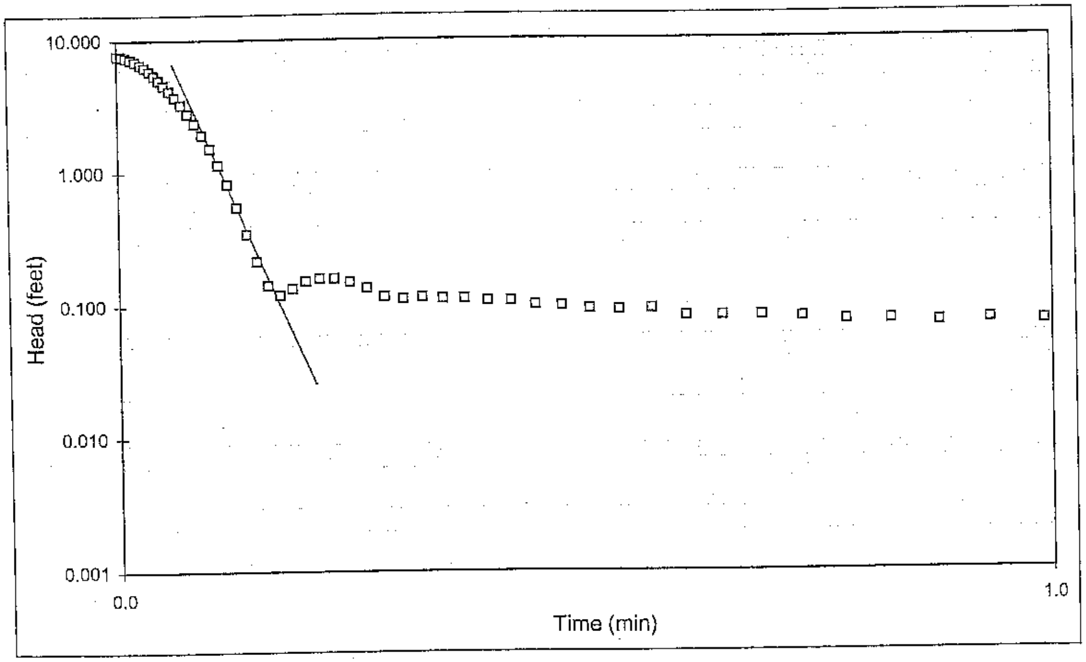
$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	10
$ln(R_e/r_w)$=	3.42
y_0 =	9.24
y_t =	0.026
t =	0.2

RESULTS		
K=	1.69E-02	cm/sec
K=	4.79E+01	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

RISING HEAD TEST GAGW-05

WELL NO.	GAGW-05	
DATE	8/4/2004	
INITIAL DEPTH TO WATER	15.22	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	63.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	73.00	FEET (btoc)
SATURATED THICKNESS	60.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	57.78	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	7.62	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	6:27	0.05	22.84	0.000	7.62	1.00
8/4/2004	6:27	0.06	22.79	0.005	7.57	0.99
8/4/2004	6:27	0.06	22.60	0.010	7.38	0.97
8/4/2004	6:27	0.07	22.37	0.015	7.15	0.94
8/4/2004	6:27	0.07	22.09	0.020	6.87	0.90
8/4/2004	6:27	0.08	21.76	0.025	6.54	0.86
8/4/2004	6:27	0.08	21.43	0.030	6.21	0.82
8/4/2004	6:28	0.09	21.01	0.035	5.79	0.76
8/4/2004	6:28	0.09	20.61	0.040	5.39	0.71
8/4/2004	6:28	0.10	20.19	0.045	4.97	0.65
8/4/2004	6:28	0.10	19.76	0.050	4.54	0.60
8/4/2004	6:28	0.11	19.35	0.056	4.13	0.54
8/4/2004	6:28	0.11	18.91	0.062	3.69	0.48
8/4/2004	6:28	0.12	18.47	0.069	3.25	0.43
8/4/2004	6:28	0.13	18.00	0.076	2.78	0.36
8/4/2004	6:28	0.13	17.55	0.083	2.33	0.31
8/4/2004	6:28	0.14	17.13	0.091	1.91	0.25
8/4/2004	6:28	0.15	16.73	0.099	1.51	0.20
8/4/2004	6:28	0.16	16.37	0.108	1.15	0.15
8/4/2004	6:28	0.17	16.04	0.117	0.82	0.11
8/4/2004	6:28	0.18	15.77	0.127	0.55	0.07
8/4/2004	6:28	0.19	15.57	0.138	0.35	0.05
8/4/2004	6:28	0.20	15.44	0.149	0.22	0.03
8/4/2004	6:28	0.21	15.36	0.160	0.14	0.02
8/4/2004	6:28	0.22	15.34	0.173	0.12	0.02
8/4/2004	6:28	0.24	15.36	0.186	0.14	0.02
8/4/2004	6:28	0.25	15.37	0.200	0.15	0.02
8/4/2004	6:28	0.26	15.38	0.215	0.16	0.02
8/4/2004	6:28	0.28	15.38	0.230	0.16	0.02
8/4/2004	6:28	0.30	15.37	0.247	0.15	0.02
8/4/2004	6:28	0.31	15.36	0.265	0.14	0.02
8/4/2004	6:28	0.33	15.34	0.283	0.12	0.02
8/4/2004	6:28	0.35	15.33	0.303	0.11	0.01
8/4/2004	6:28	0.37	15.33	0.324	0.11	0.01
8/4/2004	6:28	0.40	15.33	0.346	0.11	0.01
8/4/2004	6:28	0.42	15.33	0.370	0.11	0.01
8/4/2004	6:28	0.44	15.33	0.395	0.11	0.01
8/4/2004	6:28	0.47	15.33	0.420	0.11	0.01
8/4/2004	6:28	0.50	15.32	0.446	0.10	0.01

RISING HEAD TEST GAGW-05

WELL NO.	GAGW-05	
DATE	8/4/2004	
INITIAL DEPTH TO WATER	15.22	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	63.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	73.00	FEET (btoc)
SATURATED THICKNESS	60.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	57.78	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	7.62	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	6:28	0.52	15.32	0.475	0.10	0.01
8/4/2004	6:28	0.55	15.31	0.505	0.09	0.01
8/4/2004	6:28	0.59	15.31	0.536	0.09	0.01
8/4/2004	6:28	0.62	15.31	0.571	0.09	0.01
8/4/2004	6:28	0.66	15.30	0.608	0.08	0.01
8/4/2004	6:28	0.70	15.30	0.646	0.08	0.01
8/4/2004	6:28	0.74	15.30	0.688	0.08	0.01
8/4/2004	6:28	0.78	15.30	0.731	0.08	0.01
8/4/2004	6:28	0.83	15.30	0.778	0.07	0.01
8/4/2004	6:28	0.88	15.30	0.826	0.07	0.01
8/4/2004	6:28	0.93	15.29	0.878	0.07	0.01
8/4/2004	6:28	0.98	15.30	0.933	0.07	0.01
8/4/2004	6:28	1.04	15.29	0.991	0.07	0.01
8/4/2004	6:29	1.10	15.30	1.053	0.07	0.01
8/4/2004	6:29	1.17	15.29	1.118	0.07	0.01
8/4/2004	6:29	1.24	15.29	1.188	0.07	0.01
8/4/2004	6:29	1.31	15.29	1.261	0.07	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-07

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

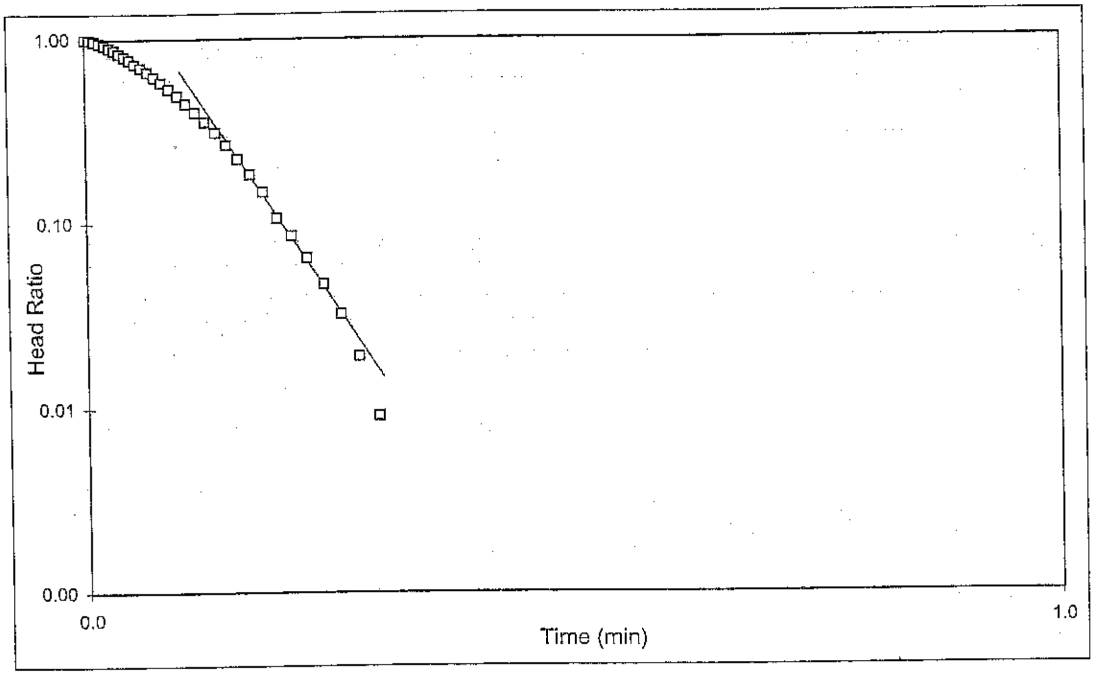
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 10.0
t_1 = 0.10
t_2 = 0.30
$h_{1(t1)}$ = 0.67
$h_{2(t2)}$ = 0.015

RESULTS

K=	1.20E-02	cm/sec
K=	3.41E+01	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-07

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

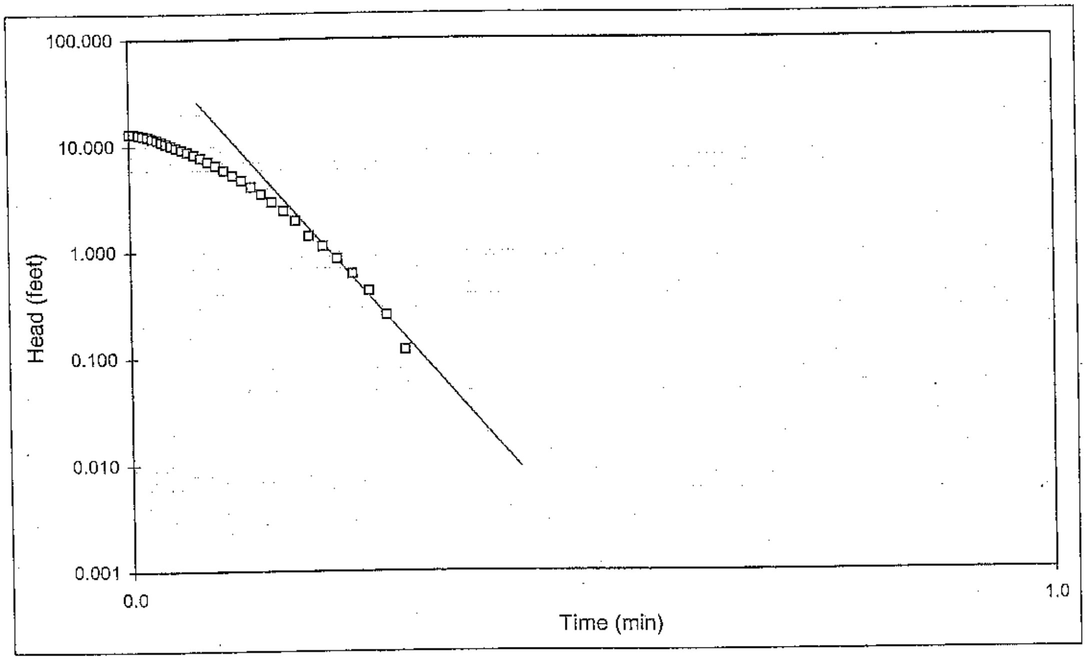
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	10
$ln(R_e/r_w)$=	3.40
y_0 =	31.26
y_t =	0.010
t =	0.4

RESULTS

K=	1.15E-02	cm/sec
K=	3.26E+01	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

RISING HEAD TEST GAGW-07

WELL NO. GAGW-07

DATE	8/4/2004	
INITIAL DEPTH TO WATER	18.16	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	63.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	73.00	FEET (btoc)
SATURATED THICKNESS	57.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	54.84	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	13.19	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	9:15	0.06	31.35	0.000	13.19	1.00
8/4/2004	9:15	0.06	31.23	0.005	13.07	0.99
8/4/2004	9:15	0.07	31.00	0.010	12.84	0.97
8/4/2004	9:15	0.07	30.70	0.015	12.54	0.95
8/4/2004	9:15	0.08	30.37	0.020	12.21	0.93
8/4/2004	9:15	0.08	30.01	0.025	11.85	0.90
8/4/2004	9:15	0.09	29.63	0.030	11.47	0.87
8/4/2004	9:15	0.09	29.21	0.035	11.05	0.84
8/4/2004	9:15	0.10	28.77	0.040	10.61	0.80
8/4/2004	9:15	0.10	28.32	0.045	10.16	0.77
8/4/2004	9:15	0.11	27.83	0.051	9.67	0.73
8/4/2004	9:15	0.11	27.36	0.057	9.20	0.70
8/4/2004	9:15	0.12	26.90	0.064	8.74	0.66
8/4/2004	9:15	0.13	26.38	0.071	8.22	0.62
8/4/2004	9:15	0.13	25.82	0.078	7.66	0.58
8/4/2004	9:15	0.14	25.22	0.086	7.06	0.54
8/4/2004	9:15	0.15	24.66	0.094	6.50	0.49
8/4/2004	9:15	0.16	24.06	0.103	5.90	0.45
8/4/2004	9:15	0.17	23.45	0.112	5.29	0.40
8/4/2004	9:15	0.18	22.85	0.122	4.69	0.36
8/4/2004	9:15	0.19	22.25	0.133	4.09	0.31
8/4/2004	9:15	0.20	21.67	0.144	3.51	0.27
8/4/2004	9:15	0.21	21.11	0.155	2.95	0.22
8/4/2004	9:15	0.22	20.59	0.168	2.43	0.18
8/4/2004	9:15	0.24	20.11	0.181	1.95	0.15
8/4/2004	9:15	0.25	19.56	0.195	1.40	0.11
8/4/2004	9:15	0.26	19.28	0.210	1.12	0.08
8/4/2004	9:16	0.28	19.02	0.225	0.86	0.06
8/4/2004	9:16	0.30	18.78	0.242	0.62	0.05
8/4/2004	9:16	0.31	18.59	0.260	0.43	0.03
8/4/2004	9:16	0.33	18.41	0.278	0.25	0.02
8/4/2004	9:16	0.35	18.28	0.298	0.12	0.01
8/4/2004	9:16	0.37	18.17	0.319	0.01	0.00
8/4/2004	9:16	0.40	18.09	0.341	-0.07	-0.01
8/4/2004	9:16	0.42	18.03	0.365	-0.13	-0.01
8/4/2004	9:16	0.44	17.98	0.390	-0.18	-0.01
8/4/2004	9:16	0.47	17.95	0.415	-0.21	-0.02
8/4/2004	9:16	0.50	17.92	0.441	-0.24	-0.02
8/4/2004	9:16	0.52	17.91	0.470	-0.25	-0.02

RISING HEAD TEST GAGW-07

WELL NO. GAGW-07

DATE	8/4/2004	
INITIAL DEPTH TO WATER	18.16	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	63.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	73.00	FEET (btoc)
SATURATED THICKNESS	57.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	54.84	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	13.19	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	9:16	0.55	17.89	0.500	-0.27	-0.02
8/4/2004	9:16	0.59	17.88	0.531	-0.28	-0.02
8/4/2004	9:16	0.62	17.87	0.566	-0.29	-0.02
8/4/2004	9:16	0.66	17.87	0.603	-0.29	-0.02
8/4/2004	9:16	0.70	17.86	0.641	-0.30	-0.02
8/4/2004	9:16	0.74	17.86	0.683	-0.30	-0.02
8/4/2004	9:16	0.78	17.86	0.726	-0.30	-0.02
8/4/2004	9:16	0.83	17.85	0.773	-0.31	-0.02
8/4/2004	9:16	0.88	17.85	0.821	-0.31	-0.02
8/4/2004	9:16	0.93	17.85	0.873	-0.31	-0.02
8/4/2004	9:16	0.98	17.84	0.928	-0.32	-0.02
8/4/2004	9:16	1.04	17.84	0.986	-0.32	-0.02
8/4/2004	9:16	1.10	17.84	1.048	-0.32	-0.02
8/4/2004	9:16	1.17	17.83	1.113	-0.33	-0.02
8/4/2004	9:16	1.24	17.83	1.183	-0.33	-0.02
8/4/2004	9:17	1.31	17.83	1.256	-0.33	-0.03
8/4/2004	9:17	1.39	17.83	1.335	-0.33	-0.03

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-08

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

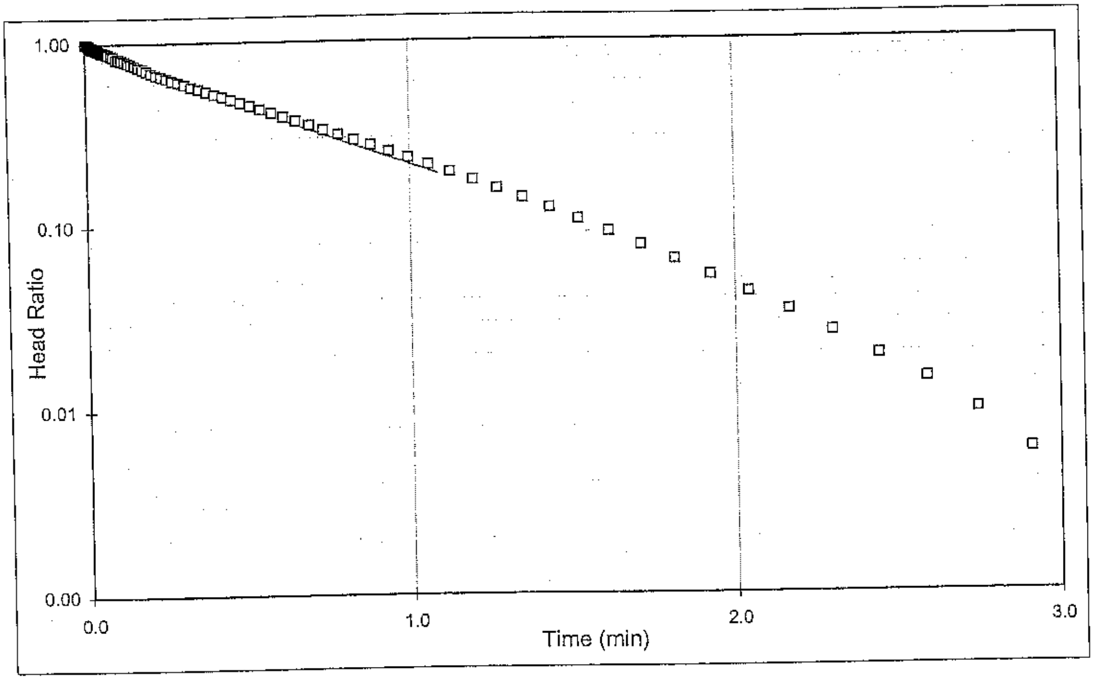
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 10.0
t_1 = 0.00
t_2 = 1.09
$h_{1(t1)}$ = 0.90
$h_{2(t2)}$ = 0.188

RESULTS

K=	9.36E-04	cm/sec
K=	2.65E+00	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-08

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);

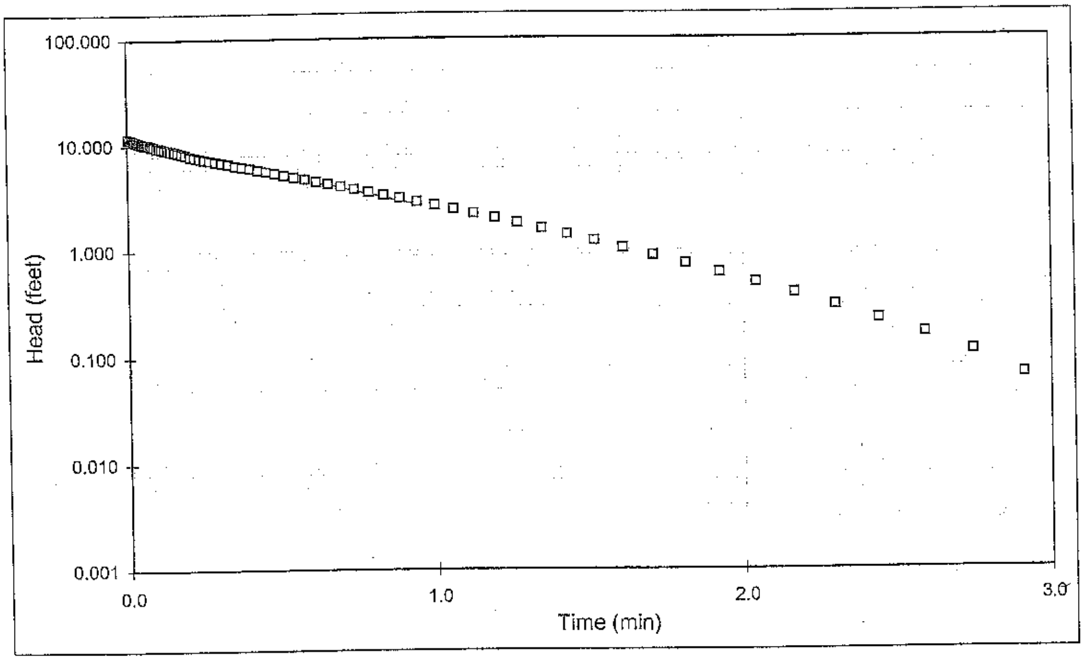
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c =	0.08
r_w =	0.25
L_e =	10
$ln(R_e/r_w)$=	3.38
y_0 =	11.55
y_t =	2.692
t =	0.9

RESULTS

K=	9.27E-04	cm/sec
K=	2.63E+00	ft/day



Project Name: Quanta Resources
Project No.: 023-6151
Test Date: 08/04/04

Analysis By: TIR
Checked By: FG
Analysis Date: 8/5/2004

RISING HEAD TEST GAGW-08

WELL NO.	GAGW-08	
DATE	8/4/2004	
INITIAL DEPTH TO WATER	15.06	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	62.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	72.00	FEET (btoc)
SATURATED THICKNESS	60.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	56.94	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	11.55	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	10:20	0.05	26.61	0.000	11.55	1.00
8/4/2004	10:20	0.05	26.53	0.005	11.47	0.99
8/4/2004	10:20	0.06	26.41	0.010	11.35	0.98
8/4/2004	10:20	0.06	26.28	0.015	11.22	0.97
8/4/2004	10:20	0.07	26.13	0.020	11.07	0.96
8/4/2004	10:20	0.07	26.00	0.025	10.94	0.95
8/4/2004	10:20	0.08	25.88	0.030	10.82	0.94
8/4/2004	10:20	0.08	25.76	0.035	10.70	0.93
8/4/2004	10:20	0.09	25.64	0.040	10.58	0.92
8/4/2004	10:20	0.09	25.54	0.045	10.48	0.91
8/4/2004	10:20	0.10	25.40	0.050	10.34	0.90
8/4/2004	10:20	0.10	25.33	0.055	10.27	0.89
8/4/2004	10:20	0.11	25.28	0.061	10.22	0.89
8/4/2004	10:20	0.11	25.22	0.067	10.16	0.88
8/4/2004	10:20	0.12	25.09	0.074	10.03	0.87
8/4/2004	10:20	0.13	24.94	0.081	9.88	0.86
8/4/2004	10:20	0.13	24.84	0.088	9.78	0.85
8/4/2004	10:20	0.14	24.49	0.096	9.43	0.82
8/4/2004	10:20	0.15	24.53	0.104	9.47	0.82
8/4/2004	10:20	0.16	24.38	0.113	9.32	0.81
8/4/2004	10:20	0.17	24.23	0.122	9.17	0.79
8/4/2004	10:20	0.18	24.07	0.132	9.01	0.78
8/4/2004	10:20	0.19	23.91	0.143	8.85	0.77
8/4/2004	10:20	0.20	23.74	0.154	8.68	0.75
8/4/2004	10:20	0.21	23.56	0.165	8.50	0.74
8/4/2004	10:20	0.22	23.37	0.178	8.31	0.72
8/4/2004	10:20	0.24	23.18	0.191	8.12	0.70
8/4/2004	10:20	0.25	22.92	0.205	7.86	0.68
8/4/2004	10:20	0.26	22.76	0.220	7.70	0.67
8/4/2004	10:20	0.28	22.58	0.235	7.52	0.65
8/4/2004	10:20	0.30	22.40	0.252	7.34	0.64
8/4/2004	10:20	0.31	22.22	0.270	7.16	0.62
8/4/2004	10:20	0.33	22.04	0.288	6.98	0.60
8/4/2004	10:20	0.35	21.84	0.308	6.78	0.59
8/4/2004	10:20	0.37	21.64	0.329	6.58	0.57
8/4/2004	10:20	0.40	21.45	0.351	6.39	0.55
8/4/2004	10:20	0.42	21.24	0.375	6.18	0.54
8/4/2004	10:20	0.44	21.04	0.400	5.98	0.52
8/4/2004	10:20	0.47	20.84	0.425	5.78	0.50

RISING HEAD TEST GAGW-08

WELL NO. GAGW-08

DATE	8/4/2004	
INITIAL DEPTH TO WATER	15.06	FEET (btoc)
CASING DIAMETER	2.00	INCHES
SAND DIAMETER	6.00	INCHES
TOP OF OPEN INTERVAL	62.00	FEET (btoc)
BOTTOM OF OPEN INTERVAL	72.00	FEET (btoc)
SATURATED THICKNESS	60.00	FEET
WATER TABLE TO BOTTOM OF SCREEN	56.94	FEET
OPEN INTERVAL LENGTH	10	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	11.55	FEET
MAX. HEAD IN SCREEN?	N	

DATE	TIME (HR:M:S)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
8/4/2004	10:20	0.50	20.64	0.451	5.58	0.48
8/4/2004	10:20	0.52	20.42	0.480	5.36	0.46
8/4/2004	10:20	0.55	20.21	0.510	5.15	0.45
8/4/2004	10:21	0.59	20.00	0.541	4.94	0.43
8/4/2004	10:21	0.62	19.77	0.576	4.71	0.41
8/4/2004	10:21	0.66	19.55	0.613	4.49	0.39
8/4/2004	10:21	0.70	19.32	0.651	4.26	0.37
8/4/2004	10:21	0.74	19.09	0.693	4.03	0.35
8/4/2004	10:21	0.78	18.86	0.736	3.80	0.33
8/4/2004	10:21	0.83	18.63	0.783	3.57	0.31
8/4/2004	10:21	0.88	18.40	0.831	3.34	0.29
8/4/2004	10:21	0.93	18.17	0.883	3.11	0.27
8/4/2004	10:21	0.98	17.94	0.938	2.88	0.25
8/4/2004	10:21	1.04	17.71	0.996	2.65	0.23
8/4/2004	10:21	1.10	17.49	1.058	2.43	0.21
8/4/2004	10:21	1.17	17.27	1.123	2.21	0.19
8/4/2004	10:21	1.24	17.06	1.193	2.00	0.17

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-06I

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

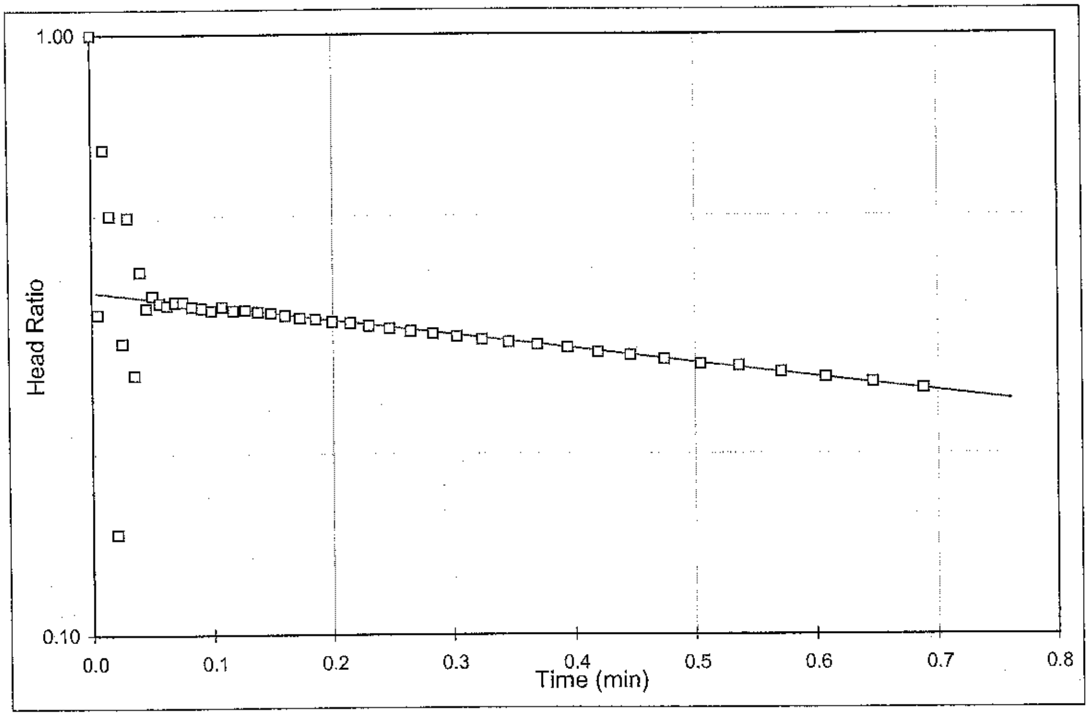
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 0.76
$h_{1(t1)}$ = 0.37
$h_{2(t2)}$ = 0.246

RESULTS

K= 3.35E-04 cm/sec
K= 9.49E-01 ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-06I

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

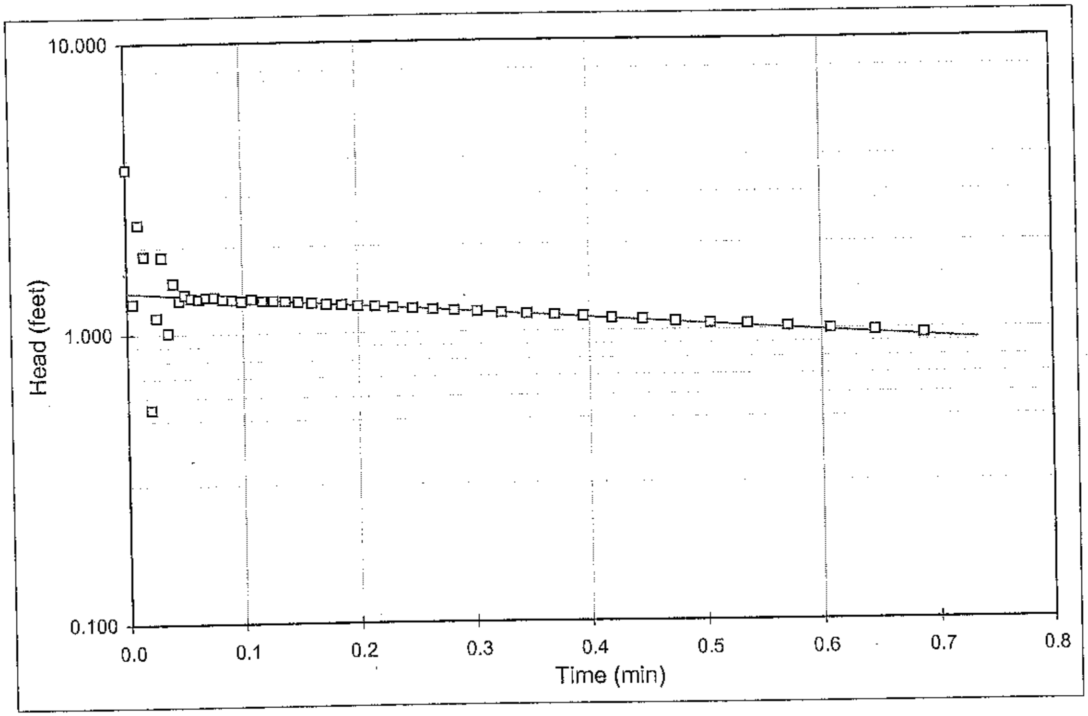
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.31
L_e = 10
$ln(R_e/r_w)$= 3.52
y_0 = 1.39
y_t = 0.914
t = 0.7

RESULTS

K=	3.56E-04	cm/sec
K=	1.01E+00	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

FALLING HEAD TEST GAGW-06I

WELL NO. GAGW-06I

DATE	4/13/2005	
INITIAL DEPTH TO WATER	17.72	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	33.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	43.9	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.72	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	8:16:47	0.05	14.00	0.000	3.72	1.00
4/13/2005	8:16:47	0.06	16.45	0.005	1.28	0.34
4/13/2005	8:16:47	0.06	15.33	0.010	2.39	0.64
4/13/2005	8:16:48	0.07	15.86	0.015	1.86	0.50
4/13/2005	8:16:48	0.07	17.17	0.020	0.55	0.15
4/13/2005	8:16:48	0.08	16.58	0.025	1.14	0.31
4/13/2005	8:16:49	0.08	15.87	0.030	1.85	0.50
4/13/2005	8:16:49	0.09	16.71	0.035	1.01	0.27
4/13/2005	8:16:49	0.09	16.22	0.040	1.50	0.40
4/13/2005	8:16:49	0.10	16.41	0.045	1.31	0.35
4/13/2005	8:16:50	0.10	16.35	0.050	1.37	0.37
4/13/2005	8:16:50	0.11	16.39	0.056	1.33	0.36
4/13/2005	8:16:50	0.11	16.40	0.062	1.32	0.35
4/13/2005	8:16:51	0.12	16.38	0.069	1.34	0.36
4/13/2005	8:16:51	0.13	16.38	0.076	1.34	0.36
4/13/2005	8:16:52	0.13	16.41	0.083	1.31	0.35
4/13/2005	8:16:52	0.14	16.41	0.091	1.31	0.35
4/13/2005	8:16:53	0.15	16.43	0.099	1.29	0.35
4/13/2005	8:16:53	0.16	16.41	0.108	1.31	0.35
4/13/2005	8:16:54	0.17	16.43	0.117	1.29	0.35
4/13/2005	8:16:54	0.18	16.43	0.127	1.29	0.35
4/13/2005	8:16:55	0.19	16.43	0.138	1.29	0.35
4/13/2005	8:16:56	0.20	16.44	0.149	1.28	0.34
4/13/2005	8:16:56	0.21	16.45	0.160	1.27	0.34
4/13/2005	8:16:57	0.22	16.46	0.173	1.26	0.34
4/13/2005	8:16:58	0.24	16.47	0.186	1.25	0.34
4/13/2005	8:16:59	0.25	16.48	0.200	1.24	0.33
4/13/2005	8:17:00	0.26	16.49	0.215	1.23	0.33
4/13/2005	8:17:01	0.28	16.50	0.230	1.22	0.33
4/13/2005	8:17:02	0.30	16.51	0.247	1.21	0.32
4/13/2005	8:17:03	0.31	16.53	0.265	1.19	0.32
4/13/2005	8:17:04	0.33	16.54	0.283	1.18	0.32
4/13/2005	8:17:05	0.35	16.55	0.303	1.17	0.31
4/13/2005	8:17:06	0.37	16.57	0.324	1.16	0.31
4/13/2005	8:17:07	0.40	16.58	0.346	1.14	0.31
4/13/2005	8:17:09	0.42	16.59	0.370	1.13	0.30
4/13/2005	8:17:10	0.44	16.60	0.395	1.12	0.30
4/13/2005	8:17:12	0.47	16.62	0.420	1.10	0.30
4/13/2005	8:17:13	0.50	16.63	0.446	1.09	0.29
4/13/2005	8:17:15	0.52	16.65	0.475	1.07	0.29
4/13/2005	8:17:17	0.55	16.67	0.505	1.05	0.28
4/13/2005	8:17:19	0.59	16.68	0.536	1.04	0.28
4/13/2005	8:17:21	0.62	16.70	0.571	1.02	0.27
4/13/2005	8:17:23	0.66	16.72	0.608	1.00	0.27
4/13/2005	8:17:25	0.70	16.74	0.646	0.98	0.26
4/13/2005	8:17:28	0.74	16.77	0.688	0.95	0.26

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-06I

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

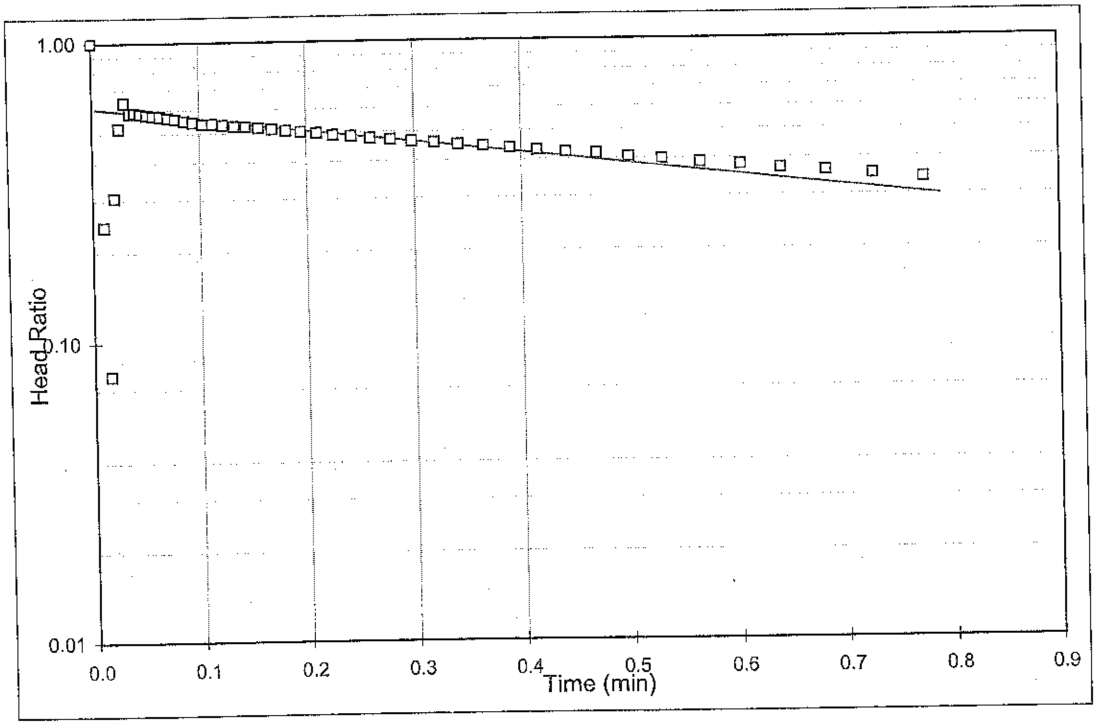
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 0.79
$h_{1(t1)}$ = 0.61
$h_{2(t2)}$ = 0.298

RESULTS

K=	5.53E-04	cm/sec
K=	1.57E+00	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-06I

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e}\frac{1}{t}\ln\frac{y_0}{y_t}$$

where:

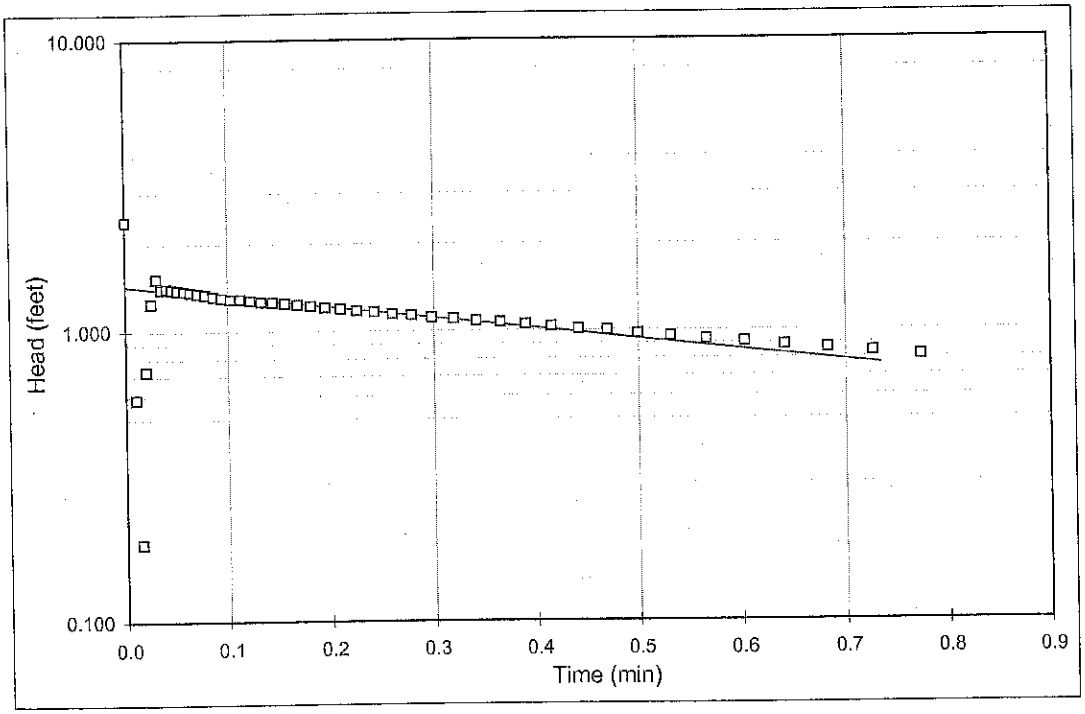
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c = 0.08
r_w = 0.31
L_e = 10
$ln(R_e/r_w)$= 3.52
y_0 = 1.44
y_t = 0.762
t = 0.7

RESULTS

K= 5.35E-04 cm/sec
K= 1.52E+00 ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

RISING HEAD TEST GAGW-06I

WELL NO. GAGW-06I

DATE	4/13/2005	
INITIAL DEPTH TO WATER	17.72	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	33.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	43.9	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.39	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	8:26:28	0.06	20.11	0.000	2.39	1.00
4/13/2005	8:26:29	0.06	17.51	0.005	-0.21	-0.09
4/13/2005	8:26:29	0.07	18.30	0.010	0.58	0.24
4/13/2005	8:26:29	0.07	17.91	0.015	0.19	0.08
4/13/2005	8:26:29	0.08	18.45	0.020	0.73	0.31
4/13/2005	8:26:30	0.08	18.97	0.025	1.25	0.52
4/13/2005	8:26:30	0.09	19.24	0.030	1.52	0.64
4/13/2005	8:26:30	0.09	19.12	0.035	1.40	0.59
4/13/2005	8:26:31	0.10	19.13	0.040	1.41	0.59
4/13/2005	8:26:31	0.10	19.11	0.045	1.39	0.58
4/13/2005	8:26:31	0.11	19.10	0.051	1.38	0.58
4/13/2005	8:26:32	0.11	19.10	0.057	1.38	0.57
4/13/2005	8:26:32	0.12	19.08	0.064	1.36	0.57
4/13/2005	8:26:32	0.13	19.07	0.071	1.35	0.56
4/13/2005	8:26:33	0.13	19.06	0.078	1.34	0.56
4/13/2005	8:26:33	0.14	19.04	0.086	1.32	0.55
4/13/2005	8:26:34	0.15	19.02	0.094	1.30	0.54
4/13/2005	8:26:34	0.16	19.01	0.103	1.29	0.54
4/13/2005	8:26:35	0.17	19.01	0.112	1.29	0.54
4/13/2005	8:26:36	0.18	18.99	0.122	1.27	0.53
4/13/2005	8:26:36	0.19	18.98	0.133	1.26	0.53
4/13/2005	8:26:37	0.20	18.97	0.144	1.25	0.52
4/13/2005	8:26:38	0.21	18.96	0.155	1.24	0.52
4/13/2005	8:26:38	0.22	18.95	0.168	1.23	0.51
4/13/2005	8:26:39	0.24	18.94	0.181	1.22	0.51
4/13/2005	8:26:40	0.25	18.92	0.195	1.20	0.50
4/13/2005	8:26:41	0.26	18.91	0.210	1.19	0.50
4/13/2005	8:26:42	0.28	18.89	0.225	1.17	0.49
4/13/2005	8:26:43	0.30	18.88	0.242	1.16	0.48
4/13/2005	8:26:44	0.31	18.86	0.260	1.14	0.48
4/13/2005	8:26:45	0.33	18.85	0.278	1.13	0.47
4/13/2005	8:26:46	0.35	18.83	0.298	1.11	0.46
4/13/2005	8:26:47	0.37	18.82	0.319	1.10	0.46
4/13/2005	8:26:49	0.40	18.80	0.341	1.08	0.45
4/13/2005	8:26:50	0.42	18.78	0.365	1.06	0.44
4/13/2005	8:26:52	0.44	18.77	0.390	1.05	0.44
4/13/2005	8:26:53	0.47	18.75	0.415	1.03	0.43
4/13/2005	8:26:55	0.50	18.73	0.441	1.01	0.42
4/13/2005	8:26:56	0.52	18.72	0.470	1.00	0.42
4/13/2005	8:26:58	0.55	18.69	0.500	0.97	0.40
4/13/2005	8:27:00	0.59	18.67	0.531	0.95	0.40
4/13/2005	8:27:02	0.62	18.65	0.566	0.93	0.39
4/13/2005	8:27:04	0.66	18.63	0.603	0.91	0.38
4/13/2005	8:27:07	0.70	18.60	0.641	0.88	0.37
4/13/2005	8:27:09	0.74	18.58	0.683	0.86	0.36
4/13/2005	8:27:12	0.78	18.56	0.726	0.84	0.35
4/13/2005	8:27:15	0.83	18.53	0.773	0.81	0.34

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-04D

$$K = \frac{r_c^2}{2L_e} ln \frac{L_e}{R_e} \left[\frac{ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

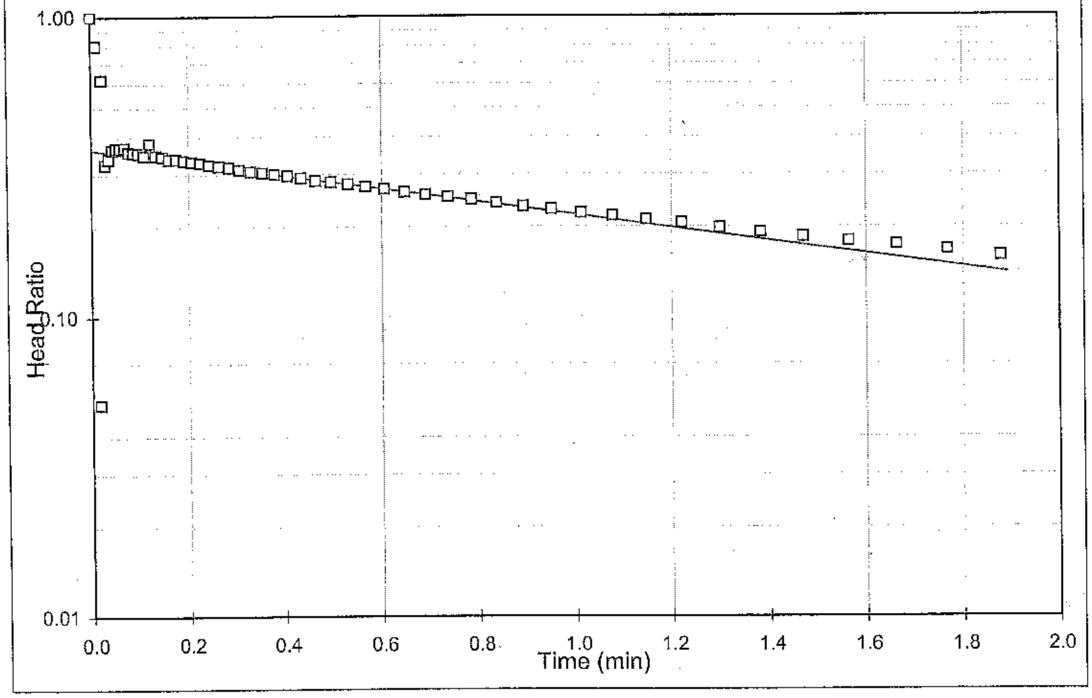
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c =	0.08
R_e =	0.31
L_e =	10.0
t_1 =	0.00
t_2 =	1.89
$h_{1(t1)}$ =	0.36
$h_{2(t2)}$ =	0.140

RESULTS

K=	3.07E-04	cm/sec
K=	8.69E-01	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAGW-04D

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

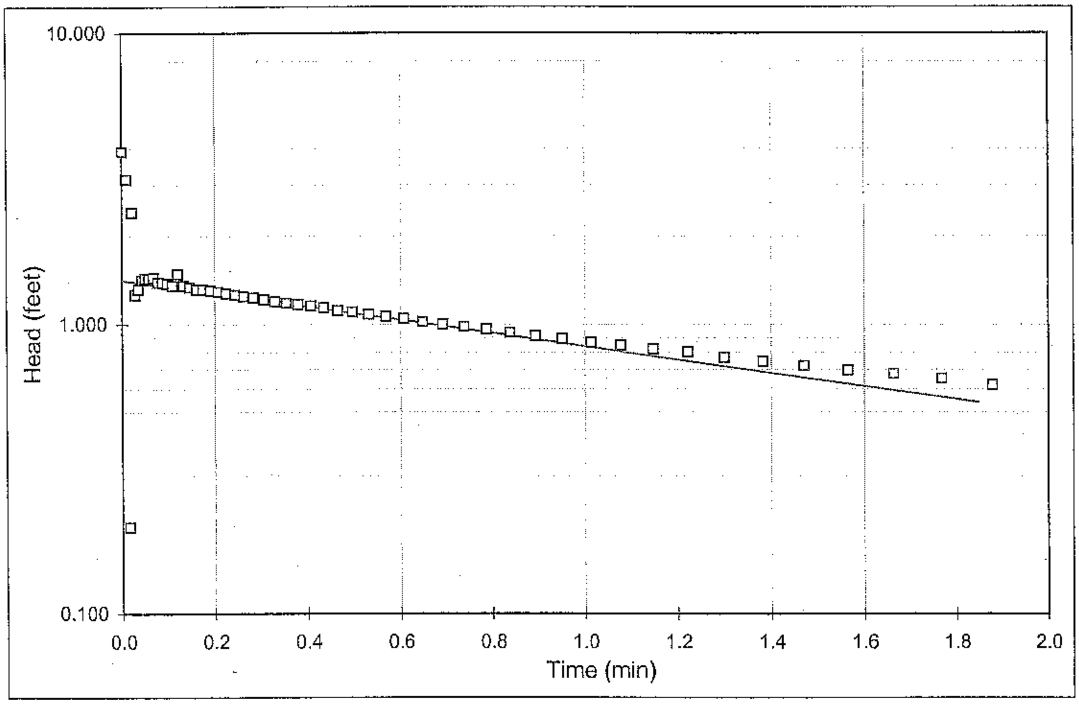
r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS

r_c =	0.08
r_w =	0.31
L_e =	10
$ln(R_e/r_w)$=	3.52
y_0 =	1.41
y_t =	0.540
t =	1.8

RESULTS

K=	3.23E-04	cm/sec
K=	9.16E-01	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

FALLING HEAD TEST GAGW-04D

WELL NO. GAGW-04D

DATE	4/13/2005	
INITIAL DEPTH TO WATER	21.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	59.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	69.1	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.90	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	11:41:14	0.09	17.45	0.000	3.90	1.00
4/13/2005	11:41:14	0.10	21.63	0.005	-0.28	-0.07
4/13/2005	11:41:14	0.10	18.22	0.010	3.13	0.80
4/13/2005	11:41:14	0.11	21.15	0.016	0.20	0.05
4/13/2005	11:41:15	0.11	18.94	0.022	2.41	0.62
4/13/2005	11:41:15	0.12	20.09	0.029	1.26	0.32
4/13/2005	11:41:16	0.13	20.03	0.036	1.32	0.34
4/13/2005	11:41:16	0.13	19.94	0.043	1.41	0.36
4/13/2005	11:41:17	0.14	19.92	0.051	1.43	0.37
4/13/2005	11:41:17	0.15	19.92	0.059	1.43	0.37
4/13/2005	11:41:18	0.16	19.91	0.068	1.44	0.37
4/13/2005	11:41:18	0.17	19.96	0.077	1.39	0.36
4/13/2005	11:41:19	0.18	19.97	0.087	1.38	0.35
4/13/2005	11:41:19	0.19	19.97	0.098	1.38	0.35
4/13/2005	11:41:20	0.20	20.00	0.109	1.35	0.35
4/13/2005	11:41:21	0.21	19.87	0.120	1.48	0.38
4/13/2005	11:41:21	0.22	20.00	0.133	1.35	0.35
4/13/2005	11:41:22	0.24	20.01	0.146	1.34	0.34
4/13/2005	11:41:23	0.25	20.04	0.160	1.31	0.34
4/13/2005	11:41:24	0.26	20.04	0.175	1.31	0.34
4/13/2005	11:41:25	0.28	20.05	0.190	1.30	0.33
4/13/2005	11:41:26	0.30	20.06	0.207	1.29	0.33
4/13/2005	11:41:27	0.31	20.08	0.225	1.28	0.33
4/13/2005	11:41:28	0.33	20.09	0.243	1.26	0.32
4/13/2005	11:41:29	0.35	20.11	0.263	1.24	0.32
4/13/2005	11:41:31	0.37	20.12	0.284	1.23	0.32
4/13/2005	11:41:32	0.40	20.14	0.306	1.21	0.31
4/13/2005	11:41:33	0.42	20.16	0.330	1.19	0.31
4/13/2005	11:41:35	0.44	20.17	0.355	1.18	0.30
4/13/2005	11:41:36	0.47	20.18	0.380	1.17	0.30
4/13/2005	11:41:38	0.50	20.20	0.406	1.16	0.30
4/13/2005	11:41:40	0.52	20.21	0.435	1.14	0.29
4/13/2005	11:41:41	0.55	20.24	0.465	1.11	0.29
4/13/2005	11:41:43	0.59	20.25	0.496	1.10	0.28
4/13/2005	11:41:45	0.62	20.27	0.531	1.08	0.28
4/13/2005	11:41:48	0.66	20.29	0.568	1.06	0.27
4/13/2005	11:41:50	0.70	20.31	0.606	1.04	0.27
4/13/2005	11:41:52	0.74	20.33	0.648	1.02	0.26
4/13/2005	11:41:55	0.78	20.35	0.691	1.00	0.26
4/13/2005	11:41:58	0.83	20.37	0.738	0.98	0.25
4/13/2005	11:42:01	0.88	20.39	0.786	0.96	0.25
4/13/2005	11:42:04	0.93	20.42	0.838	0.94	0.24
4/13/2005	11:42:07	0.98	20.44	0.893	0.91	0.23
4/13/2005	11:42:11	1.04	20.46	0.951	0.89	0.23
4/13/2005	11:42:14	1.10	20.49	1.013	0.87	0.22
4/13/2005	11:42:18	1.17	20.50	1.078	0.85	0.22
4/13/2005	11:42:22	1.24	20.53	1.148	0.82	0.21
4/13/2005	11:42:27	1.31	20.55	1.221	0.80	0.21
4/13/2005	11:42:31	1.39	20.58	1.300	0.77	0.20
4/13/2005	11:42:36	1.47	20.61	1.383	0.75	0.19
4/13/2005	11:42:42	1.56	20.63	1.471	0.72	0.18
4/13/2005	11:42:47	1.65	20.66	1.565	0.70	0.18
4/13/2005	11:42:53	1.75	20.67	1.663	0.68	0.17
4/13/2005	11:43:00	1.86	20.70	1.768	0.65	0.17
4/13/2005	11:43:06	1.97	20.73	1.878	0.62	0.16

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-04D

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t_1 - t_2)} \right]$$

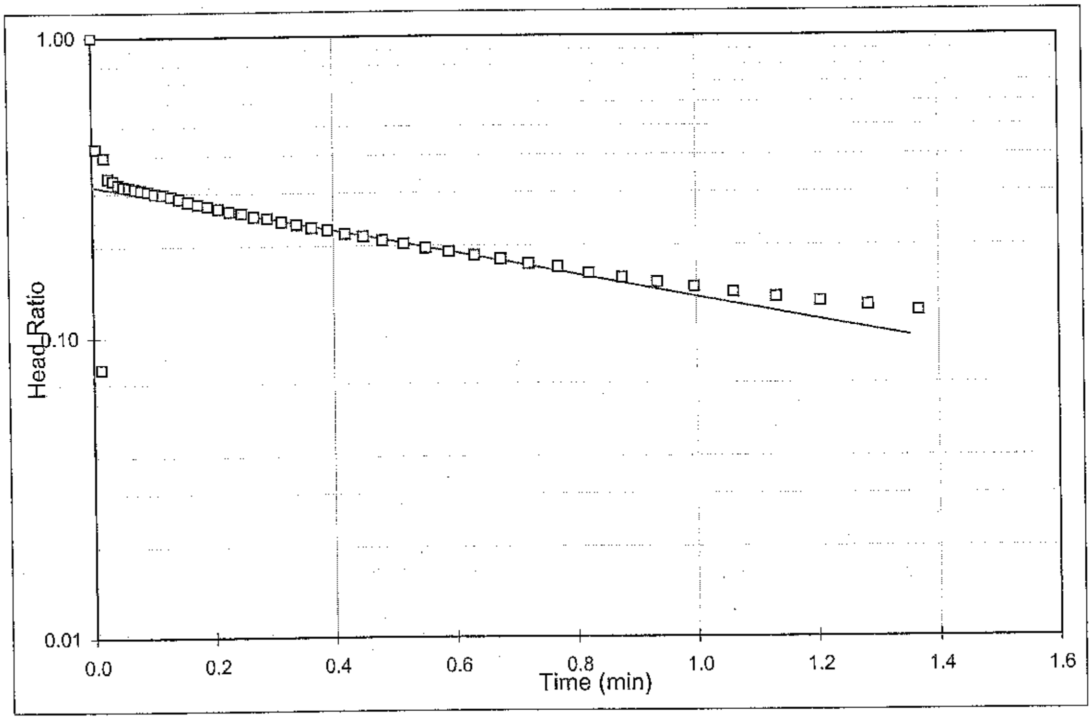
where:
r_c = casing radius (feet)
R_e = equivalent radius (feet)
L_e = length of screened interval (feet)
t = time (minutes)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.31
L_e = 10.0
t_1 = 0.00
t_2 = 1.35
$h_{1(t1)}$ = 0.32
$h_{2(t2)}$ = 0.100

RESULTS

K=	5.22E-04	cm/sec
K=	1.48E+00	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAGW-04D

$$K = \frac{r_c^2 \ln\left(\frac{L_e}{R_e}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

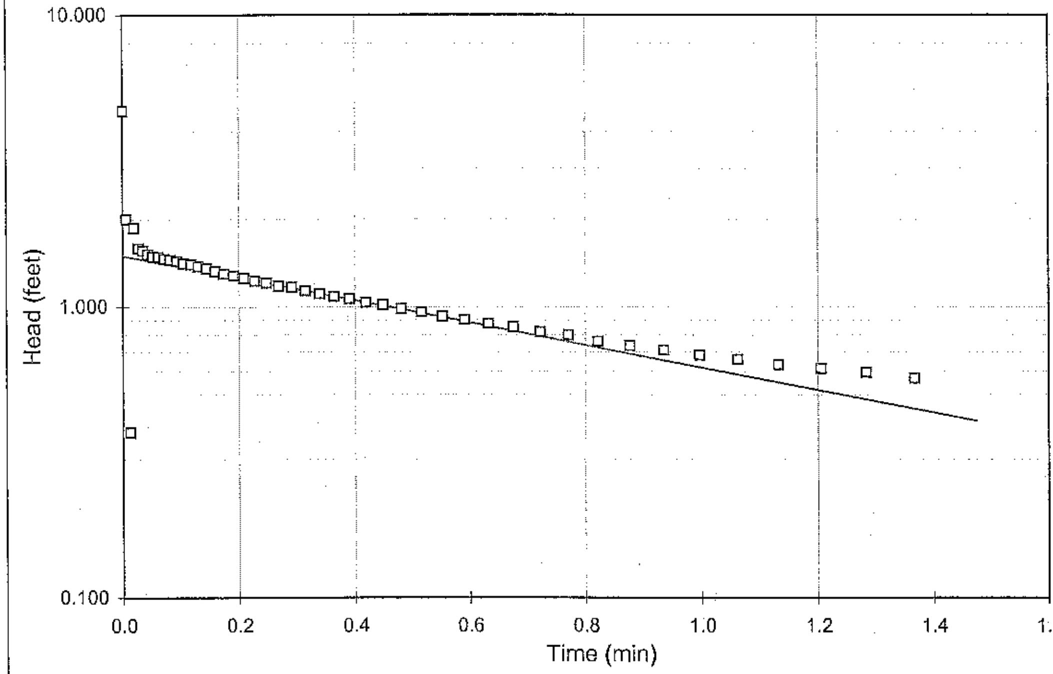
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.31
L_e =	10
$ln(R_e/r_w)$=	3.52
y_0 =	1.50
y_t =	0.406
t =	1.5

RESULTS

K=	5.50E-04	cm/sec
K=	1.56E+00	ft/day



Project Name: QUANTA
Project No.: 023-6151
Test Date: 04/13/05

Analysis By: JJE
Checked By: DSL
Analysis Date: 6/14/2005

RISING HEAD TEST GAGW-04D

WELL NO. GAGW-04D

DATE	4/13/2005	
INITIAL DEPTH TO WATER	21.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	7.50	INCHES
TOP OF OPEN INTERVAL	59.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	69.1	FEET (btoc)
SATURATED THICKNESS	10.000010	FEET
WATER TABLE TO BOTTOM OF SCREEN	10.000000	FEET
OPEN INTERVAL LENGTH	10.000000	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.71	FEET
MAX. HEAD IN SCREEN?	N	

DATE (mm/dd/yyyy)	TIME (hh:mm:ss)	EVENT EALAPSED TIME (MIN)	DEPTH TO WATER (FEET)	TEST ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
4/13/2005	11:48:51	0.11	26.06	0.000	4.71	1.00
4/13/2005	11:48:51	0.11	23.34	0.006	1.99	0.42
4/13/2005	11:48:51	0.12	21.72	0.013	0.37	0.08
4/13/2005	11:48:52	0.13	23.22	0.020	1.87	0.40
4/13/2005	11:48:52	0.13	22.94	0.027	1.59	0.34
4/13/2005	11:48:53	0.14	22.91	0.035	1.56	0.33
4/13/2005	11:48:53	0.15	22.86	0.043	1.51	0.32
4/13/2005	11:48:54	0.16	22.84	0.052	1.49	0.32
4/13/2005	11:48:54	0.17	22.83	0.061	1.48	0.31
4/13/2005	11:48:55	0.18	22.81	0.071	1.46	0.31
4/13/2005	11:48:55	0.19	22.80	0.082	1.45	0.31
4/13/2005	11:48:56	0.20	22.79	0.093	1.44	0.30
4/13/2005	11:48:57	0.21	22.76	0.104	1.41	0.30
4/13/2005	11:48:58	0.22	22.75	0.117	1.40	0.30
4/13/2005	11:48:58	0.24	22.73	0.130	1.38	0.29
4/13/2005	11:48:59	0.25	22.71	0.144	1.36	0.29
4/13/2005	11:49:00	0.26	22.67	0.159	1.32	0.28
4/13/2005	11:49:01	0.28	22.65	0.175	1.30	0.28
4/13/2005	11:49:02	0.30	22.63	0.191	1.28	0.27
4/13/2005	11:49:03	0.31	22.60	0.209	1.25	0.27
4/13/2005	11:49:04	0.33	22.58	0.228	1.23	0.26
4/13/2005	11:49:05	0.35	22.56	0.247	1.21	0.26
4/13/2005	11:49:07	0.37	22.53	0.268	1.18	0.25
4/13/2005	11:49:08	0.40	22.52	0.291	1.17	0.25
4/13/2005	11:49:09	0.42	22.48	0.314	1.13	0.24
4/13/2005	11:49:11	0.44	22.46	0.339	1.11	0.24
4/13/2005	11:49:12	0.47	22.43	0.364	1.08	0.23
4/13/2005	11:49:14	0.50	22.41	0.391	1.06	0.23
4/13/2005	11:49:16	0.52	22.38	0.419	1.03	0.22
4/13/2005	11:49:17	0.55	22.36	0.449	1.01	0.21
4/13/2005	11:49:19	0.59	22.33	0.481	0.98	0.21
4/13/2005	11:49:21	0.62	22.31	0.516	0.96	0.20
4/13/2005	11:49:24	0.66	22.27	0.552	0.92	0.20
4/13/2005	11:49:26	0.70	22.25	0.591	0.90	0.19
4/13/2005	11:49:28	0.74	22.22	0.632	0.87	0.19
4/13/2005	11:49:31	0.78	22.20	0.676	0.85	0.18
4/13/2005	11:49:34	0.83	22.17	0.722	0.82	0.17
4/13/2005	11:49:37	0.88	22.15	0.771	0.80	0.17
4/13/2005	11:49:40	0.93	22.11	0.822	0.76	0.16
4/13/2005	11:49:43	0.98	22.08	0.877	0.73	0.16
4/13/2005	11:49:47	1.04	22.06	0.936	0.71	0.15
4/13/2005	11:49:50	1.10	22.03	0.997	0.68	0.14
4/13/2005	11:49:54	1.17	22.01	1.062	0.66	0.14
4/13/2005	11:49:58	1.24	21.98	1.132	0.63	0.13
4/13/2005	11:50:03	1.31	21.96	1.206	0.61	0.13
4/13/2005	11:50:08	1.39	21.95	1.284	0.59	0.13
4/13/2005	11:50:13	1.47	21.92	1.367	0.57	0.12

APPENDIX J

ONE-DIMENSIONAL SOLUTE TRANSPORT MODELING

APPENDIX J
ONE-DIMENSIONAL SOLUTE TRANSPORT MODELING

1.0 INTRODUCTION

One-dimensional solute transport modeling was used to simulate the changes of concentration versus distance for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). A conservative approach was used for these simulations, assuming as an initial estimation that the simulated compounds are not affected by retardation. If the simulated concentrations indicated exceedances at the groundwater discharge zone in Newtown Creek, then the one-dimensional simulations were carried out using the compound-specific retardation factor. The retardation factor was estimated based on published literature data for compound specific distribution coefficient (Kd) and assumed fraction of organic carbon (foc) as further described in Section 3.2.

Following is a presentation of the analytical model description (Section 2), input parameter selection (Section 3), and simulation results (Section 4).

2.0 ANALYTICAL MODEL DESCRIPTION

Following de Marsily (1986), a one-dimensional case was chosen to model the displacement of a constituent (C) in a semi-infinite medium given the following initial and boundary conditions:

$$C(x) = 0, \qquad x > 0, t = 0$$
$$C(0) = C_o, \qquad t > 0$$

The one-dimensional advection – dispersion equation with retardation is:

$$D \frac{\partial^2 C}{\partial x^2} - U \frac{\partial C}{\partial x} = \omega R \frac{\partial C}{\partial t} \tag{1}$$

where:

C = concentration;
t = time;
x = distance;
U = the Darcy velocity (considered constant for one-dimensional flow);
D = the dispersion coefficient (considered constant, using only longitudinal dispersion for a one-dimensional model);
ω = effective porosity; and,
R = the retardation factor of the constituent due to adsorption.

The solution to equation (1) is:

$$C(x,t) = \frac{C_o}{2}[erfc(\frac{x-(U/\omega R)t}{2\sqrt{Dt/\omega R}}) + \exp(\frac{Ux}{D})erfc(\frac{x+(U/\omega R)t}{2\sqrt{Dt/\omega R}})] \qquad (2)$$

where:

erfc = the complementary error function.

If decay (e.g. biodegradation) is added, the governing equation is:

$$D\frac{\partial^2 C}{\partial x^2} - U\frac{\partial C}{\partial x} = \omega R(\frac{\partial C}{\partial t} + \lambda C) \qquad (3)$$

where:

λ = the coefficient of exponential decay; and,
R = the retardation factor, as before.

Here, λ was determined from:

$C/C_o = 1/2 = \exp(-\lambda\, t_{1/2})$

Where:

λ = the half-life decay constant, and,
$t_{1/2}$ = solute half-life.

The solution to equation (3) is:

$$C(x,t) = \frac{C_o}{2}\exp(\frac{Ux}{2D})\{\exp(-Bx)erfc[\frac{x-t\sqrt{(U/\omega R)2+4\lambda D/\omega R)}}{2\sqrt{Dt/\omega R}}] + \exp(Bx)erfc[\frac{x+t\sqrt{(U/\omega R)2+4\lambda D/\omega R)}}{2\sqrt{Dt/\omega R}}]\} \qquad (4)$$

where:

$$B = \sqrt{(U/2D)^2 + (\lambda\omega R/D)}$$

3.0 PARAMETER SELECTION

The solute transport model input parameters were: Darcy velocity, porosity, distribution coefficient, retardation factor, porosity, bulk density, dispersivity, and half-life time. The rationale for selecting parameter values used in the solute transport model is described in the following paragraphs. All the parameters used for the solute transport simulations are consistent with the parameter values used for the LNAPL multi-phase modeling.

3.1 Groundwater Velocity and Porosity

The analytical solute transport model requires Darcy velocity as input data, which is defined by the following formula:

$$U = Ki$$

where:

U = Darcy velocity [ft/day];
K = Hydraulic conductivity [ft/day]; and,
i = Hydraulic gradient [ft/ft].

The Darcy velocity used for the flow pathway was U = 0.045 ft/day. This value was calculated for the groundwater flow using the higher end of the mean hydraulic conductivity values a (1E-02 cm/s or 28.35 ft/day), and the average horizontal hydraulic gradient values along the flow pathway (2E-03 ft/ft).

The porosity of the aquifer materials was assumed to be 38 percent consistent with the value used for the LNAPL simulations.

3.2 Retardation

The linear sorption isotherm assumes that the sorbed concentration (C_s) is directly proportional to the dissolved phase concentration:

$$C_s = K_d C$$

where K_d is the distribution coefficient. The distribution coefficient (K_d) was calculated using the published organic carbon partitioning coefficient (K_{oc}) and an assumed fraction of organic carbon (f_{oc}) as follows:

$$K_d = K_{oc} f_{oc}$$

K_{oc} values for each constituent were obtained from the Superfund Public Health Evaluation Manual (USEPA, 1986) and Groundwater Chemicals - Desk Reference, Third Edition, John Montgomery (2000). An f_{oc} concentration of 0.1%, was used for the aquifer materials consistent with the parameter used for LNAPL simulations. However, most of the one-dimensional simulations were carried out assuming no retardation.

Individual retardation factors were then calculated for each compound included in this analysis. The retardation factor was calculated using the retardation equation (Freeze and Cherry, 1979, p. 404):

$$R = 1 + K_d \rho_b / n$$

where:

R = Retardation factor;
n = Porosity of the rock mass; this was estimated at 38 percent (a value used consistently
in the LNAPL models);
ρ_b = Bulk density; the bulk density was estimated at 1.8 g/cm^3; and,
(Crampon et al. 1993).

Table 1 presents a summary of the published parameters for the simulated constituents (VOCs and SVOCs) and the calculation of the corresponding retardation factors.

3.3 Longitudinal Dispersivity and Dispersion Coefficients

The longitudinal dispersivity was estimated from the method of Al-Suwaiyan (1996) assuming a plume length of 400 feet to 800 feet. This results in a longitudinal dispersivity of about 15 feet.

3.4 Half-Life Time

Organic constituents in groundwater may degrade due to natural chemical and / or biological processes. The half-life ($t_{1/2}$) of a constituent represents the time required for the concentration to decrease to one-half of the original value. This parameter represents the rate of mass degraded/treated for both the dissolved phase and the sorbed phase. Table 2 presents the published ranges of half-life times for the VOCs and SVOCs considered in this analysis.

3.5 Travel Times

To simplify the solute transport modeling results a travel time of 50 years was used to compare the measured concentrations versus the simulated concentrations. [Note: the model simulation indicates that the system reaches steady state for the simulated constituents in less than 10 years assuming a constant source concentration.]

3.6 Travel Distances

Estimates of travel distances were used in the comparison of measured versus simulated concentrations. Travel distances were measured along the flow pathway of each of the simulated VOC and SVOCs as further described in Section 4.

4.0 EVALUATION APPROACH AND RESULTS

4.1 General

As discussed above, the analytical model selected for this evaluation is presented in "Quantitative Hydrogeology" (de Marsily, 1986). Two solutions of the one-dimensional advection-dispersion equation for groundwater flow and solute transport were developed by de Marsily for the following conditions:

- Advective-dispersive transport with constituent retardation due to adsorption and no degradation; and,
- Advective-dispersive transport with constituent retardation and contaminant exponential decay.

These solutions (models) were used to predict both the long-term steady-state and transient groundwater constituent concentrations at the Site.

The first solution allows only for retardation and does not account for any degradation of constituents over time. In this situation, the predicted groundwater impact area and constituent concentrations represent an extreme worst case in which the total mass of a constituent in the groundwater is continuously increasing. The continuous mass increase is the result of an assumed continuous constituent release from the source combined with no degradation of the constituent over time. However, this is not a realistic scenario since degradation processes affect the organic constituents. This solution was used only for comparison to site specific data to evaluate whether natural attenuation is occurring. This solution indicated that natural attenuation is occurring because the concentrations predicted by the advective dispersive model are much higher than the observed concentrations downgradient of VOCs/SVOCs sources. Therefore, the decay term was added and used in the second solution.

The second solution accounts for degradation of the constituents by natural attenuation (a first order reaction rate for the sum of natural chemical and biological processes). The parameter used to estimate the rate of degradation was the half-life time (i.e., the amount of time it takes for the concentration of a compound to decrease by one-half due to degradation processes). The second solution appropriately accounted for both constituents released into the groundwater (mass increase) and constituents treated through natural attenuation processes (mass decrease). Steady state conditions occur when the mass of constituents dissolved into groundwater equals the mass treated through natural attenuation processes.

As discussed in Sections 5.1.1 and 5.1.2 of the RI, the groundwater sample analysis from well GAGW-06I installed during the remedial investigation and several monitoring wells installed prior to the remedial investigation were evaluated and determined to be representative of the groundwater within the LNAPL smear zone at the site directly below the bulk of the LNAPL mass. In fact, since a number of samples from these wells were collected through a LNAPL layer in the wells, the resulting groundwater data are believed to represent worst-case or near worst-case conditions.

A number of VOCs and SVOCs were detected at concentrations exceeding the TOGS 1.1.1 SD criteria in these wells. To assess the potential impact of organic constituents in groundwater within the LNAPL smear zone at the site to Newtown Creek surface water, simulations were carried out. Thesc simulations evaluated the transport and attenuation of the maximum concentrations of the VOCs and SVOCs in the LNAPL smear zone, described in Sections 5.1.1 and 5.1.2, without any retardation (i.e., retardation was set as unity in the model) which have a TOGS 1.1.1 SD Criteria. In addition, simulations were carried out to evaluate the transport and attenuation of the maximum concentrations of VOCs and SVOCs that exceeded the TOGS 1.1.1 GA Criteria for the remedial investigation deep well (GAGW-01, GAGW-02, GAGW-03, GAGW-05, GAGW-06I, GAGW-07 and GAGW-08). The simulations assumed, in a very conservative fashion, that the maximum concentration of these constituents would be hypothetically present at the downgradient end of the Quanta property at a constant concentration over a long period of time (i.e., 50 years). In addition, these simulations assumed that the solute migration is <u>not</u> affected by retardation.

Following is a presentation of the simulation results.

4.2 Simulation of VOCs and SVOCs

LNAPL Smear Zone Wells

VOCs and SVOCs detected in the smear zone wells that exceeded the TOGS 1.1.1 SD Criteria include benzene, ethylbenzene, toluene, xylene, benzo(a)pyrene, naphthalene, and phenanthrene. A solute transport simulation was performed for each of these constituents.

The solute transport simulations assumed that maximum concentration of these VOCs and SVOCs would be hypothetically present at the each monitoring well location over a long period of time (i.e., 50 years). As a result, the concentrations predicted by the solute transport model represent concentrations versus distance downgradient of a specific monitoring well that detected the highest VOC and SVOC concentration. In addition, these simulations assumed that the solute migration is not affected by retardation. The results of these simulations (Tables 3 through 9) predict that the groundwater concentrations reaching Newtown Creek will be less than the TOGS 1.1.1 GA and SD Criteria, except for benzo(a)pyrene. Using a retardation factor for benzo(a)pyrene, the predicted concentration prior to discharge to Newtown Creek is non-detectable (Table 10).

Deep Groundwater Monitoring Wells (RI GAGW Wells)

VOCs and SVOCs detected in the groundwater monitoring wells screened below the LNAPL smear zone that exceeded the TOGS 1.1.1 GA and SD Criteria include chloroform, trichloroethene (TCE), 1,2,-cis dichloroethene (cis DCE), vinyl chloride (VC), Methyl Tertiary Butyl Ether (MTBE), benzo(a)pyrene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. A solute transport simulation was performed for each of these constituents.

The solute transport simulations assumed, in a very conservative fashion, that the maximum concentration of these constituents would be hypothetically present at the downgradient end of the Quanta property at a constant concentration over a long period of time (i.e., 50 years). In addition, these simulations assumed that the solute migration is not affected by retardation. The results of these simulations (Tables 11 through 15) indicated that the groundwater concentrations for VOCs reaching Newtown Creek are less than the TOGS 1.1.1 GA and SD Criteria. Using a retardation factor for PAHs the predicted concentration prior to discharge to Newtown Creek is non-detectable (Tables 16 through 25).

TABLE 1
CALCULATED RETARDATION RATES
QUANTA RESOURCES SITE
LONG ISLAND CITY, NEW YORK

Compound Name	CAS Number	log (Kow) [(mg-C/Kg-octanol)/(mg-C/L-water)]	Log (Koc) = 0.72*log(Kow)+0.5 or Value from Referece	= 0.88*log(Kow)-0.27 [chlorinateds] (3)	Koc from Log(Koc) [L/Kg] or [mL/g]	Foc [wt/wt]	Kd = Koc*Foc [ml/g]	n, Porosity [ ]	ρb =ρs(1-n) (bulk density) [g/cm3]	R, retardation =1+Kd*ρb/n [ ]
Benzo(a)pyrene	50-32-8	6	5.950		891250.94	0.001	891.25	0.38	1.8	4222.71
Benzo(b)fluoranthene	205-99-2	6.06	6.260		1819700.86	0.001	1819.70	0.38	1.8	8620.64
Benzo(k)fluoranthene	207-08-9	6.85	5.990		977237.22	0.001	977.24	0.38	1.8	4630.02
Chrysene	218-01-9	5.81	6.270		1862087.14	0.001	1862.09	0.38	1.8	8821.41
Naphthalene	91-20-3	3.4	2.740		549.54	0.001	0.55	0.38	1.8	3.60
Phenanthrene	85-01-8	4.57	3.720		5248.07	0.001	5.25	0.38	1.8	25.86
Indeno(1,2,3-cd)pyrene	193-39-5	5.97	6.300		1995262.31	0.001	1995.26231	0.38	1.8	9452.24

Reference:

Groundwater Chemicals - Desk Reference, Third Edition, John Montgomery, 2000

(3) Schwarzenbach, Gshwend, and Imboden; Environmental Organic Chemistry

TABLE 2
SUMMARY OF DEGRADATION HALF-LIFE TIME
QUANTA RESOURCES SITE
LONG ISLAND CITY, NEW YORK

Compound Name	Overall Groundwater Half-Life		Overall Groundwater Half-Life					Anaerobic half-life		
	Degradation Rate (hr)		Degradation Rate (days)		Hrs	days	years	Degradation Rate (days)		
	High	Low	High	Low	Ave	Ave	Ave	High	Low	Ave
1,2-Dichloroethene (cis and trans)	69,000	1,344	2,875	56	35,172	1,466	4.02	720	112	416
Chloroform	43,200	1,344	1,800	56	22,272	928	2.54	28	7	18
Trichloroethene	39,672	7,704	1,653	321	23,688	987	2.70	1642.5	98	870.25
Vinyl Chloride	69,000	1,344	2,875	56	35,172	1,466	4.02	720	112	416
Methyl Tertiary Butyl Ether	8,640	1,344	360	56	4,992	208	0.57			
Benzene	17,280	240	720	10	8,760	365	1.00			
Toluene	672	168	28	7	420	18	0.05			
Ethylbenzene	5,472	144	228	6	2,808	117	0.32			
m-Xylene	8,640	336	360	14	4,488	187	0.51			
o-Xylene	8,640	336	360	14	4,488	187	0.51			
p-Xylene	8,640	336	360	14	4,488	187	0.51			
Xylenes, Total	8,640	336	360	14	4,488	187	0.51			
Benzo(a)pyrene	25,440	2,736	1,060	114	14,088	587	1.61			
Benzo(b)fluoranthene	29,280	17,280	1,220	720	23,280	970	2.66			
Benzo(k)fluoranthene	102,720	42,680	4,280	1,778	72,700	3,029	8.30			
Chrysene	48,000	17,808	2,000	742	32,904	1,371	3.76			
Naphthalene	6,192	24	258	1	3,108	130	0.35			
Phenanthrene	9,600	768	400	32	5,184	216	0.59			
Ideno(1,2,3-cd)pyrene	35,040	28,800	1,460	1,200	31,920	1,330	3.64			

Notes:

Reference: Howard et al, 1991, Handbook of Environmental Degradation Rates, Lewis Publishers.

Table 3
Predicted Solute Concentrations Downgradient of MW-10
Benzene

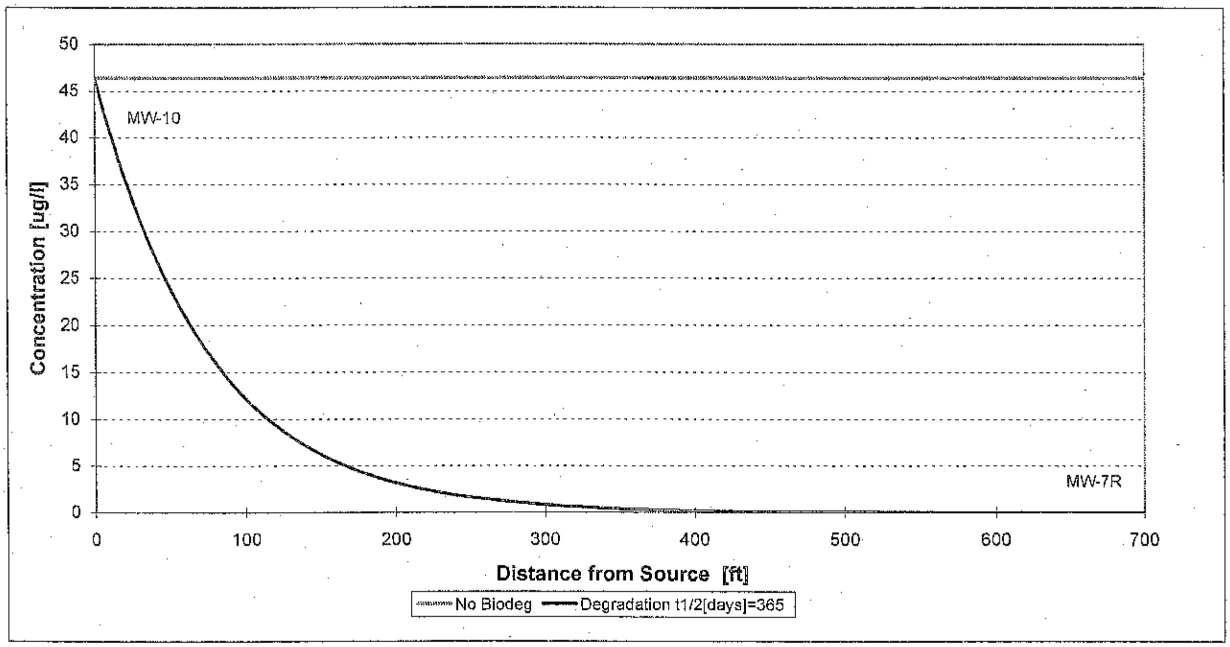
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	$U = K\,I$	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	46.4	[ug/l]	
Retardation Factor	$R = 1 + K_d\,\rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.001899	[day-1]	
Half-Life Time	$t_{1/2}$	365	[days]	
Half-Life Time	$t_{1/2}$	1.00	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 4
Predicted Solute Concentrations Downgradient of MW-10
Ethylbenzene

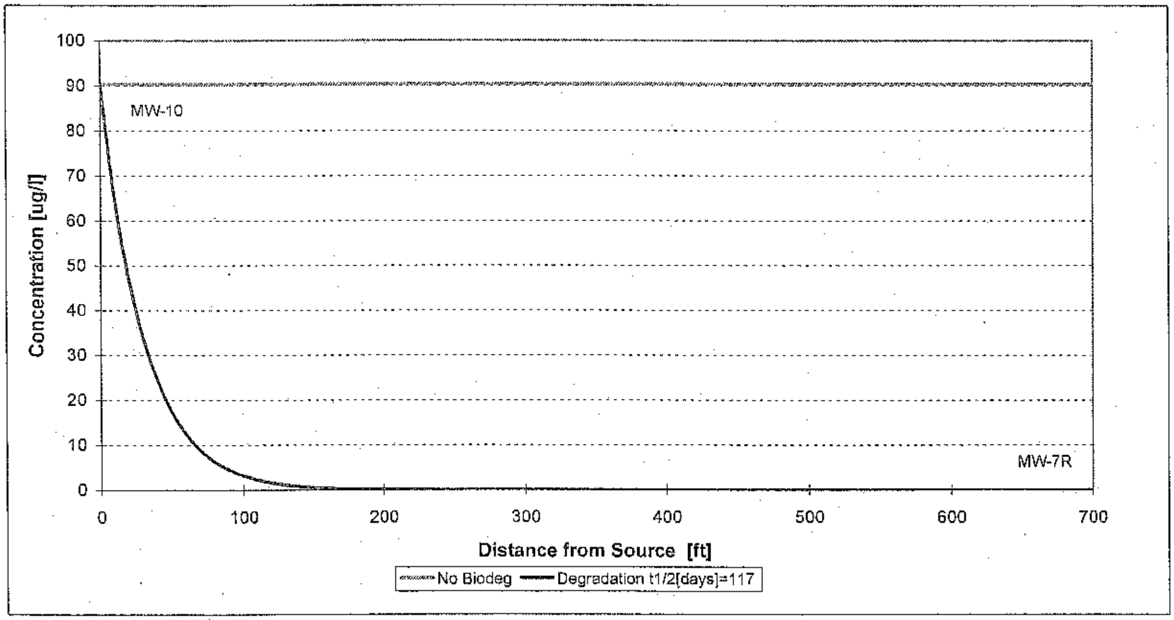
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}\exp\left(\frac{Ux}{2D}\right)\left\{\exp(-Bx)\operatorname{erfc}\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+\exp(Bx)\operatorname{erfc}\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	90.3	[ug/l]	
Retardation Factor	$R = 1 + K_d\,\rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2)/t_{1/2}$	0.0059243	[day-1]	
Half-Life Time	$t_{1/2}$	117	[days]	
Half-Life Time	$t_{1/2}$	0.32	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 5
Predicted Solute Concentrations Downgradient of MW-10
Toluene

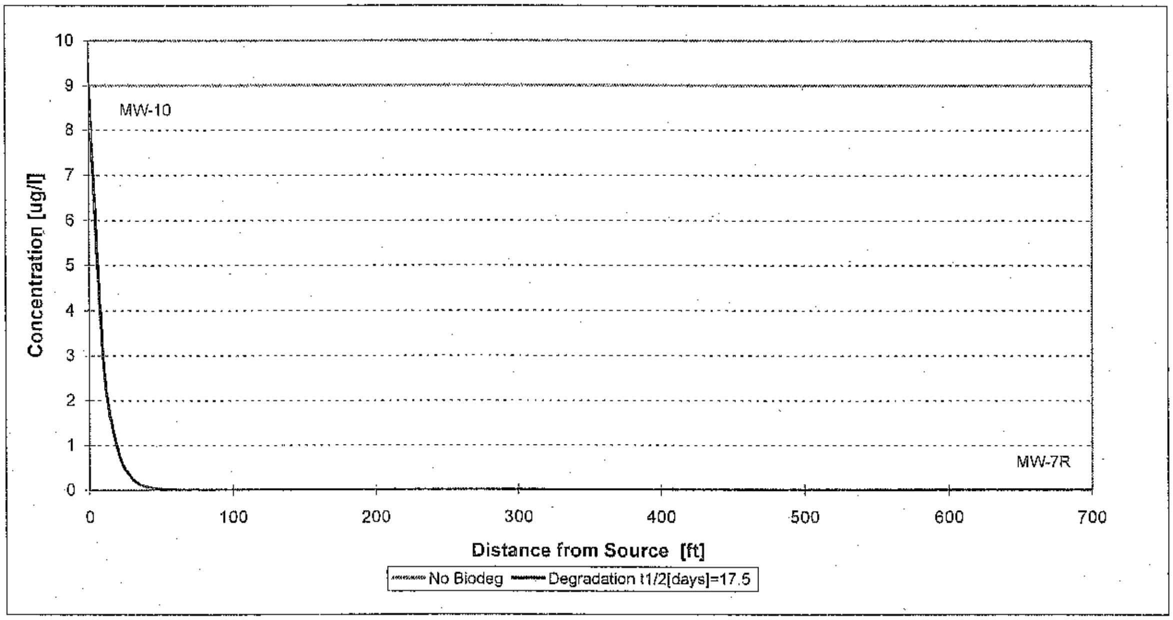
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	9	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0396084	[day-1]	
Half-Life Time	$t_{1/2}$	18	[days]	
Half-Life Time	$t_{1/2}$	0.05	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 6
Predicted Solute Concentrations Downgradient of MW-10
Xylene

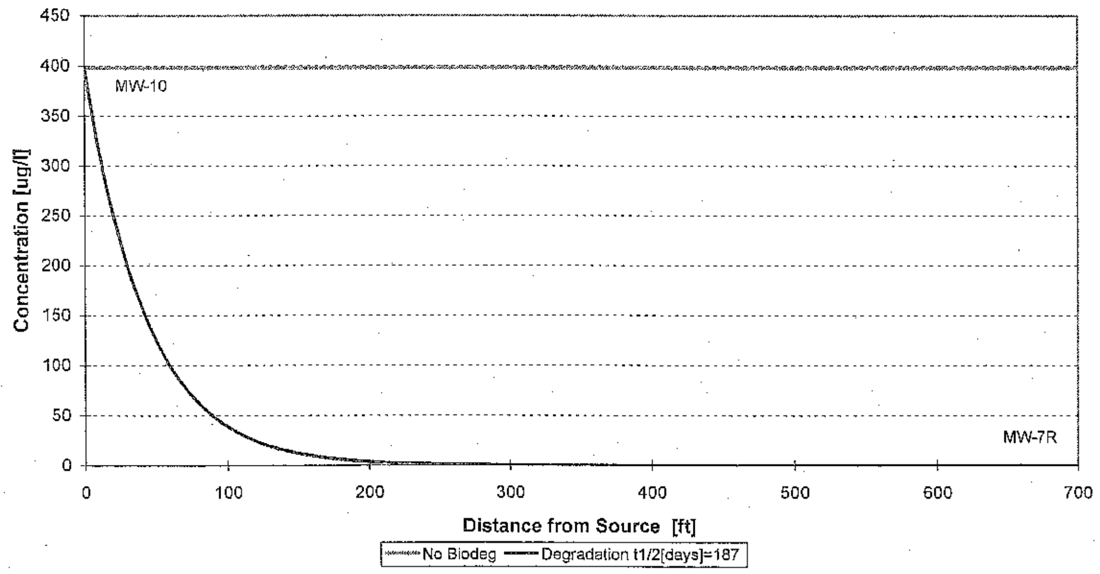
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	398	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0037067	[day-1]	
Half-Life Time	$t_{1/2}$	187	[days]	
Half-Life Time	$t_{1/2}$	0.51	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 7
Predicted Solute Concentrations Downgradient of GW-1 Assuming No Retardation
Benzo(a)pyrene

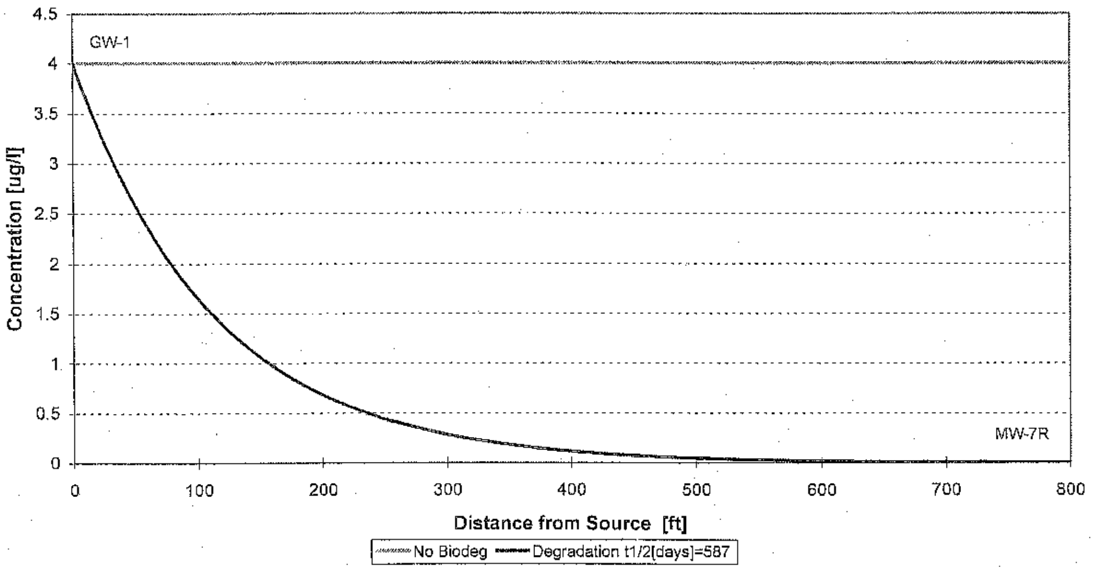
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	4	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0011808	[day-1]	
Half-Life Time	$t_{1/2}$	587	[days]	
Half-Life Time	$t_{1/2}$	1.61	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 8
Predicted Solute Concentrations Downgradient of MW-10 Assuming No Retardation
Naphthalene

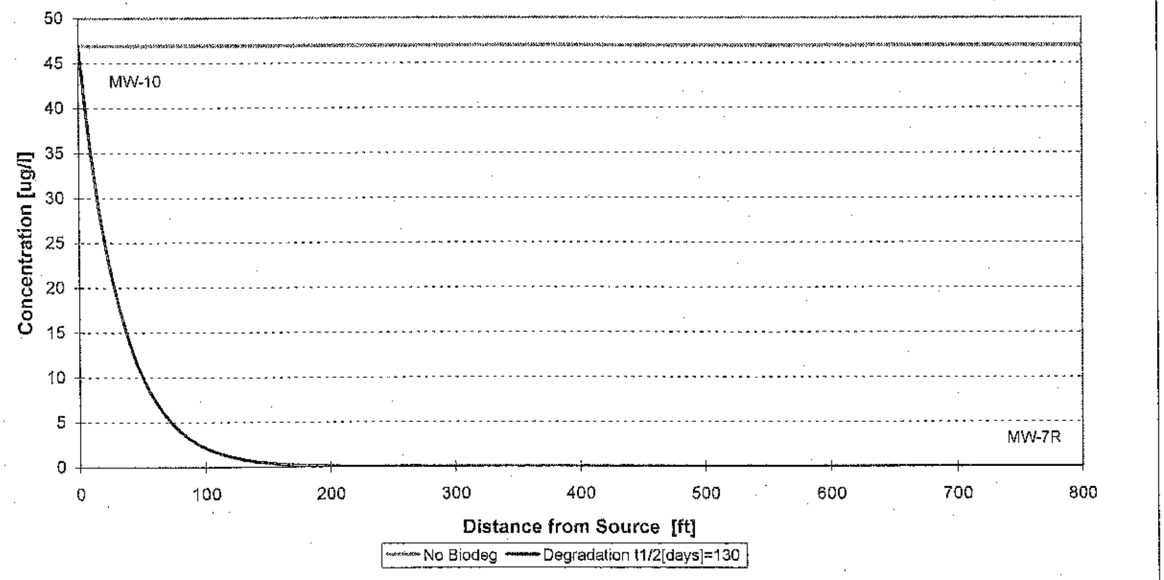
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	46.9	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0053319	[day-1]	
Half-Life Time	$t_{1/2}$	130	[days]	
Half-Life Time	$t_{1/2}$	0.36	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 9
Predicted Solute Concentrations Downgradient of MW-11 Assuming No Retardation
Phenanthrene

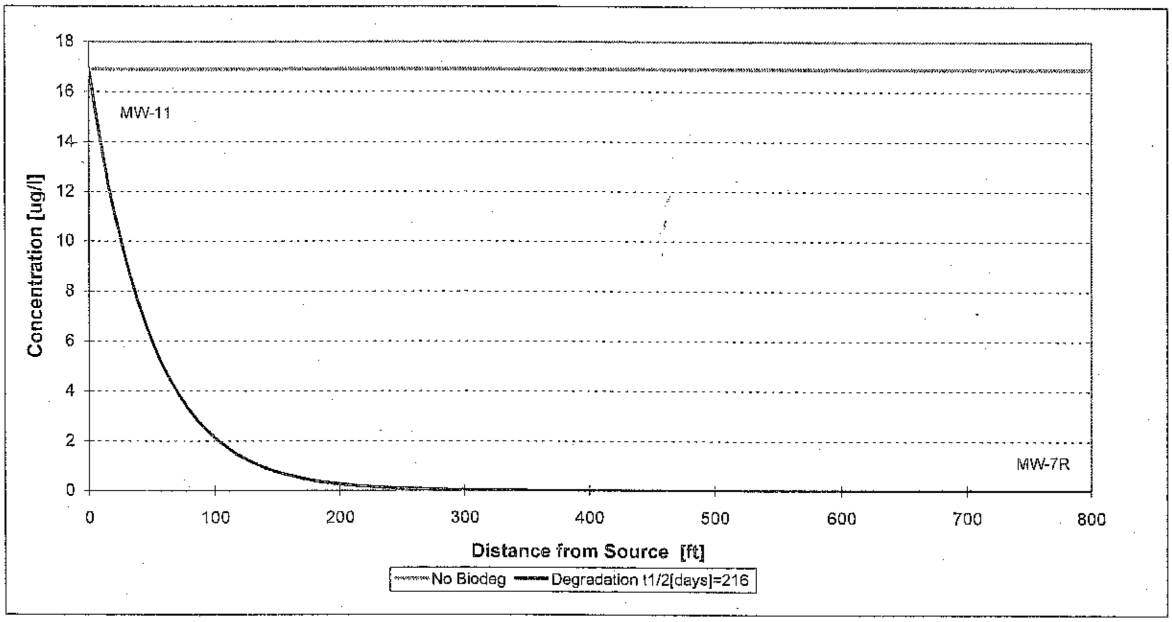
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	16.9	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.003209	[day-1]	
Half-Life Time	$t_{1/2}$	216	[days]	
Half-Life Time	$t_{1/2}$	0.59	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 10
Predicted Solute Concentrations Downgradient of GW-1 Assuming Retardation
Benzo(a)pyrene

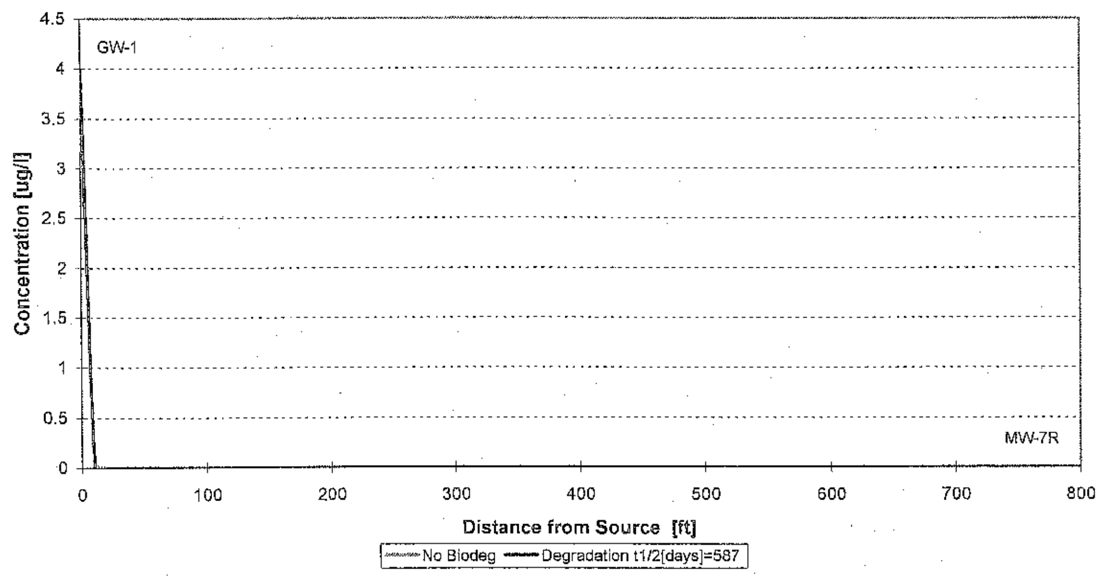
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	4	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	4222.7	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	891.25	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0011808	[day-1]	
Half-Life Time	$t_{1/2}$	587	[days]	
Half-Life Time	$t_{1/2}$	1.61	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		1	[feet]	



Notes:

Table 11
Predicted Solute Concentrations Downgradient of the Site Boundary
Chloroform

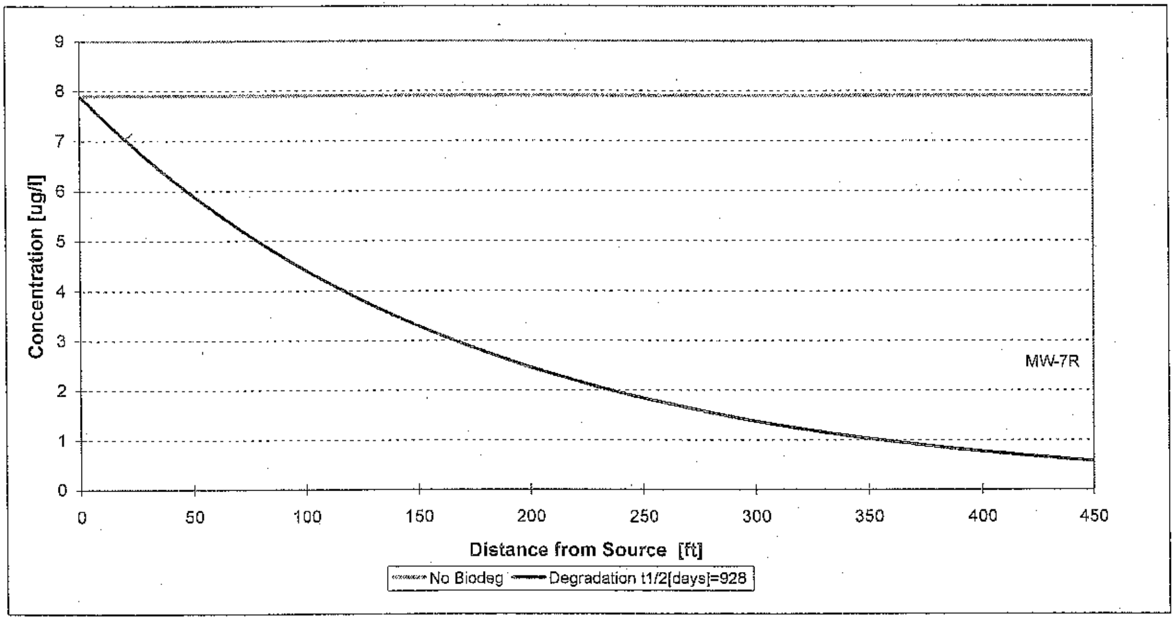
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}\,exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	7.9	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	λ = ln(2) / $t_{1/2}$	0.0007469	[day-1]	
Half-Life Time	$t_{1/2}$	928	[days]	
Half-Life Time	$t_{1/2}$	2.54	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 12
Predicted Solute Concentrations Downgradient of the Site Boundary
Trichloroethene (TCE)

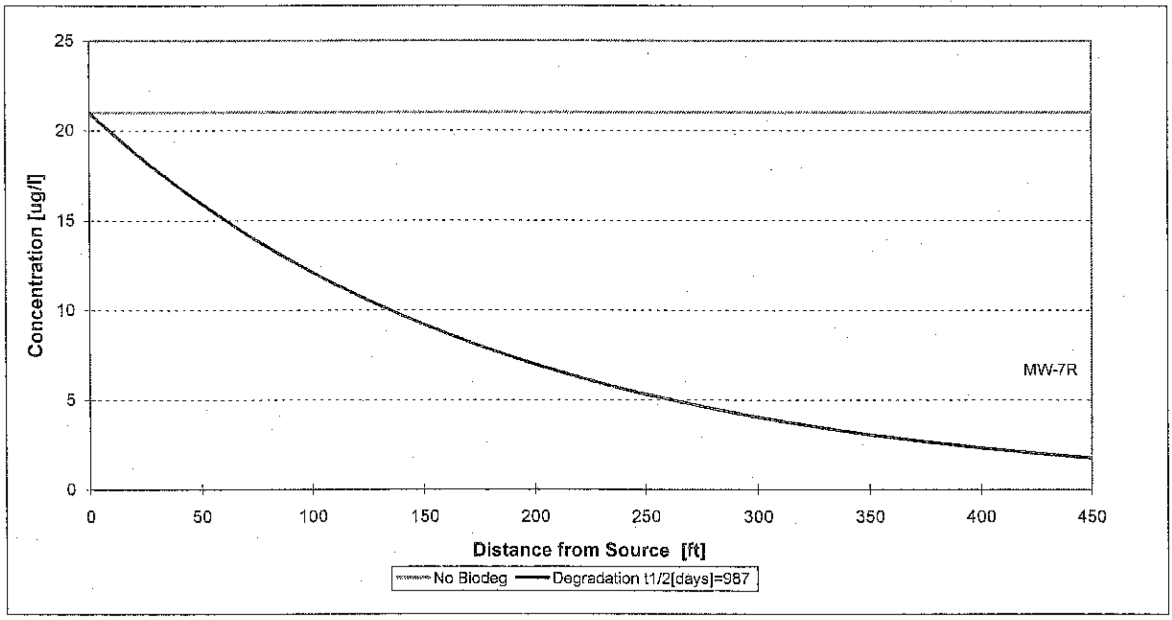
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	21	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0007023	[day-1]	
Half-Life Time	$t_{1/2}$	987	[days]	
Half-Life Time	$t_{1/2}$	2.70	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 13
Predicted Solute Concentrations Downgradient of the Site Boundary
cis-1,2 Dichloroethene (cis DCE)

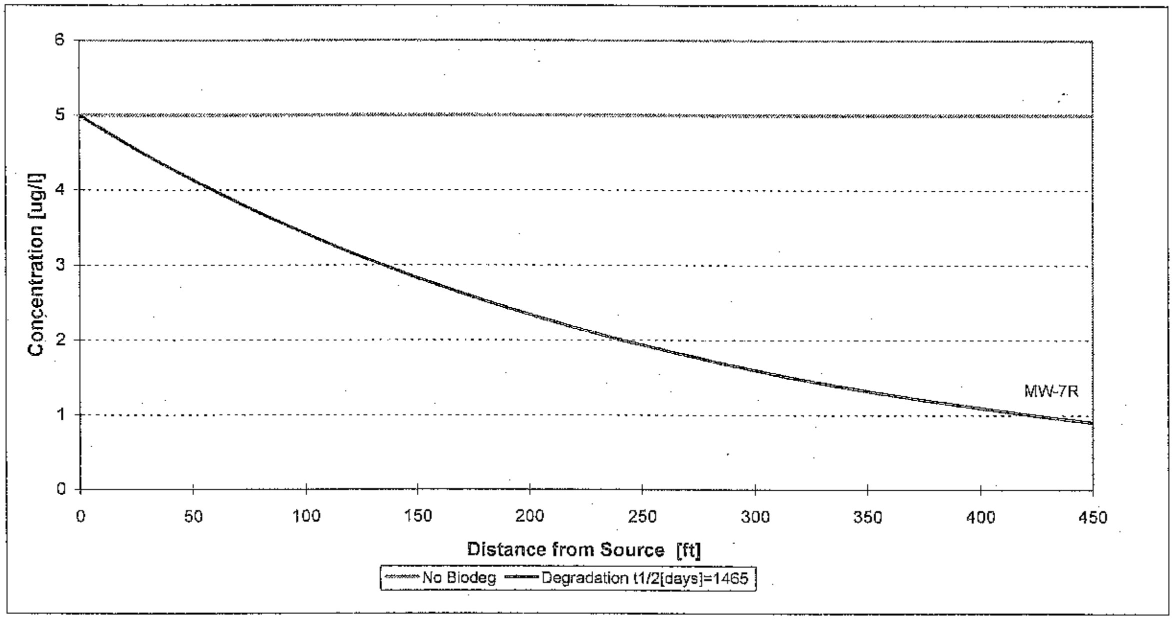
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}\,exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	5	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0004731	[day-1]	
Half-Life Time	$t_{1/2}$	1465	[days]	
Half-Life Time	$t_{1/2}$	4.01	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 14
Predicted Solute Concentrations Downgradient of the Site Boundary
Vinyl Chloride

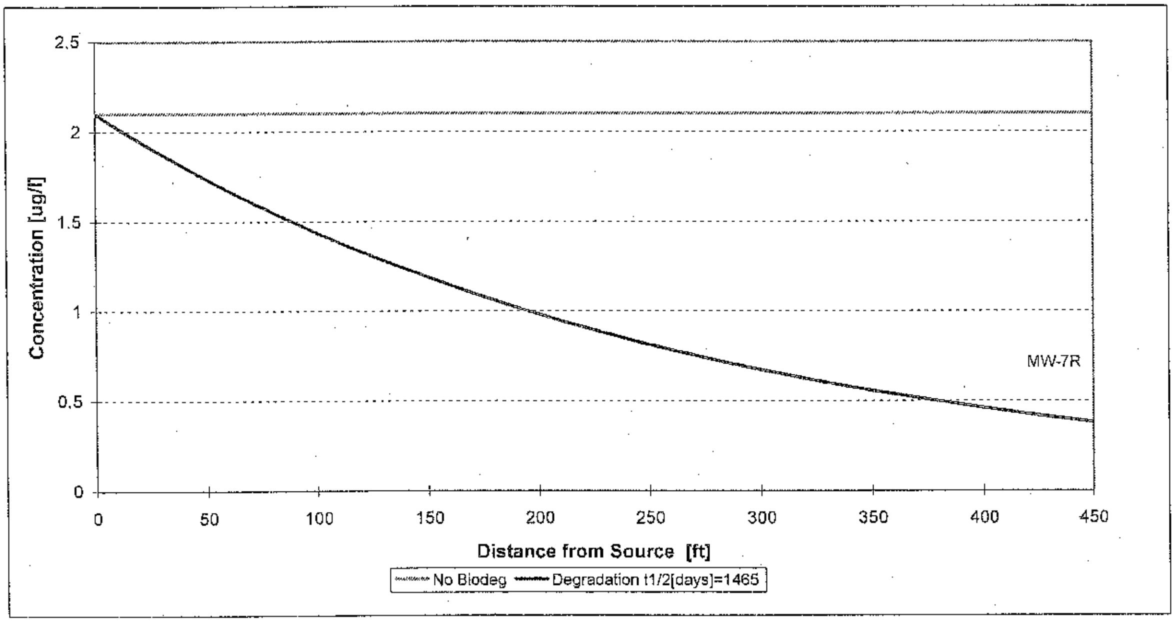
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	2.1	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0004731	[day-1]	
Half-Life Time	$t_{1/2}$	1465	[days]	
Half-Life Time	$t_{1/2}$	4.01	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 15
Predicted Solute Concentrations Downgradient of the Site Boundary
Methyl Tertiary Butyl Ether (MTBE)

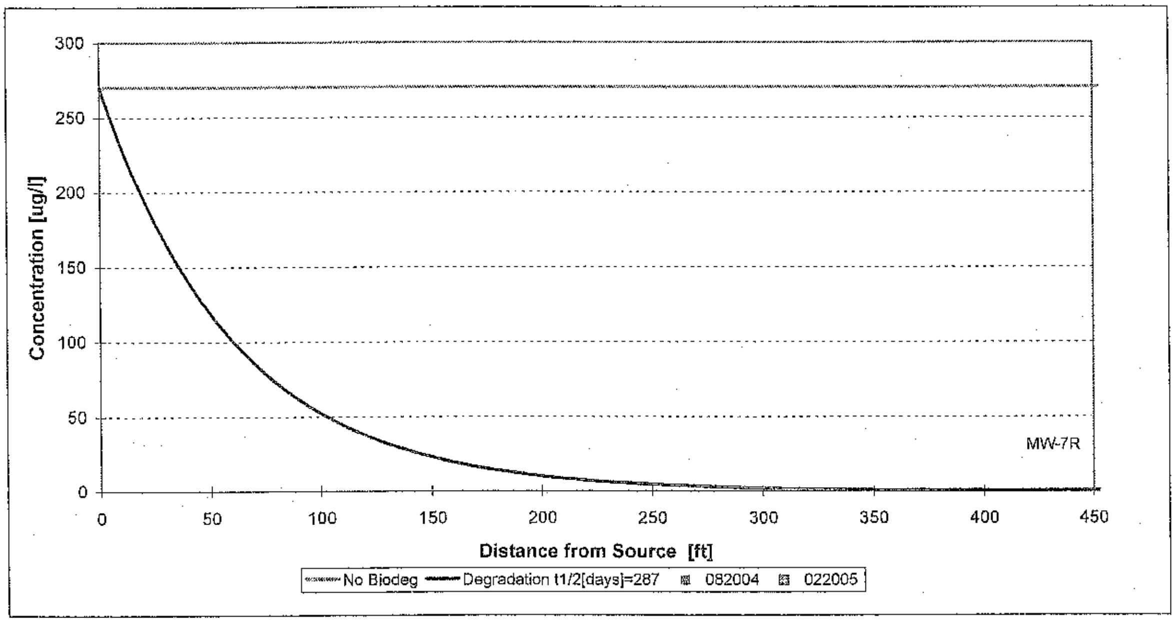
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}\,exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	270	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0024151	[day-1]	
Half-Life Time	$t_{1/2}$	287	[days]	
Half-Life Time	$t_{1/2}$	0.7863014	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 16
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming No Retardation
Benzo(a)pyrene

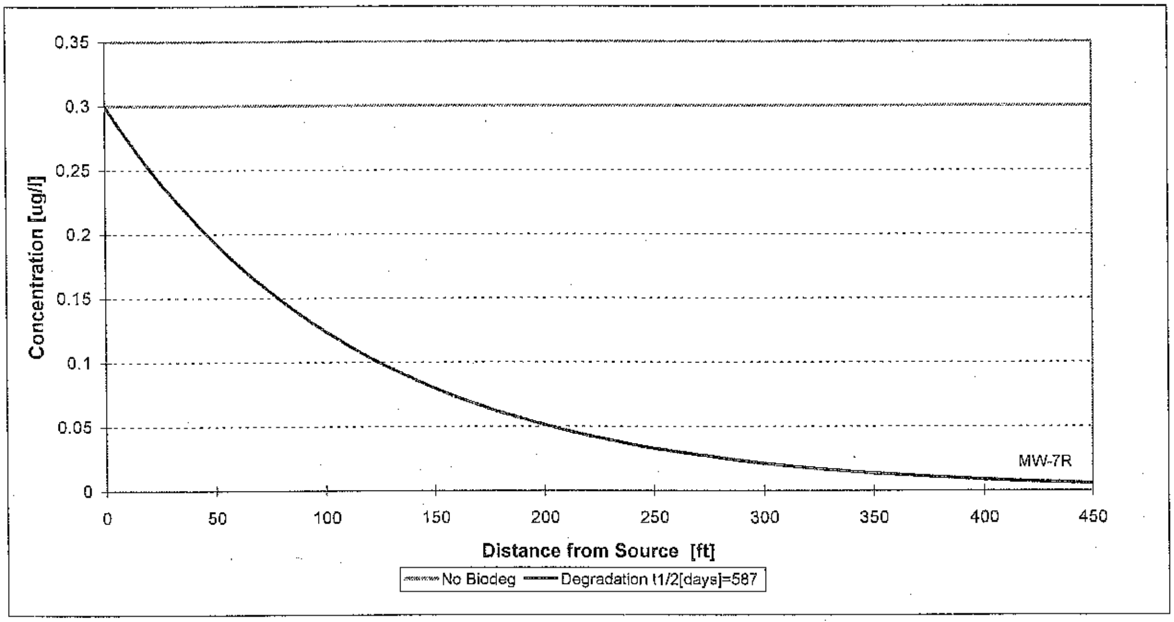
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K i	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0011808	[day-1]	
Half-Life Time	$t_{1/2}$	587	[days]	
Half-Life Time	$t_{1/2}$	1.61	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 17
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming Retardation
Benzo(a)pyrene

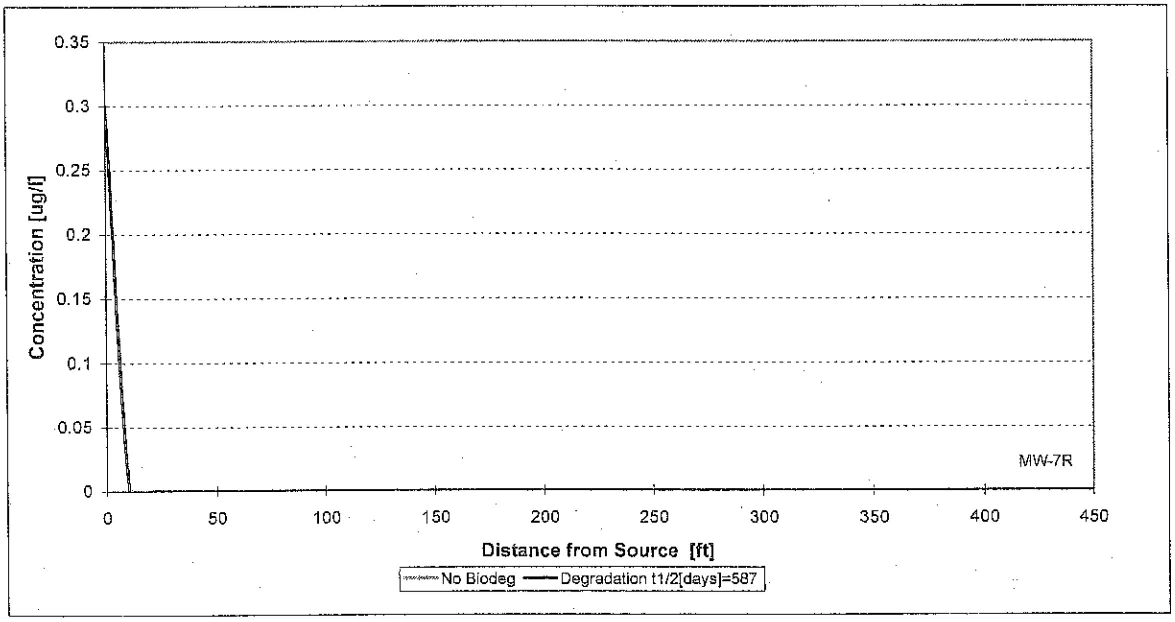
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t) = \frac{C_o}{2} exp\left(\frac{Ux}{2D}\right)\left\{ exp(-Bx)erfc\left[\frac{x - t\sqrt{(U/\omega R)^2 + 4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right] + exp(Bx)erfc\left[\frac{x + t\sqrt{(U/\omega R)^2 + 4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B = \sqrt{(U/2D)^2 + (\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_0	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	4222.7	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	891.25	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0011808	[day-1]	
Half-Life Time	$t_{1/2}$	587	[days]	
Half-Life Time	$t_{1/2}$	1.61	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		1	[feet]	



Notes:

Table 18
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming No Retardation
Chrysene

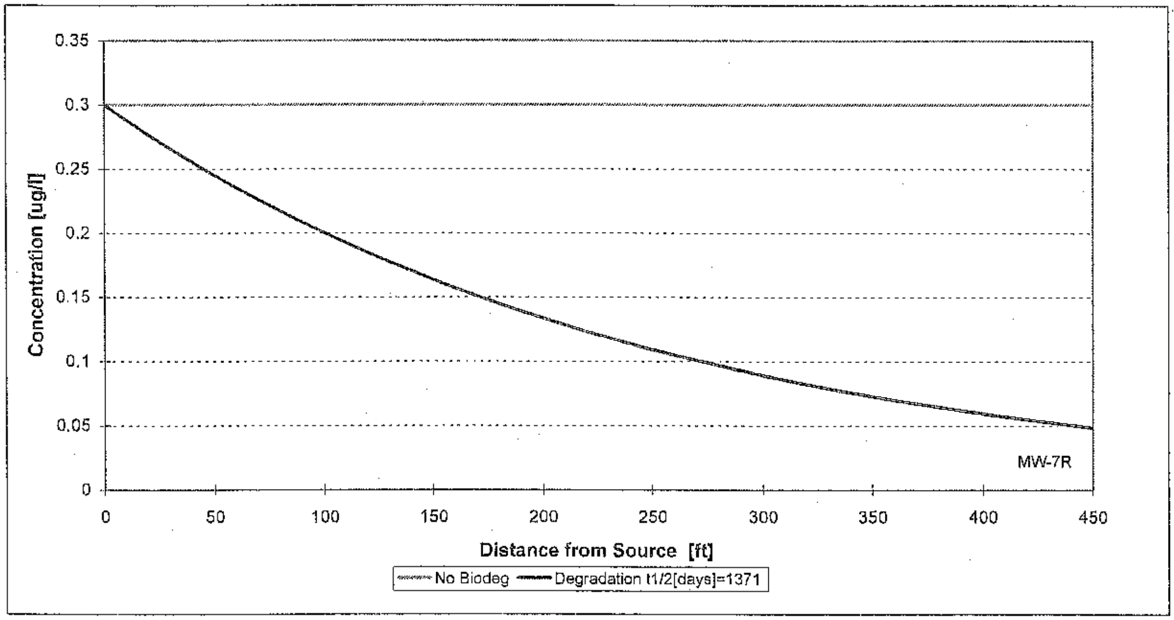
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0005056	[day-1]	
Half-Life Time	$t_{1/2}$	1371	[days]	
Half-Life Time	$t_{1/2}$	3.76	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 19
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming Retardation
Chrysene

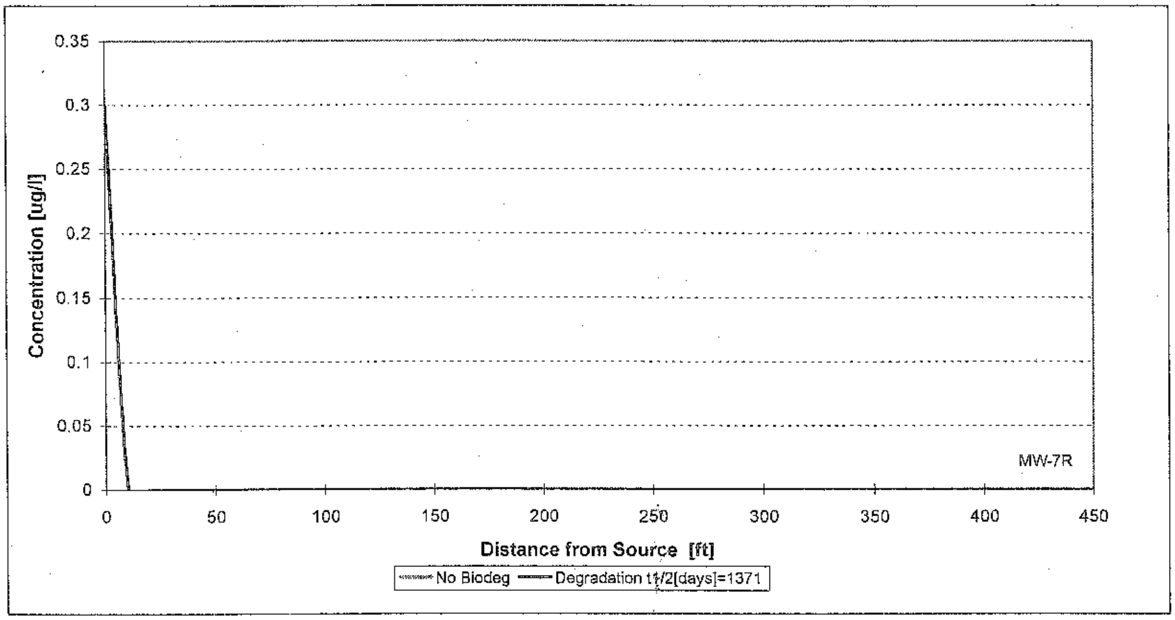
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	8821.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0005056	[day-1]	
Half-Life Time	$t_{1/2}$	1371	[days]	
Half-Life Time	$t_{1/2}$	3.76	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		0	[feet]	



Notes:

Table 20
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming No Retardation
Benzo(b)fluoranthene

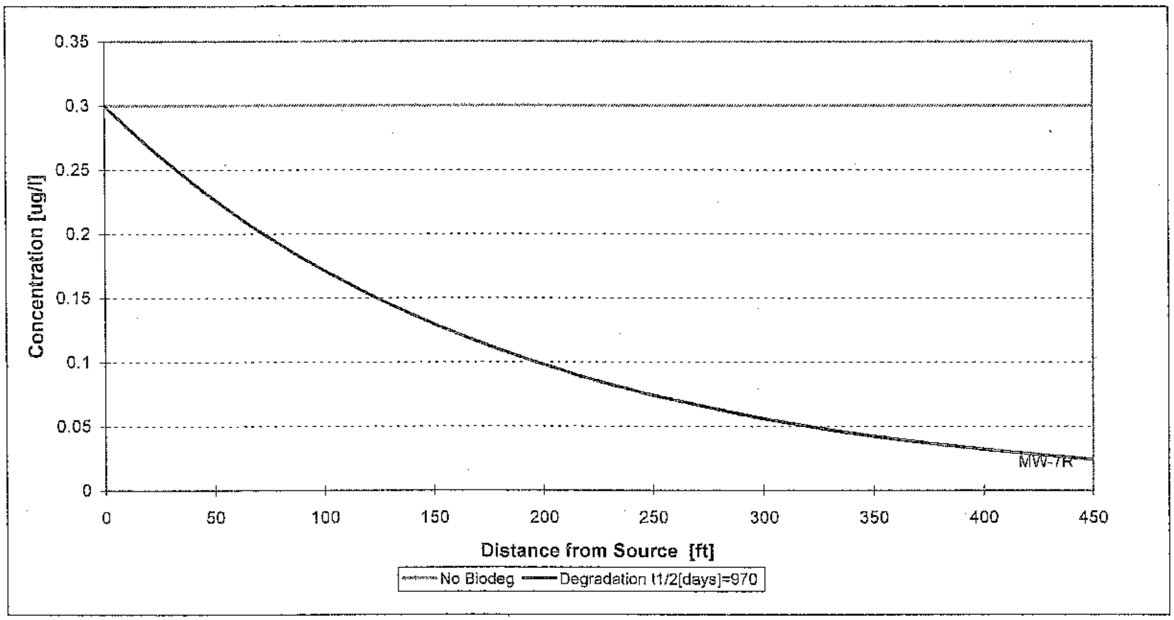
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}\,exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d\,\rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2)/t_{1/2}$	0.0007146	[day-1]	
Half-Life Time	$t_{1/2}$	970	[days]	
Half-Life Time	$t_{1/2}$	2.66	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 21

Predicted Solute Concentrations Downgradient of the Site Boundary Assuming Retardation

Benzo(b)fluoranthene

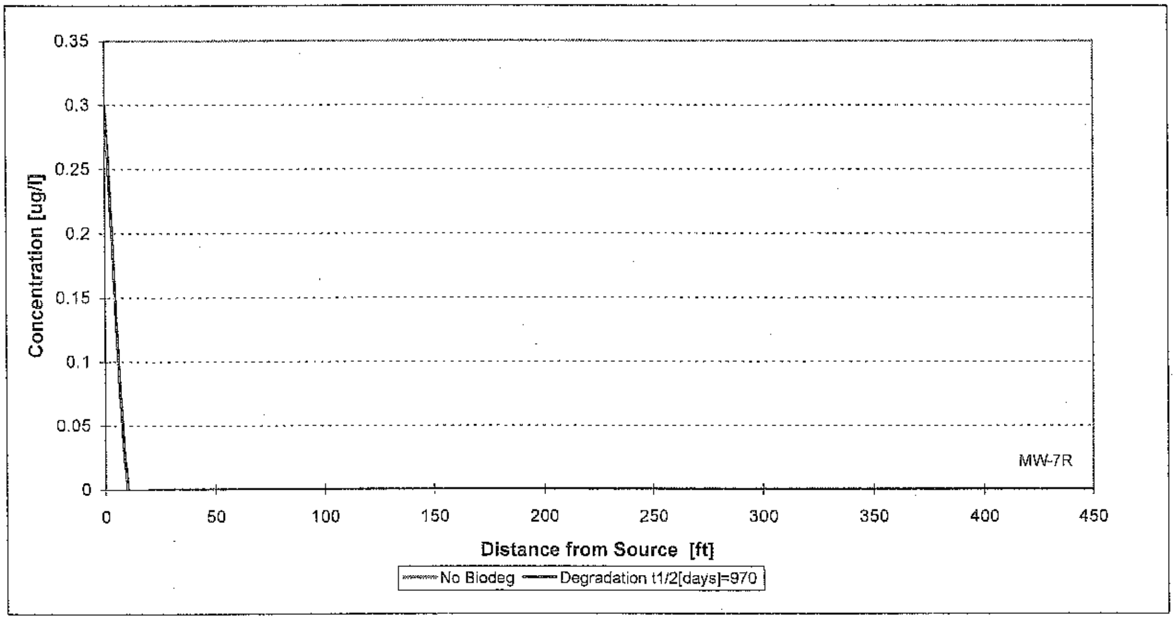
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	8620.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0007146	[day-1]	
Half-Life Time	$t_{1/2}$	970	[days]	
Half-Life Time	$t_{1/2}$	2.66	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		0	[feet]	



Notes:

Table 22
Predicted Solute Concentrations Downgradient of the Site Boundary Assmining No Retardation
Benzo(k)fluoranthene

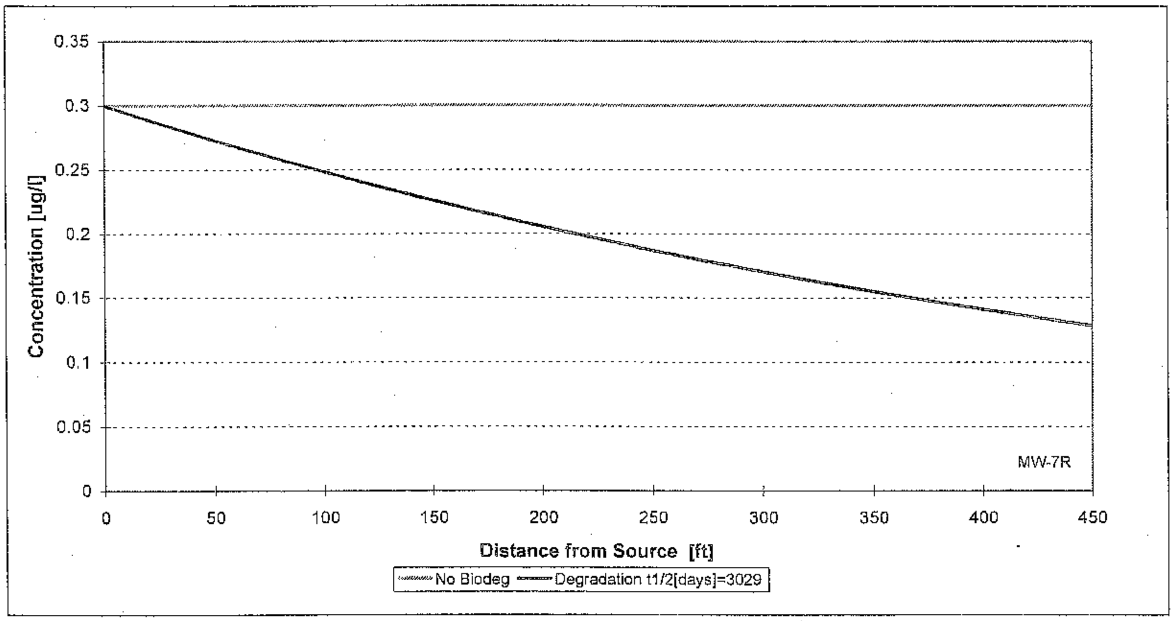
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}\,exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d\,\rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2)/t_{1/2}$	0.0002288	[day-1]	
Half-Life Time	$t_{1/2}$	3029	[days]	
Half-Life Time	$t_{1/2}$	8.30	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 23
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming Retardation
Benzo(k)fluoranthene

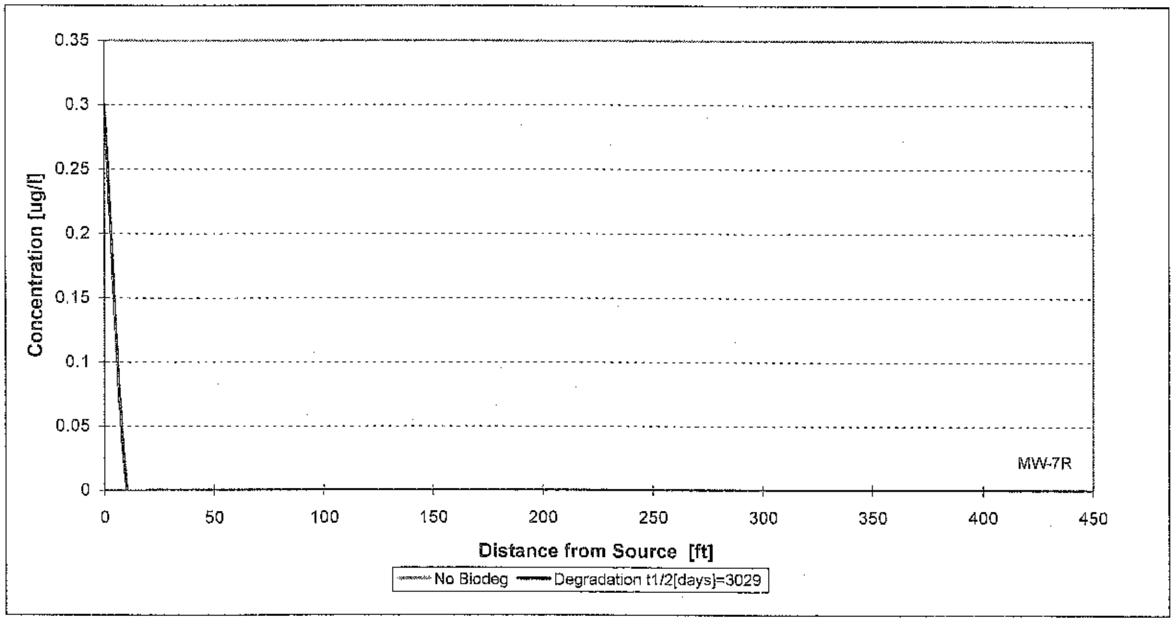
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_0	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	4630.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0002288	[day-1]	
Half-Life Time	$t_{1/2}$	3029	[days]	
Half-Life Time	$t_{1/2}$	8.30	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		0	[feet]	



Notes:

Table 24
Predicted Solute Concentrations Downgradient of Site Boundary Assuming No Retardation
Indeno(1,2,3-cd)pyrene

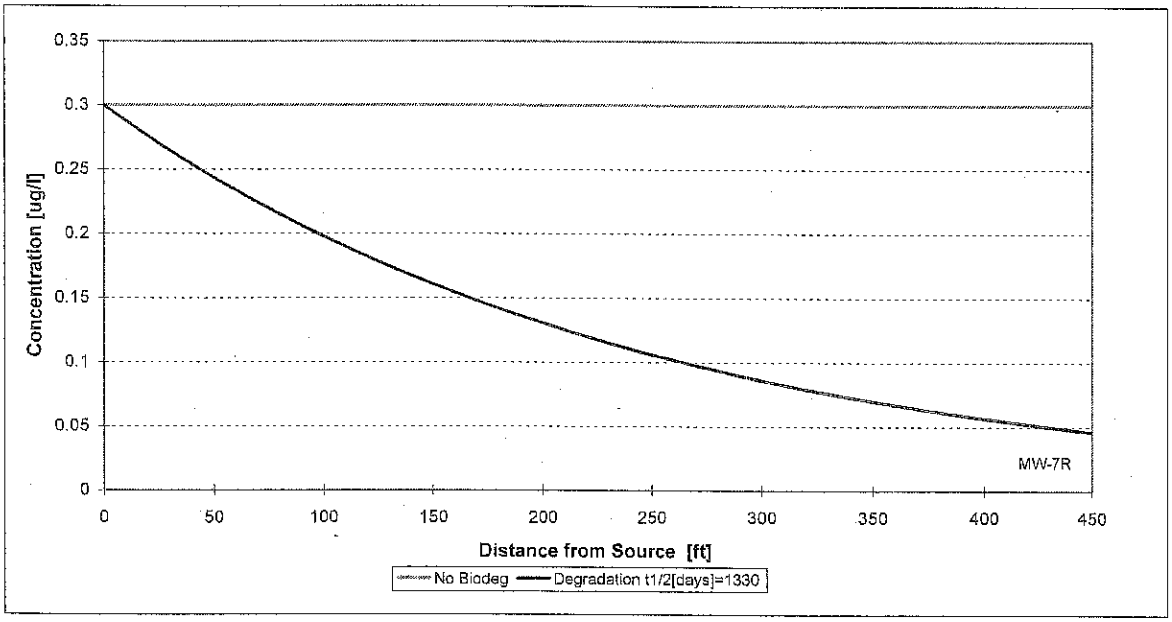
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	1.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0005212	[day-1]	
Half-Life Time	$t_{1/2}$	1330	[days]	
Half-Life Time	$t_{1/2}$	3.64	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		2151	[feet]	



Notes:

Table 25
Predicted Solute Concentrations Downgradient of the Site Boundary Assuming Retardation
Indeno(1,2,3-cd)pyrene

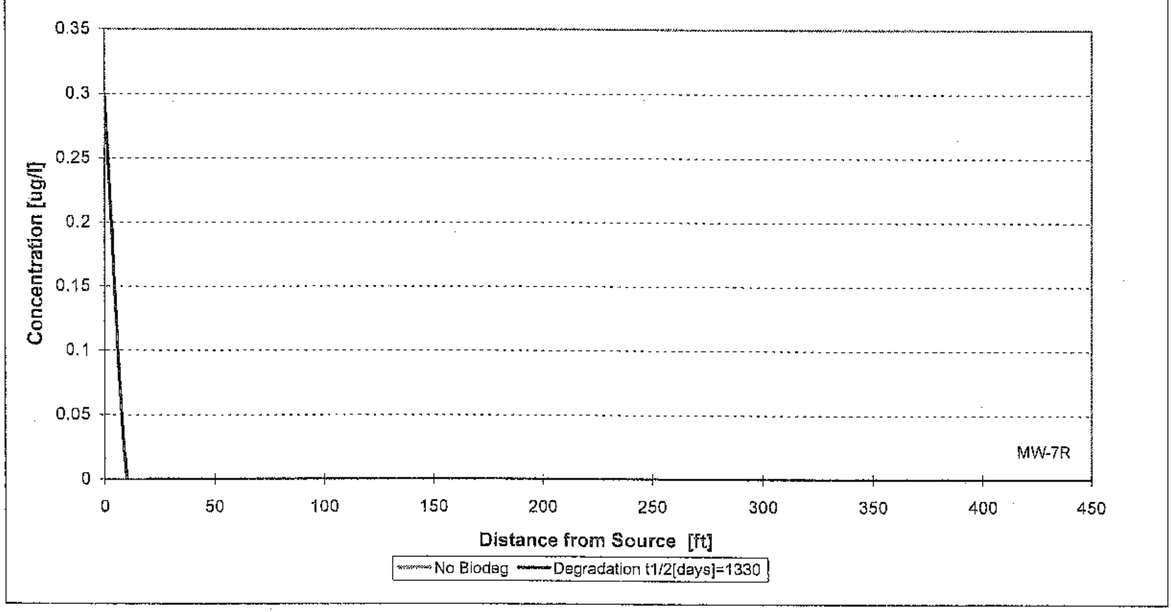
Steady State One-Dimensional Advection/Dispersion Model with Reaction Terms (Degradation)

$$C(x,t)=\frac{C_o}{2}exp\left(\frac{Ux}{2D}\right)\left\{exp(-Bx)erfc\left[\frac{x-t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]+exp(Bx)erfc\left[\frac{x+t\sqrt{(U/\omega R)^2+4\lambda D/\omega R}}{2\sqrt{Dt/\omega R}}\right]\right\}$$

where: $B=\sqrt{(U/2D)^2+(\lambda\omega R/D)}$

Model Input Parameters

Hydraulic Conductivity	K	28.35	[ft/day]	0.01 [cm/s]
Hydraulic Gradient	I	0.002	[ft/ft]	
Darcy Velocity	U = K I	0.045	[ft/day]	
Dispersivity	α	15	[ft]	
Total Porosity	ω	0.38	[-]	
Initial Concentration	C_o	0.3	[ug/l]	
Retardation Factor	$R = 1 + K_d \rho_b/n$	9452.0	[-]	
Bulk Density	ρ_b	1.8	[g/cm^3]	
Distribution Coefficient	K_d	-	[cm^3/g] [ml/g]	
Decay Coefficient	$\lambda = \ln(2) / t_{1/2}$	0.0005212	[day-1]	
Half-Life Time	$t_{1/2}$	1330	[days]	
Half-Life Time	$t_{1/2}$	3.64	[years]	
Simulation Time	t	18250	[days]	
Simulation Time	t	50	[years]	
Distance to Center of Advective Front		0	[feet]	



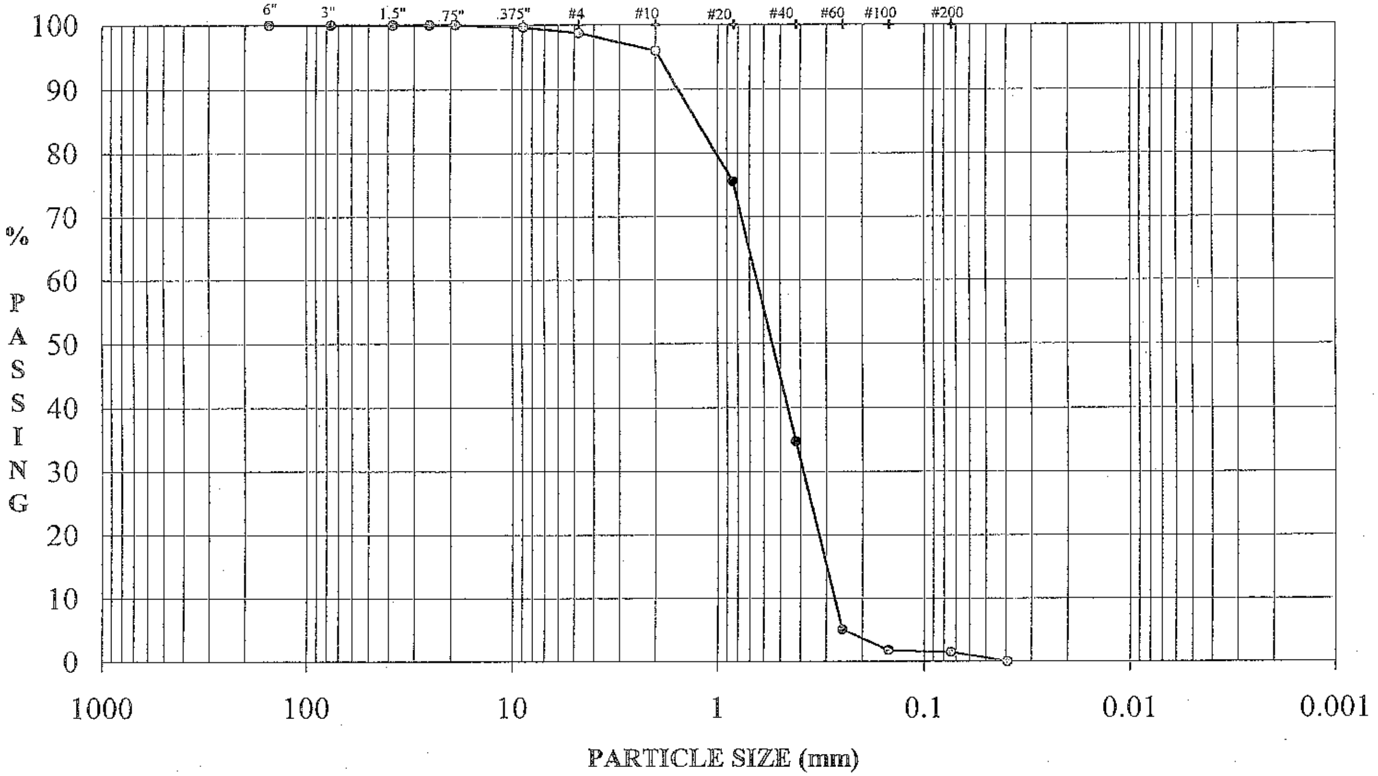
Notes:

APPENDIX K

GRAIN SIZE ANALYSES RESULTS

PARTICLE-SIZE DISTRIBUTION TM D 422

US STANDARD SIEVE OPENING SIZES



COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	99.6%
#4	98.7%
#10	96.0%
#20	75.5%
#40	34.7%
#60	5.1%
#100	1.8%
#200	1.5%

Hydrometer Data

Particle Diameter	% Finer
0.039	0.0%

DESCRIPTION

Sample:	GAL-01R	Depth:	9'
		USCS:	SP
Wet Color:	Dark olive		
Description:	Poorly graded sand		
Comments:			

SAMPLE DATA

W_C (%):	12.4		C_C	0.8
G_S:	2.65	(ASSUMED)	C_U	2.6
% Gravel	1.3		LL	-
% Sand	97.2		PL	-
% Fines	1.5		PI	-

Date: 08/20/04
Technician: KL
Reviewer: RMW

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023-6151.002A

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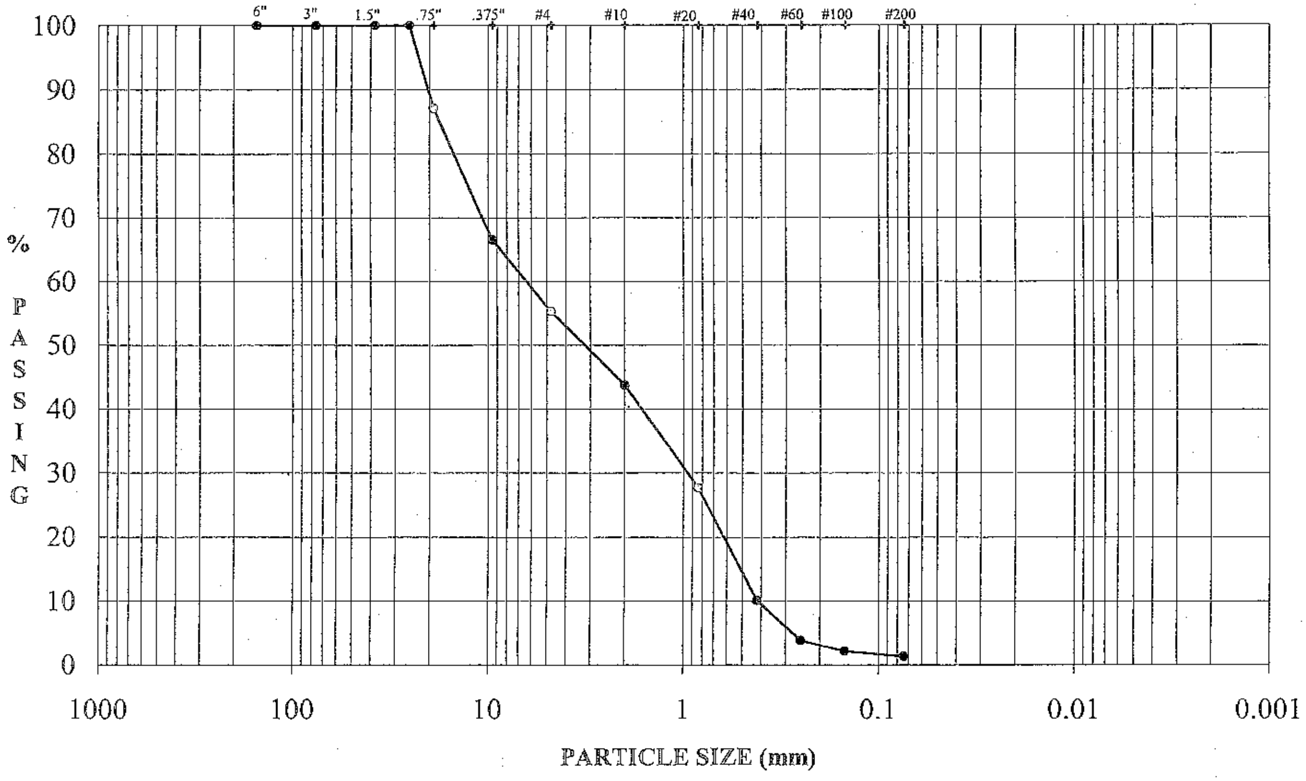

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	44.7
% Sand	54.0
% Fines	1.3
C_C	0.3
C_U	16.0
LL	-
PL	-
PI	-
USCS	SP
w (%)	9.2

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	87.1%
3/8"	66.6%
#4	55.3%
#10	43.8%
#20	27.7%
#40	10.1%
#60	3.9%
#100	2.2%
#200	1.3%

COMMENTS:

DESCRIPTION

Sample: GAGW-8

Depth: 52'

Wet Color: Dark yellowish brown

Description: Poorly graded sand with gravel

Date: 07/19/04

Technician: ND

Reviewer: RMW

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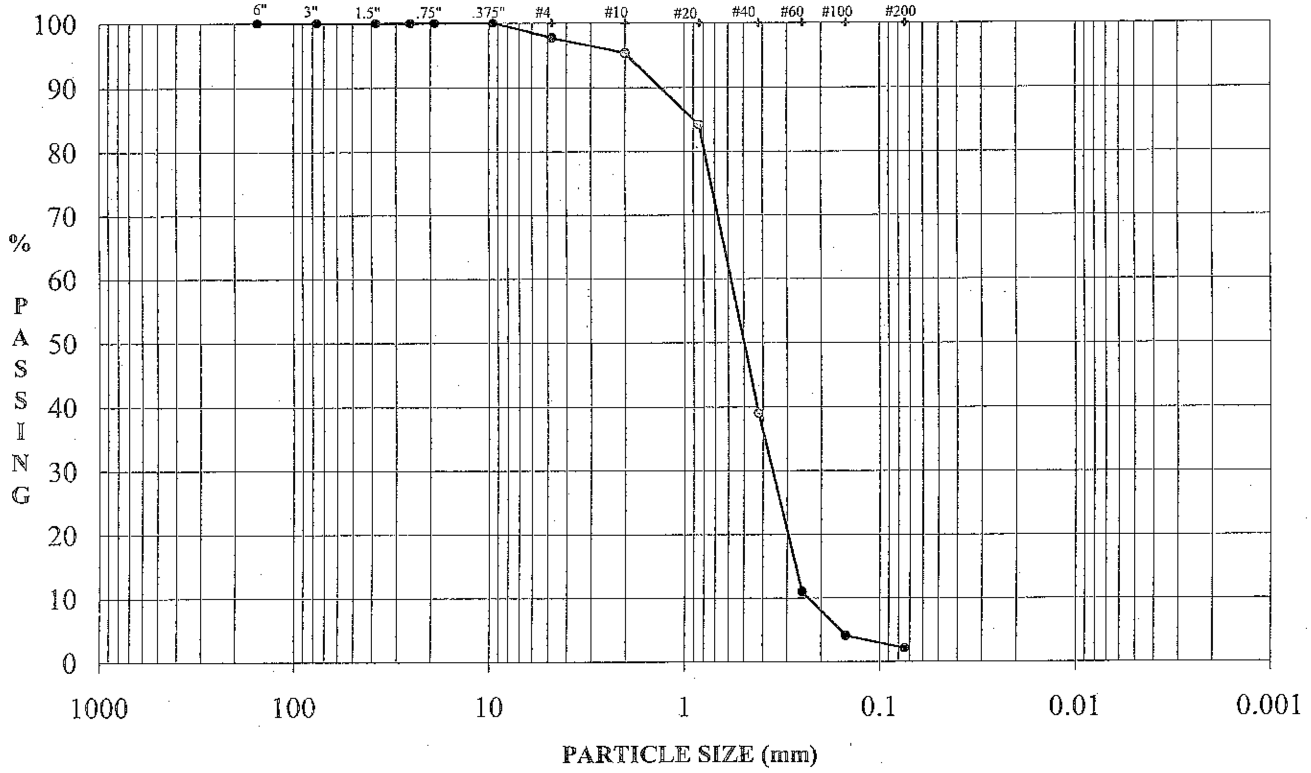

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	2.3
% Sand	95.5
% Fines	2.1
C_C	0.9
C_U	2.5
LL	-
PL	-
PI	-
USCS	SP
w (%)	22.8
Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	97.7%
#10	95.3%
#20	84.1%
#40	38.9%
#60	11.0%
#100	4.1%
#200	2.1%

COMMENTS:

DESCRIPTION

Sample: GAGW-8

Depth: 33'

Wet Color: Dark olive

Description: Poorly graded sand

Date: 07/19/04

Technician: AM

Reviewer: RMW

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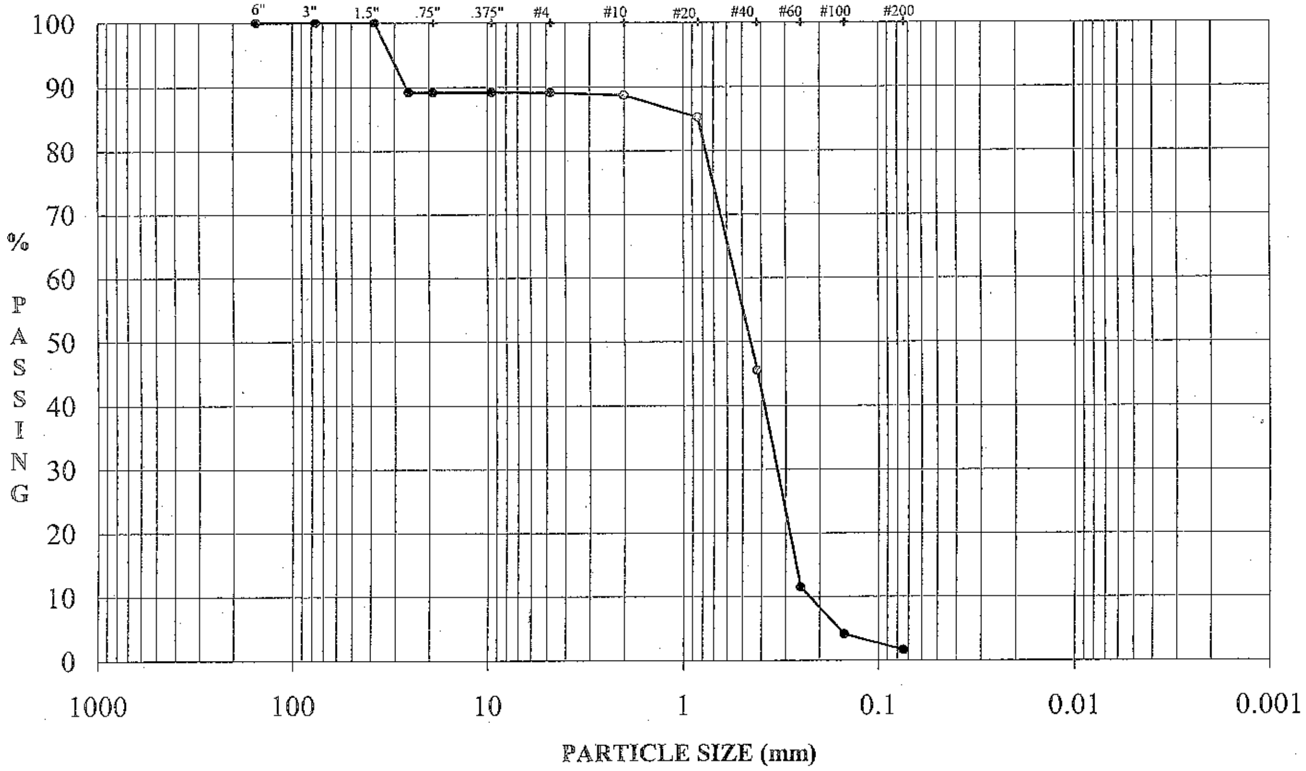

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	10.9
% Sand	87.5
% Fines	1.6
C_C	0.8
C_U	2.3
LL	-
PL	-
PI	-
USCS	SP
w (%)	19.3

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	89.2%
3/4"	89.2%
3/8"	89.2%
#4	89.1%
#10	88.6%
#20	85.2%
#40	45.5%
#60	11.5%
#100	4.1%
#200	1.6%

COMMENTS:

DESCRIPTION

Sample: GAGW-8

Depth: 25'

Wet Color: Dark yellowish brown

Description: Poorly graded sand

Date: 07/19/04

Technician: ND

Reviewer: RMW

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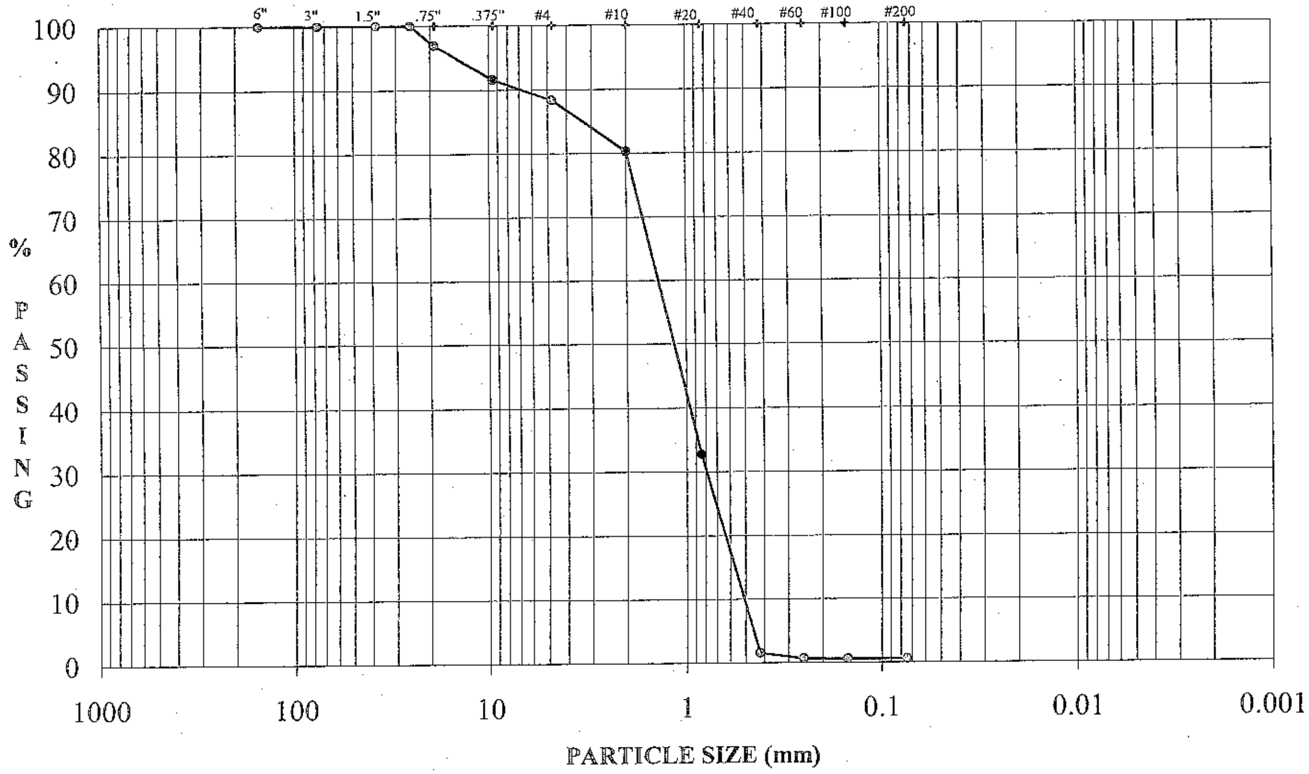

COBBLE	Coarse	Fine	Cor	Med	Fine	Silt or Clay
	GRAVEL		SAND			FINES

Sample Data	
% Gravel	11.6
% Sand	87.8
% Fines	0.6
C_C	0.9
C_U	2.7
LL	-
PL	-
PI	-
USCS	SP
w (%)	10.3

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	96.9%
3/8"	91.6%
#4	88.4%
#10	80.3%
#20	32.7%
#40	1.6%
#60	0.6%
#100	0.6%
#200	0.6%

COMMENTS:

DESCRIPTION

Sample: GAGW-8

Depth: 17'

Wet Color: Very dark brown

Description: Poorly graded sand

Date: 07/19/04

Technician: ND

Reviewer: RMW

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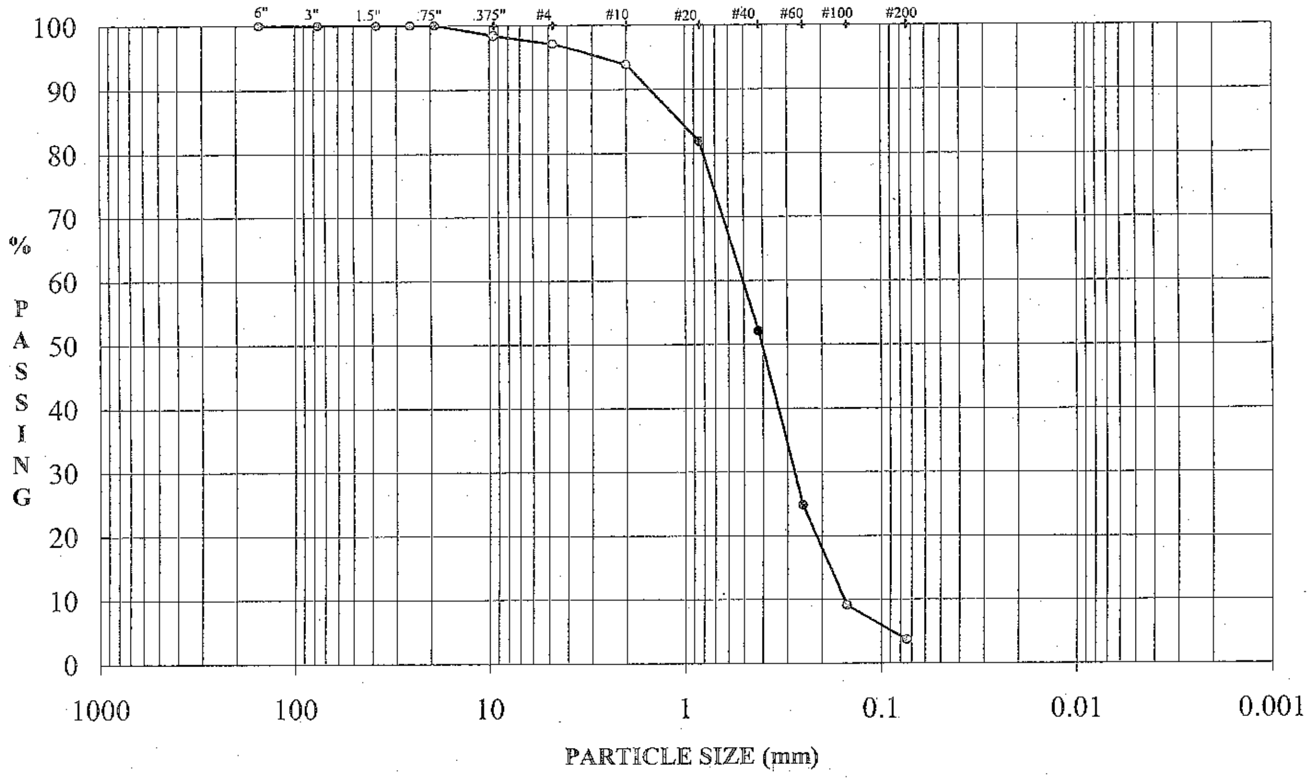

COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sample Data

% Gravel	2.9
% Sand	93.4
% Fines	3.7
C_C	1.0
C_U	3.2
LL	-
PL	-
PI	-
USCS	SP
w (%)	6.7

Percent Finer

3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	98.4%
#4	97.1%
#10	93.9%
#20	81.9%
#40	52.1%
#60	24.8%
#100	9.0%
#200	3.7%

COMMENTS:

DESCRIPTION

Sample: GAGW-8

Depth: 9'

Wet Color: Yellowish red

Description: Poorly graded sand

Date: 07/19/04

Technician: AM

Reviewer: RMW

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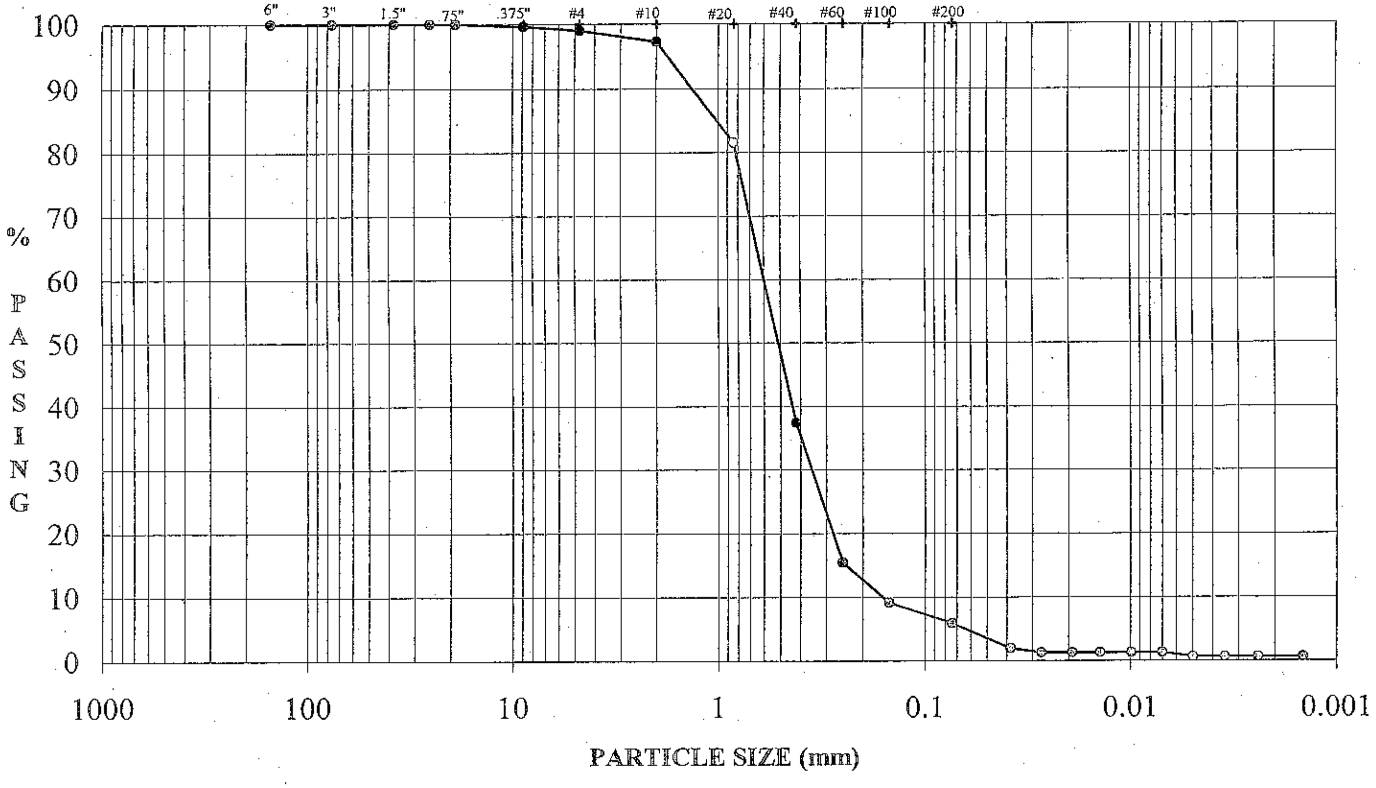

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	99.6%
#4	99.0%
#10	97.3%
#20	81.5%
#40	37.5%
#60	15.5%
#100	9.1%
#200	5.9%

Hydrometer Data

Particle Diameter	% Finer
0.038	2.0%
0.027	1.3%
0.019	1.3%
0.014	1.3%
0.010	1.3%
0.007	1.3%
0.005	0.7%
0.003	0.7%
0.002	0.7%
0.001	0.7%

DESCRIPTION

Sample: GAGW-07

Depth: 27'

USCS: SP-SM

Wet Color: Olive

Description: Poorly graded sand with silt

Comments:

SAMPLE DATA

W_C (%):	21.4		C_C	1.3
G_S:	2.65	(ASSUMED)	C_U	3.9
% Gravel	1.0		LL	-
% Sand	93.1		PL	-
% Fines	5.9		PI	-

Date: 08/31/04

Technician: AM

Reviewer: RMW

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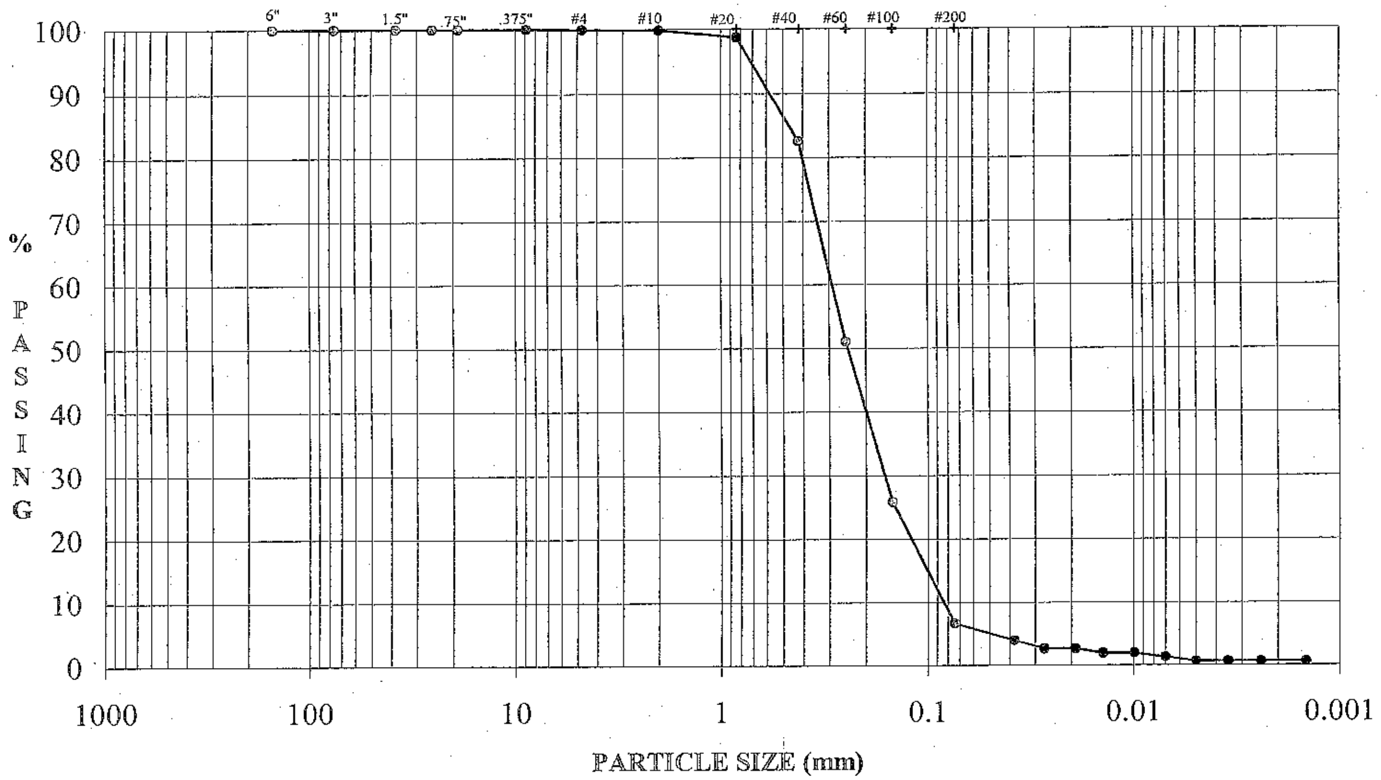

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.9%
#10	99.8%
#20	98.7%
#40	82.5%
#60	51.0%
#100	25.8%
#200	6.7%

Hydrometer Data

Particle Diameter	% Finer
0.038	4.0%
0.027	2.6%
0.019	2.6%
0.014	2.0%
0.010	2.0%
0.007	1.3%
0.005	0.7%
0.003	0.7%
0.002	0.7%
0.001	0.7%

DESCRIPTION

Sample:	GAGW-07	Depth:	22'
		USCS:	SP-SM
Wet Color:	Olive		
Description:	Poorly graded sand with silt		
Comments:			

SAMPLE DATA

W_C (%):	26.8		C_C	1.2
G_S:	2.65	(ASSUMED)	C_U	3.5
% Gravel	0.1		LL	-
% Sand	93.2		PL	-
% Fines	6.7		PI	-

Date: 08/31/04
Technician: AM
Reviewer: RMW

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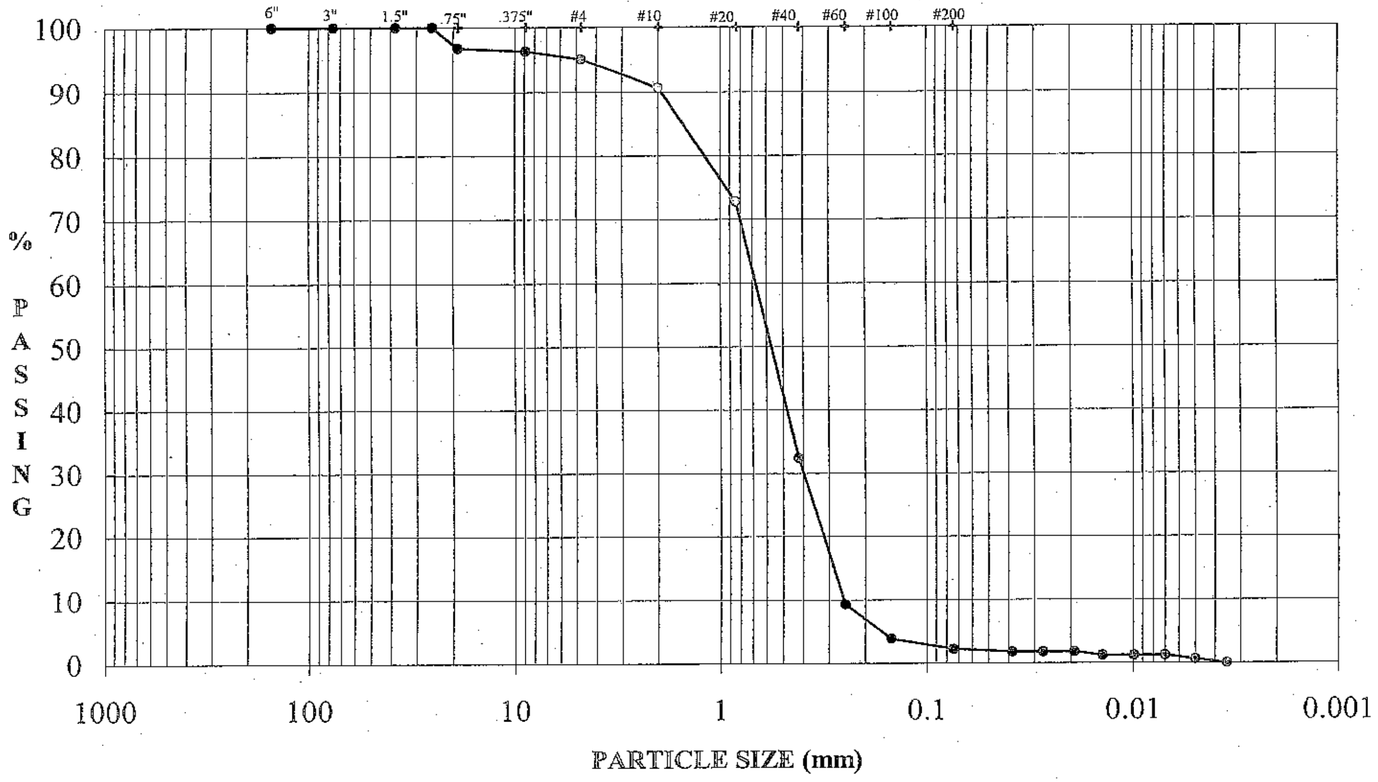

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	96.8%
3/8"	96.3%
#4	95.1%
#10	90.7%
#20	72.8%
#40	32.5%
#60	9.3%
#100	3.8%
#200	2.2%

Hydrometer Data

Particle Diameter	% Finer
0.038	1.8%
0.027	1.8%
0.019	1.8%
0.014	1.2%
0.010	1.2%
0.007	1.2%
0.005	0.6%
0.003	0.0%

DESCRIPTION

Sample:	GAGW-07	Depth:	19'
		USCS:	SP
Wet Color:	Olive brown		
Description:	Poorly graded sand		
Comments:			

SAMPLE DATA

W_C (%):	17.3		C_C	0.9
G_S:	2.65	(ASSUMED)	C_U	2.7
% Gravel	4.9		LL	-
% Sand	92.9		PL	-
% Fines	2.2		PI	-

Date:	08/31/04
Technician:	AM
Reviewer:	RMW

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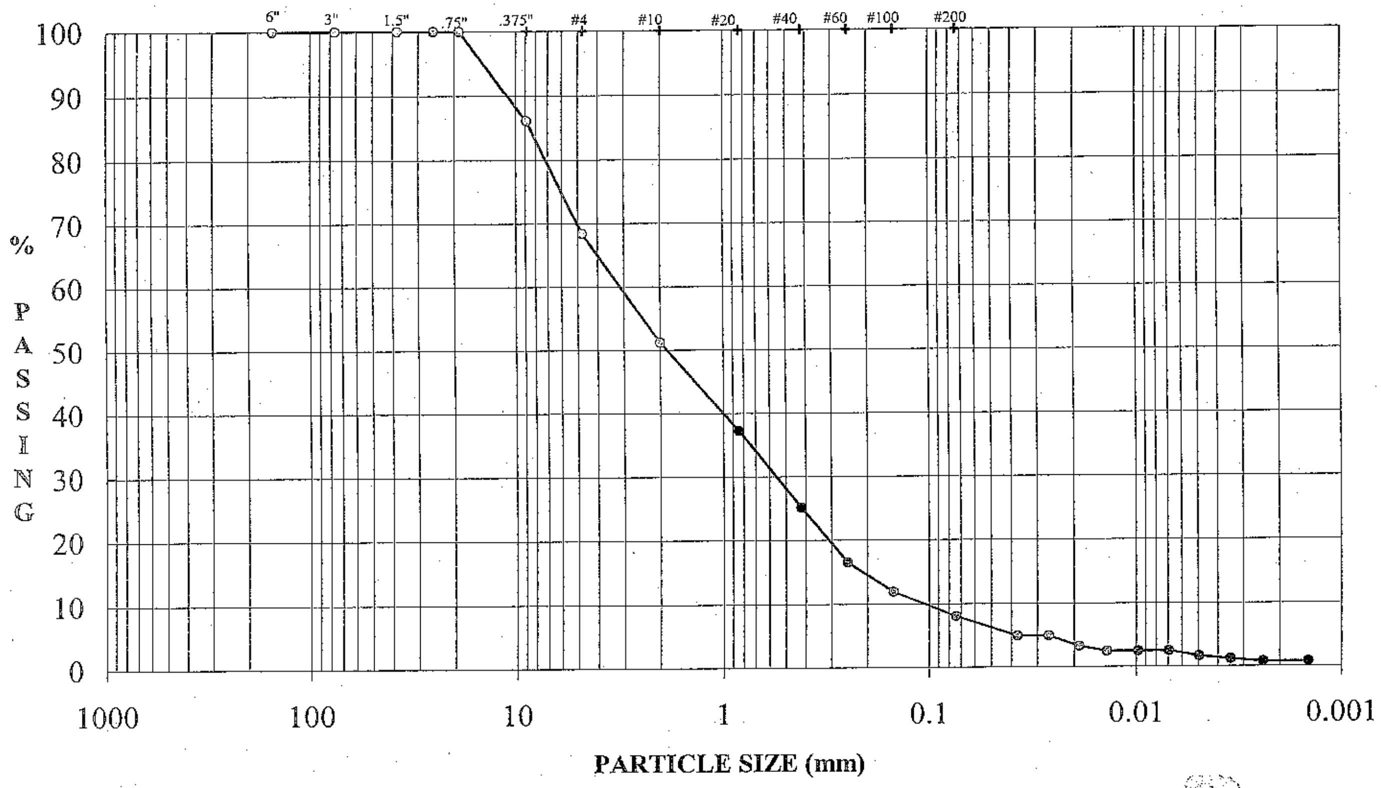

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	86.1%
#4	68.4%
#10	51.2%
#20	37.2%
#40	25.2%
#60	16.6%
#100	11.9%
#200	8.0%

Hydrometer Data

Particle Diameter	% Finer
0.037	4.9%
0.026	4.9%
0.019	3.3%
0.014	2.4%
0.010	2.4%
0.007	2.4%
0.005	1.6%
0.003	1.2%
0.002	0.8%
0.001	0.8%

DESCRIPTION

Sample:	GAGW-07	Depth:	6'
		USCS:	SP-SM
Wet Color:	Very dark gray		
Description:	Poorly graded sand with silt and gravel		
Comments:			

SAMPLE DATA

W_C (%):	22.9		C_C	0.9
G_S:	2.65	(ASSUMED)	C_U	29.8
% Gravel	31.6		LL	-
% Sand	60.4		PL	-
% Fines	8.0		PI	-

Date: 09/01/04

Technician: KL

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY

023-6151.002A

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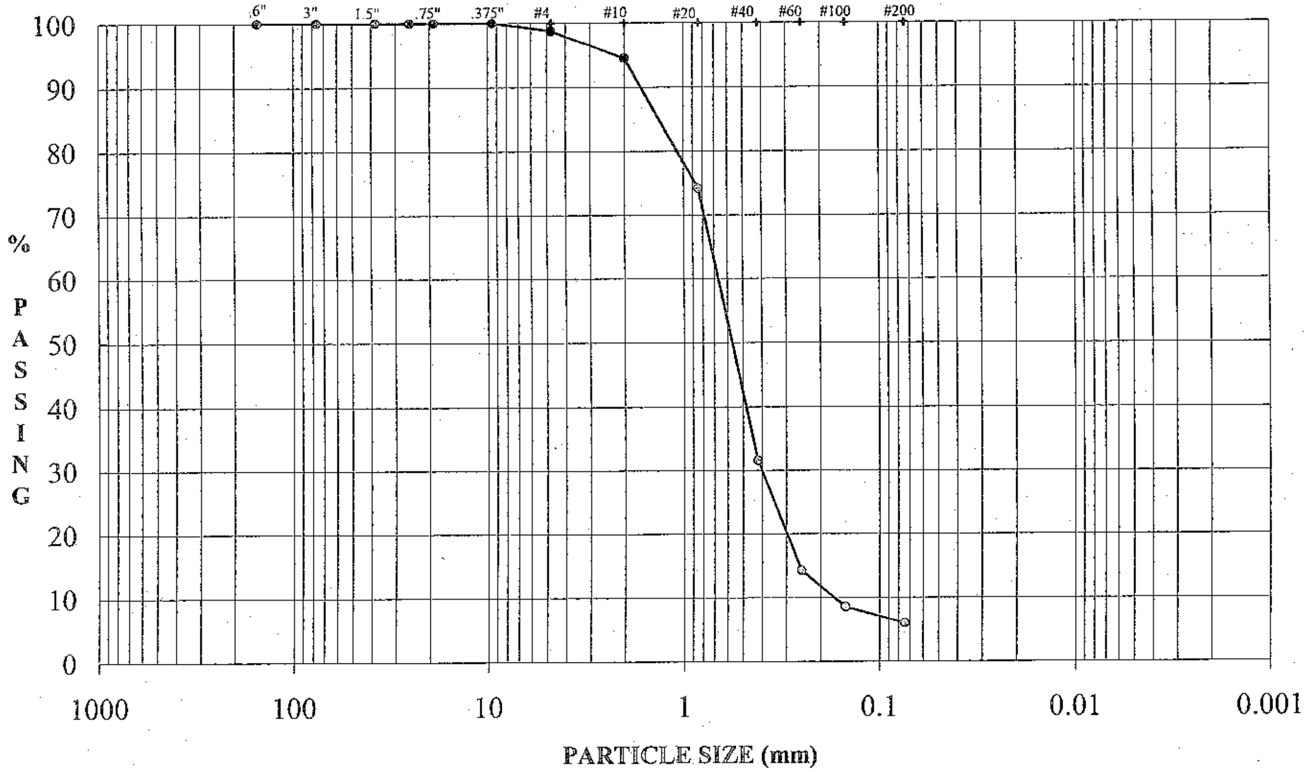
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	1.2
% Sand	92.8
% Fines	6.0
C_C	1.4
C_U	3.9
LL	-
PL	-
PI	-
USCS	SP-SM
w (%)	20.0

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	98.8%
#10	94.6%
#20	74.2%
#40	31.6%
#60	14.2%
#100	8.6%
#200	6.0%

COMMENTS:

DESCRIPTION

Sample: GAGW-29

Depth: -

Wet Color: Olive

Description: Poorly graded sand with silt

Date: 07/16/04

Technician: KL

Reviewer: RMW

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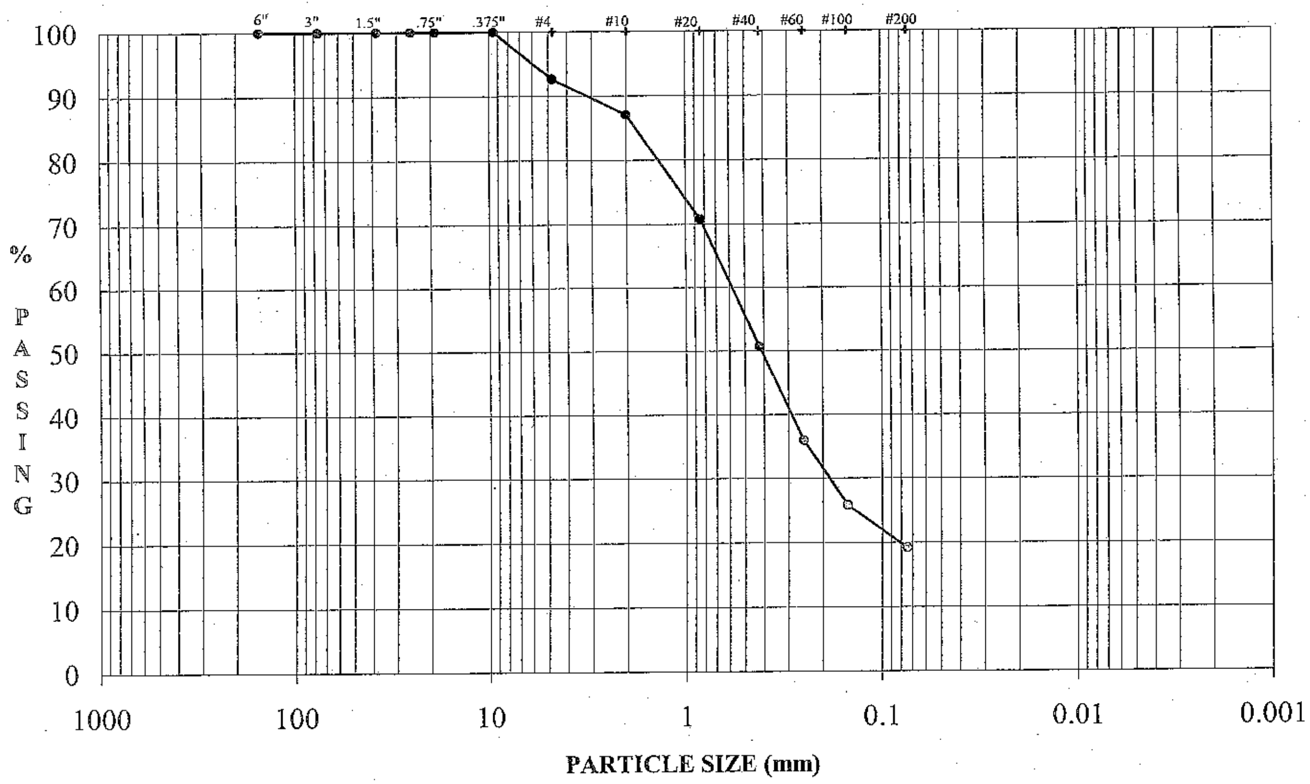

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data

% Gravel	7.3
% Sand	73.5
% Fines	19.2
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	41.6

Percent Finer

3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	92.7%
#10	87.1%
#20	70.8%
#40	50.7%
#60	35.9%
#100	25.8%
#200	19.2%

COMMENTS: Sample contained a 408.48 g piece of gravel. It was removed. Not representative.

DESCRIPTION

Sample: GAGW-21

Depth: -

Wet Color: Olive

Description: m-f Sand, some fines, little gravel

Date: 07/19/04

Technician: ND

Reviewer: RMW

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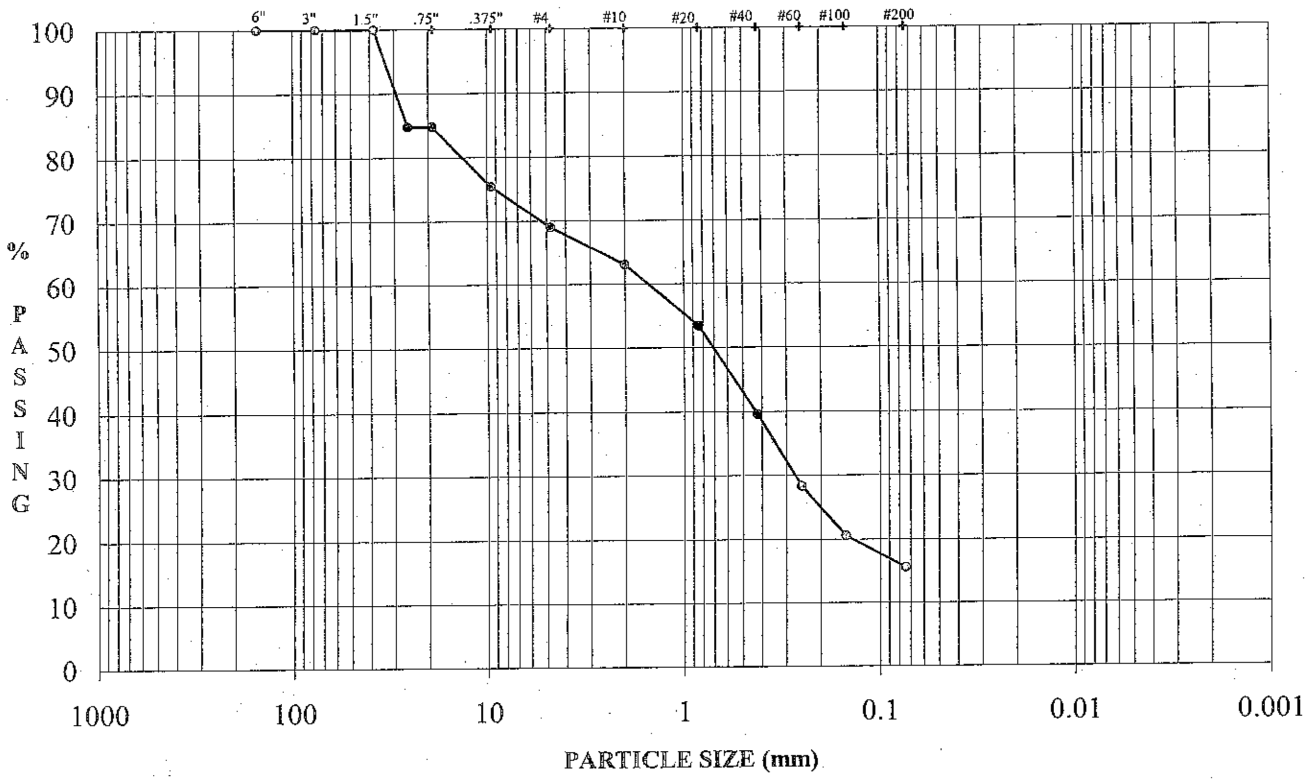

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	31.0
% Sand	53.5
% Fines	15.5
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	9.0
Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	84.8%
3/4"	84.8%
3/8"	75.4%
#4	69.0%
#10	63.0%
#20	53.4%
#40	39.6%
#60	28.3%
#100	20.5%
#200	15.5%

COMMENTS:

DESCRIPTION

Sample: GAGW-15

Depth: -

Wet Color: Olive

Description: m-f Sand, some c-f gravel, some fines

Date: 07/15/04

Technician: KL

Reviewer: RMW

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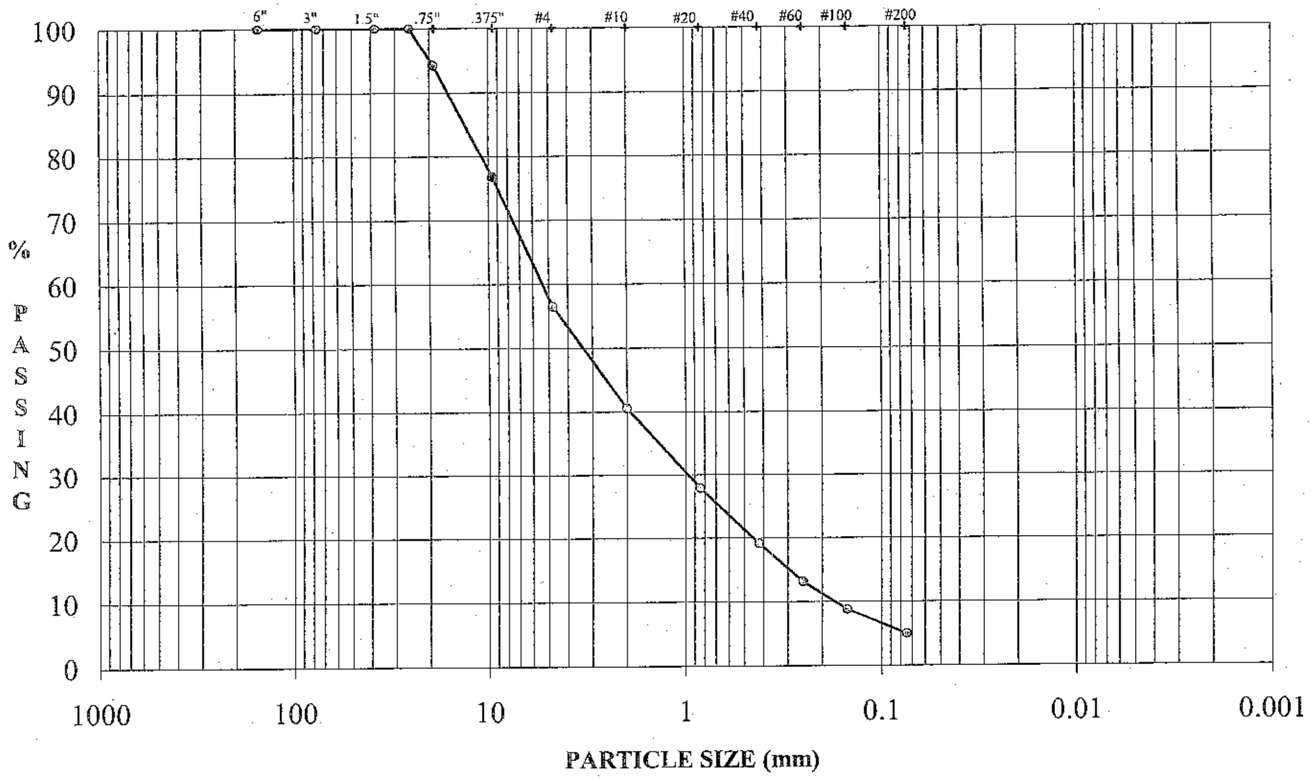

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data

% Gravel	43.5
% Sand	51.6
% Fines	4.9
C_C	1.1
C_U	31.8
LL	-
PL	-
PI	-
USCS	SW
w (%)	41.9

Percent Finer

3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	94.3%
3/8"	76.8%
#4	56.5%
#10	40.5%
#20	27.8%
#40	19.1%
#60	13.1%
#100	8.8%
#200	4.9%

COMMENTS:

DESCRIPTION

Sample: GAGW-6

Depth: -

Wet Color: Dark olive

Description: Well graded sand with gravel

Date: 07/16/04

Technician: KL

Reviewer: RMW

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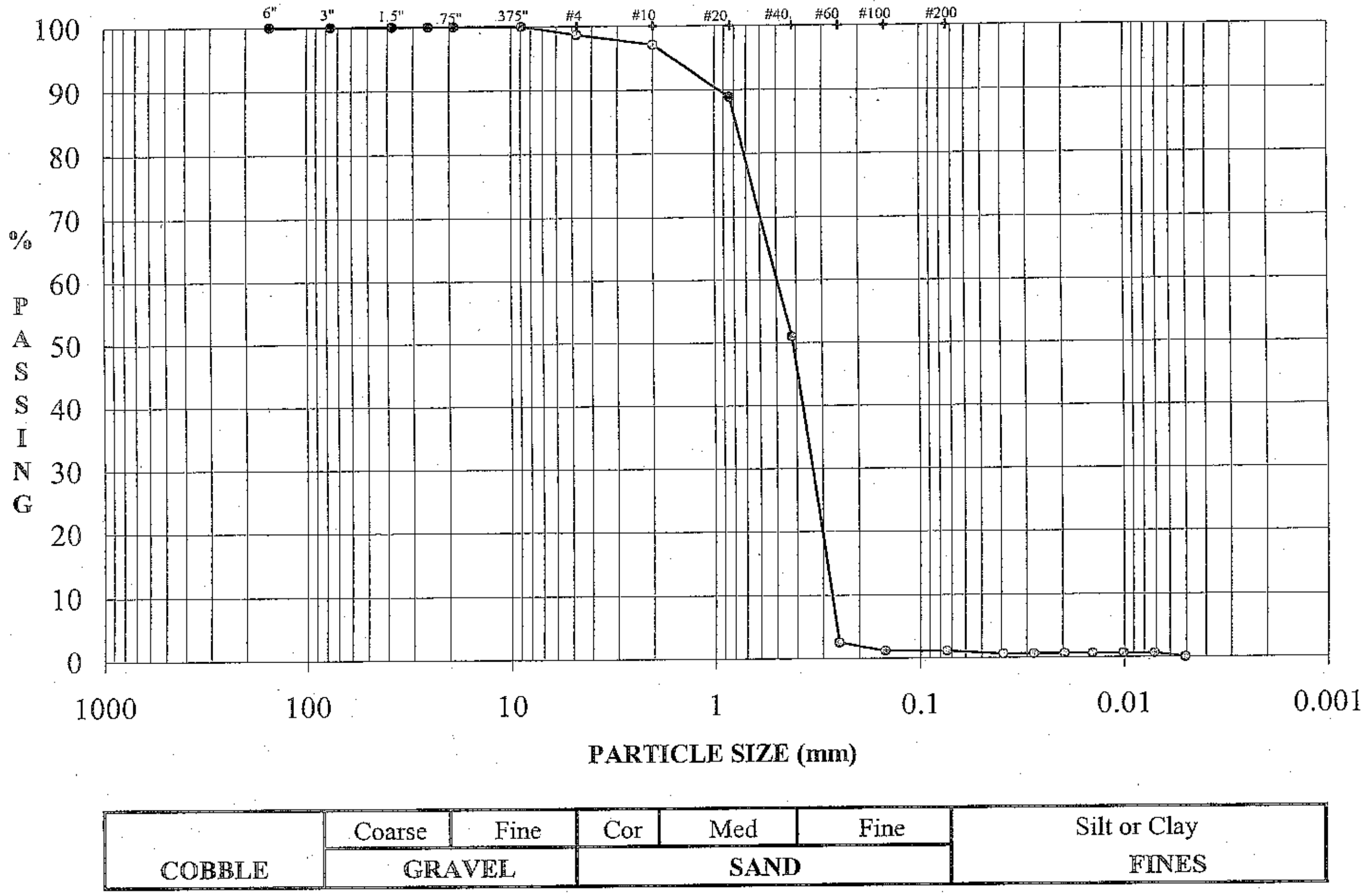

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	98.7%
#10	97.1%
#20	88.9%
#40	51.0%
#60	2.6%
#100	1.2%
#200	1.2%

Hydrometer Data

Particle Diameter	% Finer
0.039	0.7%
0.028	0.7%
0.020	0.7%
0.014	0.7%
0.010	0.7%
0.007	0.7%
0.005	0.0%

DESCRIPTION

Sample:	GAL-01R	**Depth:**	19'
		USCS:	SP
Wet Color:	Dark olive		
Description:	Poorly graded sand		
Comments:			

SAMPLE DATA

W_C (%):	12.5		C_C	0.9
G_S:	2.65	(ASSUMED)	C_U	1.9
% Gravel	1.3		LL	-
% Sand	97.5		PL	-
% Fines	1.2		PI	-

Date: 08/20/04
Technician: KL
Reviewer: RMW

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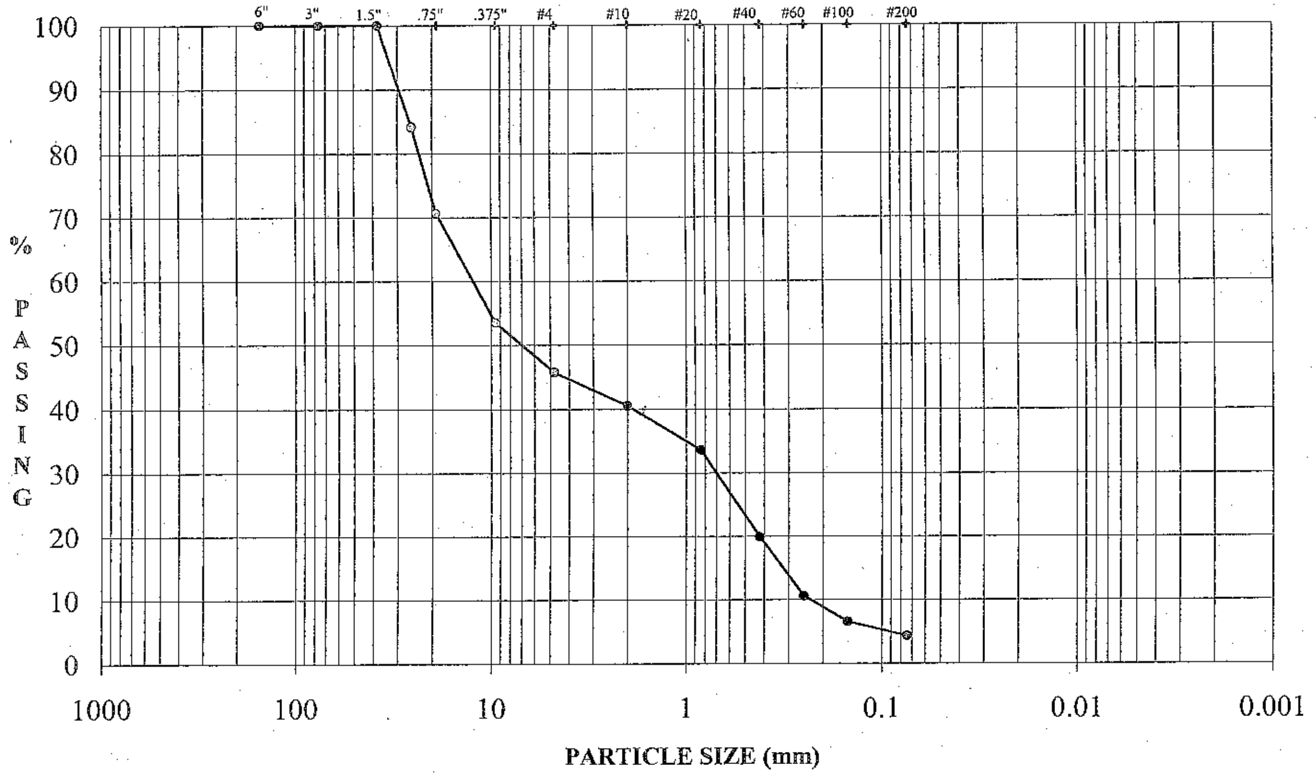

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	54.3
% Sand	41.4
% Fines	4.4
C_C	0.2
C_U	53.0
LL	-
PL	-
PI	-
USCS	GP
w (%)	9.1

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	84.2%
3/4"	70.7%
3/8"	53.5%
#4	45.7%
#10	40.5%
#20	33.6%
#40	19.9%
#60	10.6%
#100	6.5%
#200	4.4%

COMMENTS:

DESCRIPTION

Sample: GAL-13

Depth: 6'

Wet Color: Olive brown

Description: Poorly graded gravel with sand

Date: 07/20/04

Technician: AM

Reviewer: RMW

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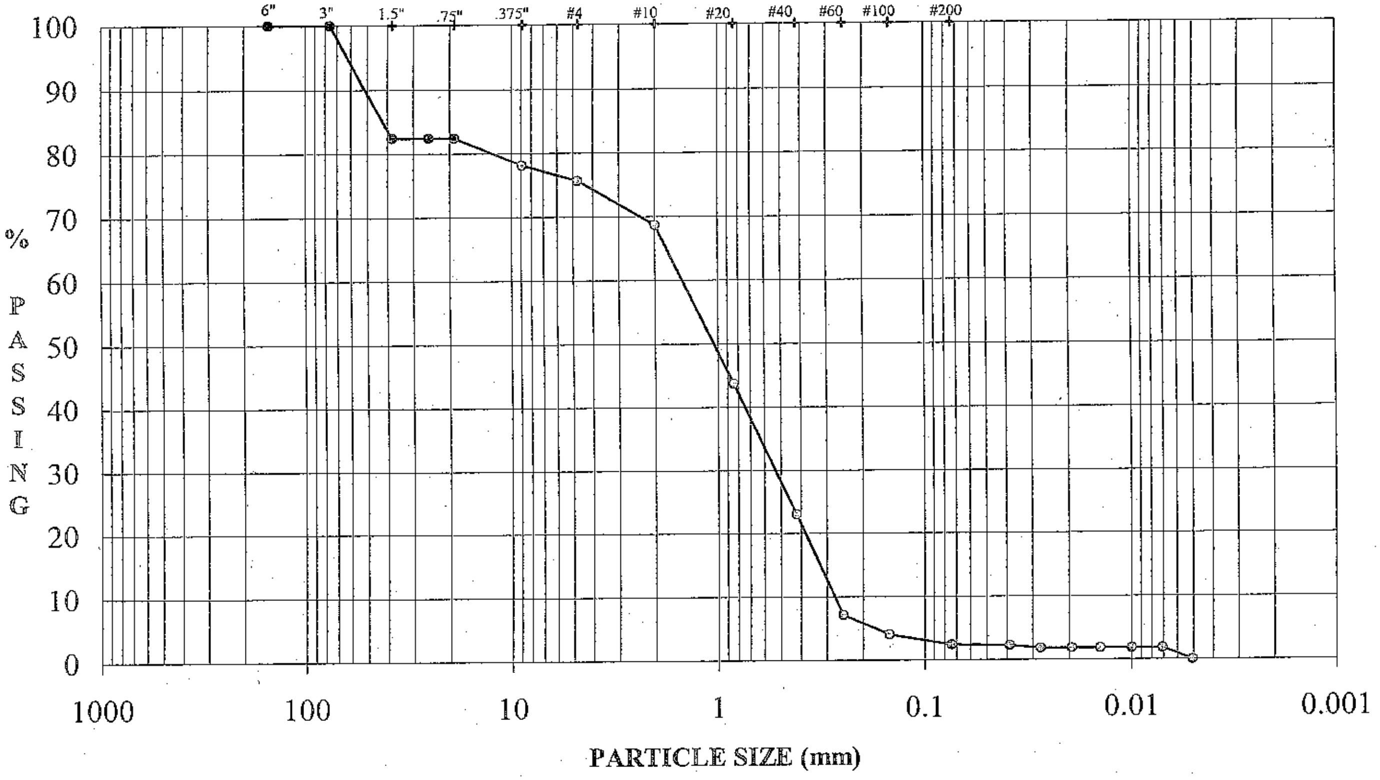

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	82.4%
1"	82.4%
3/4"	82.4%
3/8"	78.1%
#4	75.7%
#10	68.7%
#20	43.7%
#40	23.0%
#60	7.1%
#100	4.0%
#200	2.5%

Hydrometer Data

Particle Diameter	% Finer
0.039	2.3%
0.027	1.8%
0.019	1.8%
0.014	1.8%
0.010	1.8%
0.007	1.8%
0.005	0.0%

DESCRIPTION

Sample:	GAL-12	Depth:	29'
		USCS:	SP
Wet Color:	Dark olive		
Description:	Poorly graded sand with gravel		
Comments:			

SAMPLE DATA

W_C (%):	13.1		C_C	0.7
G_S:	2.65	(ASSUMED)	C_U	5.6
% Gravel	24.3		LL	-
% Sand	73.2		PL	-
% Fines	2.5		PI	-

Date:	08/20/04
Technician:	KL
Reviewer:	RMW

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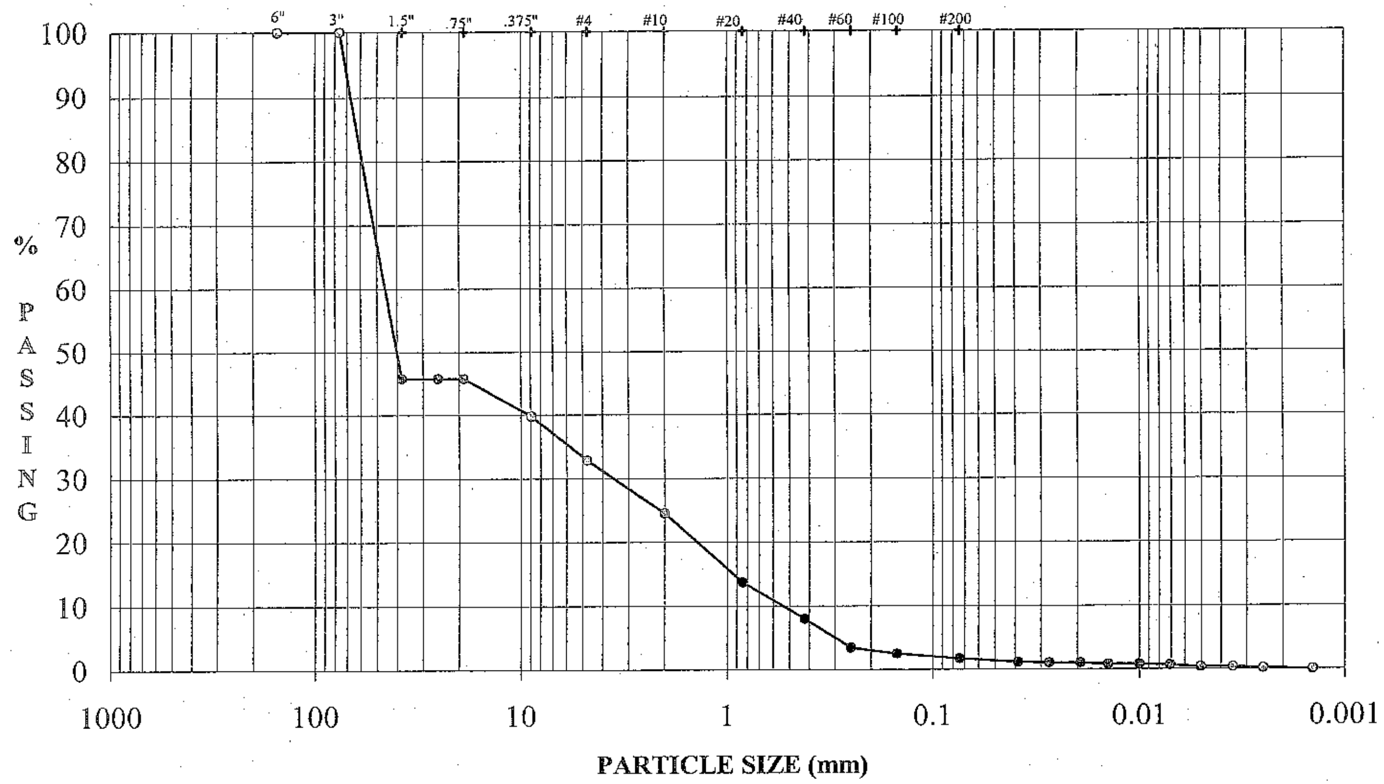

COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sieve Data	
Particle Diameter	% Finer
3"	100.0%
1 1/2"	45.8%
1"	45.8%
3/4"	45.8%
3/8"	39.8%
#4	32.8%
#10	24.5%
#20	13.7%
#40	8.0%
#60	3.5%
#100	2.5%
#200	1.7%

Hydrometer Data	
Particle Diameter	% Finer
0.039	1.1%
0.027	1.0%
0.019	1.0%
0.014	0.8%
0.010	0.8%
0.007	0.7%
0.005	0.3%
0.003	0.3%
0.002	0.2%
0.001	0.0%

DESCRIPTION

Sample:	GAL-12	Depth:	22'
		USCS:	GP
Wet Color:	Dark olive		
Description:	Poorly graded gravel with sand		
Comments:			

SAMPLE DATA

W_C (%):	8.2		C_C	0.5
G_S:	2.65	(ASSUMED)	C_U	86.1
% Gravel	67.2		LL	-
% Sand	31.2		PL	-
% Fines	1.7		PI	-

Date:	08/20/04
Technician:	KL
Reviewer:	RMW

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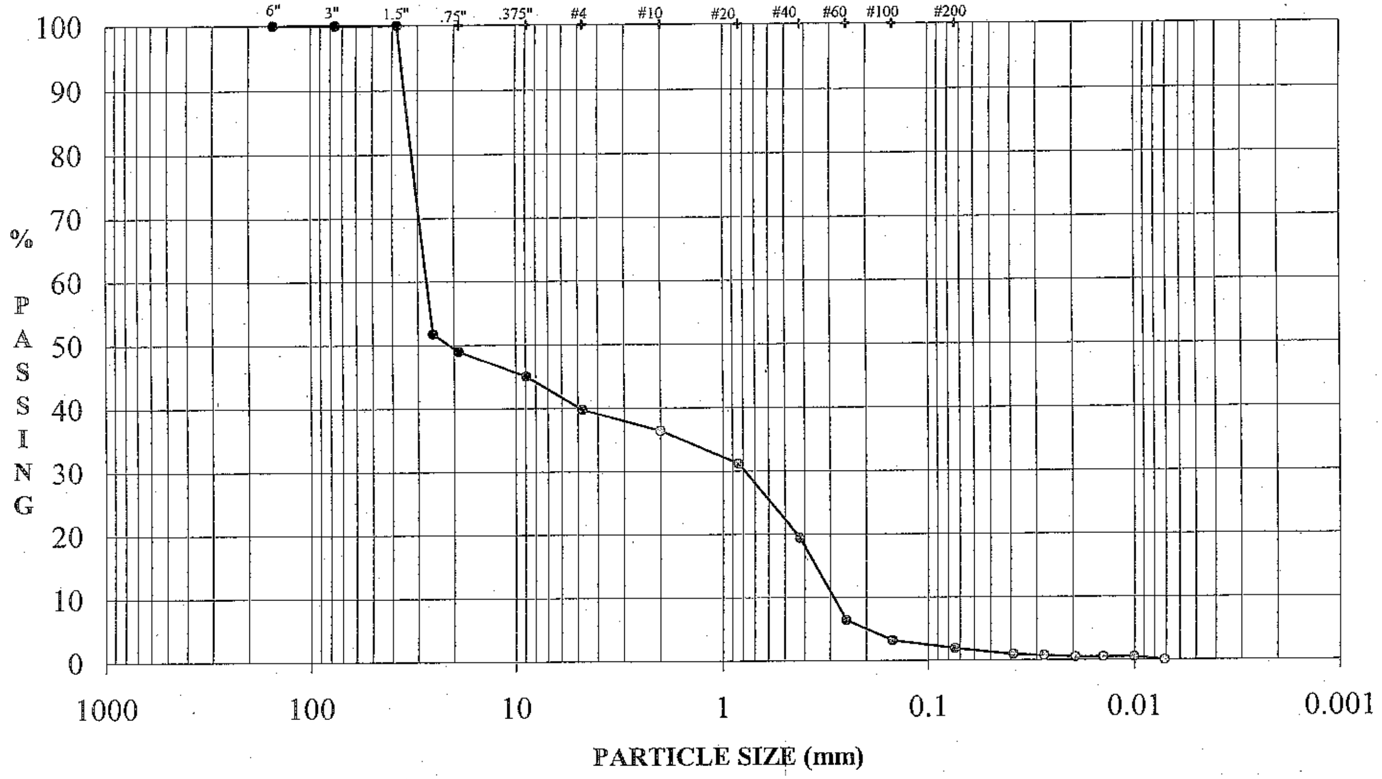

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	51.7%
3/4"	48.9%
3/8"	45.0%
#4	39.8%
#10	36.4%
#20	31.2%
#40	19.4%
#60	6.4%
#100	3.2%
#200	1.9%

Hydrometer Data

Particle Diameter	% Finer
0.039	1.0%
0.027	0.7%
0.019	0.5%
0.014	0.5%
0.010	0.5%
0.007	0.0%

DESCRIPTION

Sample:	GAL-12	Depth:	14'
		USCS:	GP
Wet Color:	Dark olive		
Description:	Poorly graded gravel with sand		
Comments:			

SAMPLE DATA

W_C (%):	10.3	(ASSUMED)	C_C	0.1
G_S:	2.65		C_U	100.7
% Gravel	60.2		LL	-
% Sand	37.9		PL	-
% Fines	1.9		PI	-

Date: 08/20/04
Technician: KL
Reviewer: RMW

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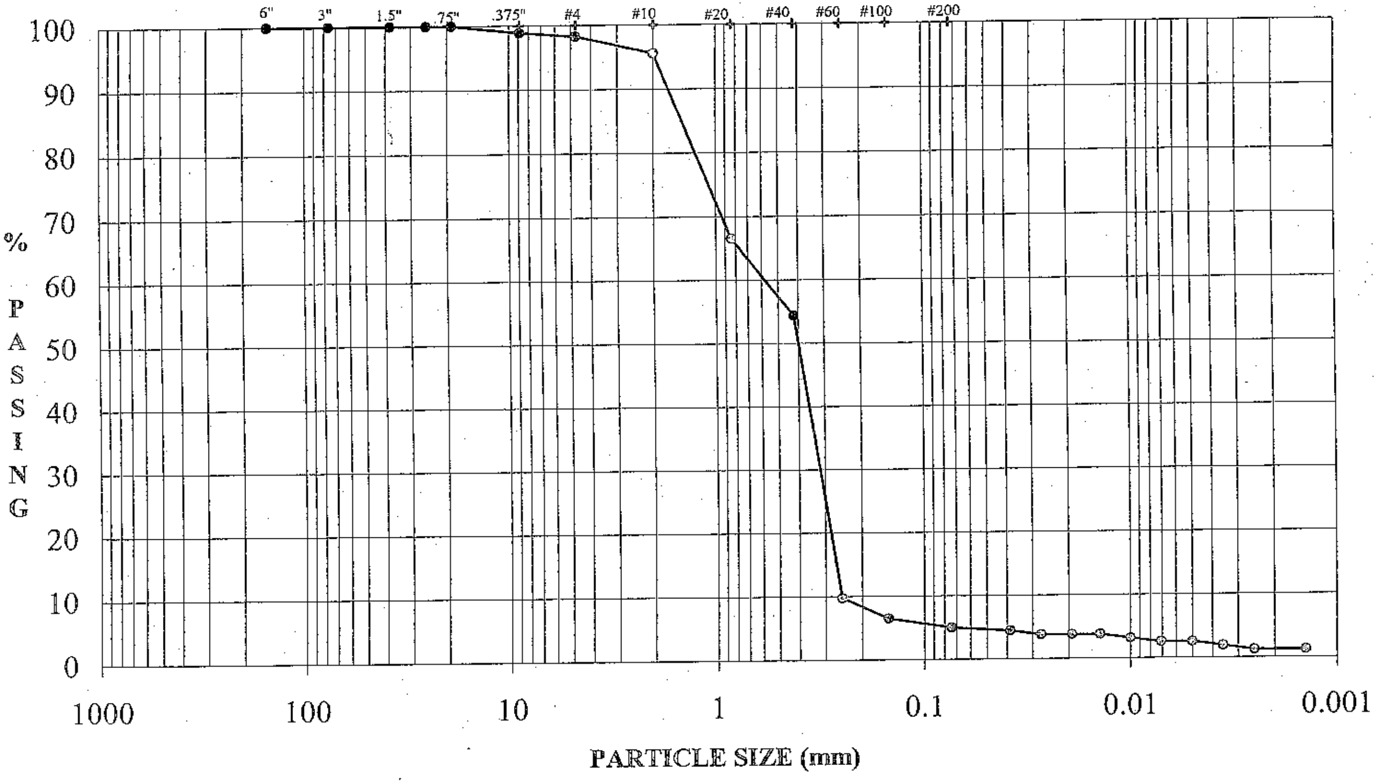

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	98.9%
#4	98.3%
#10	95.6%
#20	66.6%
#40	54.3%
#60	9.7%
#100	6.5%
#200	5.0%

Hydrometer Data

Particle Diameter	% Finer
0.039	4.5%
0.027	3.8%
0.019	3.8%
0.014	3.8%
0.010	3.2%
0.007	2.5%
0.005	2.5%
0.004	1.9%
0.003	1.3%
0.001	1.3%

DESCRIPTION

Sample:	GAL-12	Depth:	9'
		USCS:	SP-SM
Wet Color:	Yellowish black		
Description:	Poorly graded sand with silt		
Comments:			

SAMPLE DATA

W_C (%):	6.2		C_C	0.7
G_S:	2.65	(ASSUMED)	C_U	2.5
% Gravel	1.7		LL	-
% Sand	93.3		PL	-
% Fines	5.0		PI	-

Date:	08/20/04
Technician:	RD
Reviewer:	RMW

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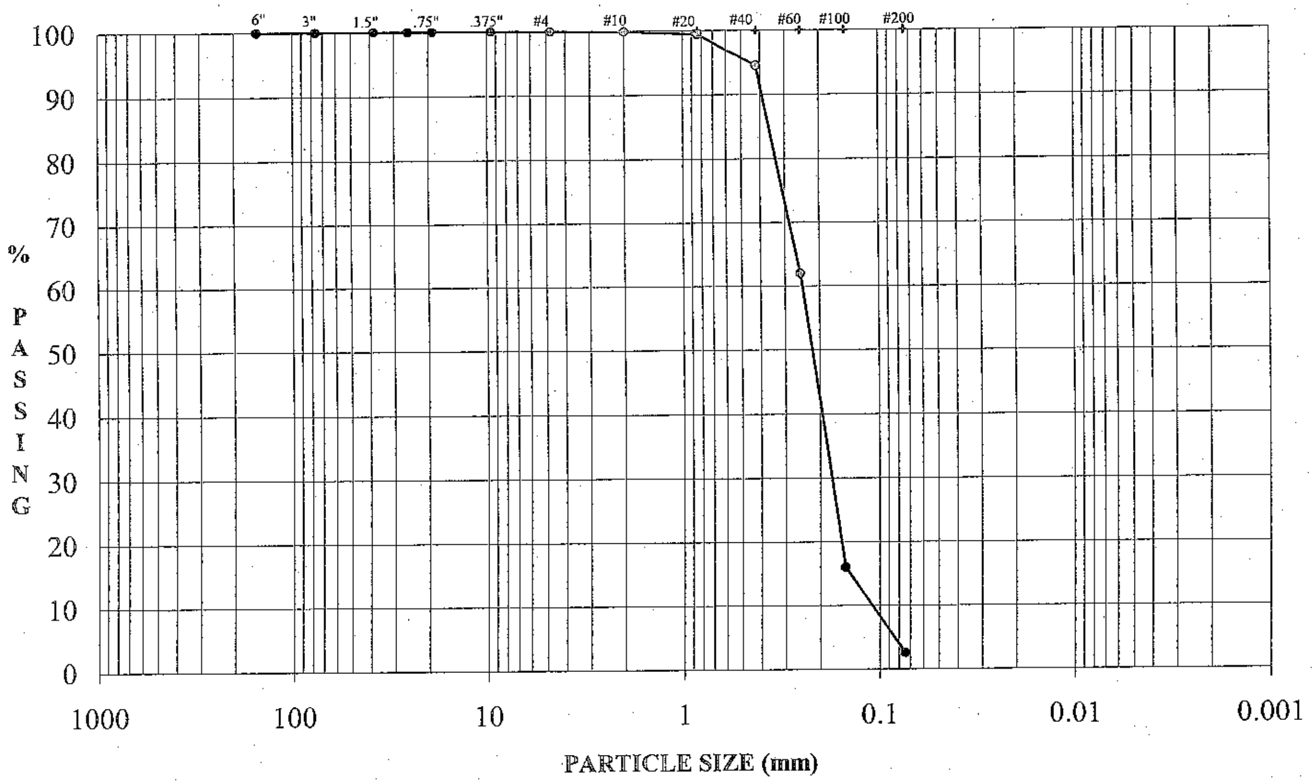

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data

% Gravel	0.0
% Sand	97.4
% Fines	2.6
C_C	1.2
C_U	2.1
LL	-
PL	-
PI	-
USCS	SP
w (%)	30.7

Percent Finer

3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	99.9%
#20	99.4%
#40	94.5%
#60	62.0%
#100	16.0%
#200	2.6%

COMMENTS:

DESCRIPTION

Sample: GAL-10

Depth: 26'

Wet Color: Strong brown

Description: Poorly graded sand

Date: 07/19/04

Technician: ND

Reviewer: RMW

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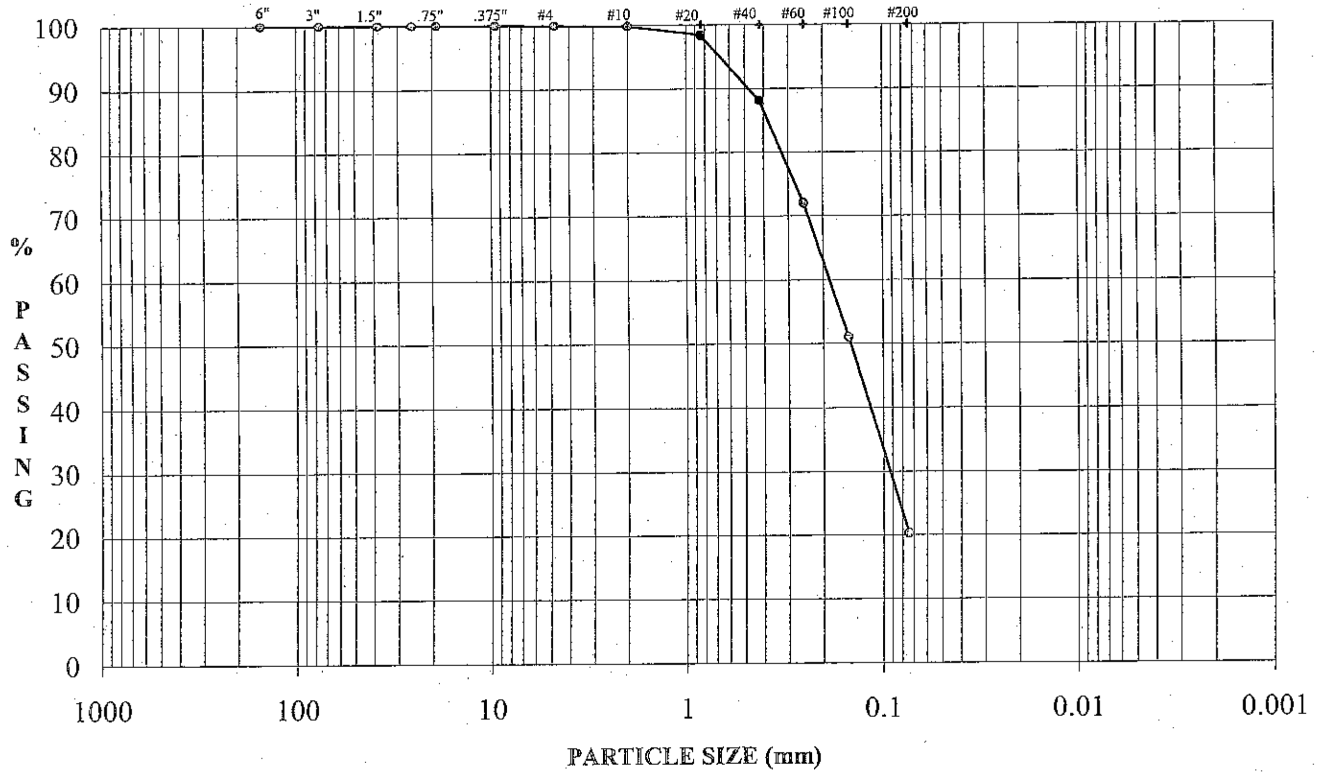

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	0.1
% Sand	79.7
% Fines	20.2
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	22.3
Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.9%
#10	99.8%
#20	98.3%
#40	88.1%
#60	72.0%
#100	51.0%
#200	20.2%

COMMENTS:

DESCRIPTION

Sample: GAL-10

Depth: 24.5'

Wet Color: Strong brown

Description: m-f Sand, some fines, trace gravel

Date: 07/19/04

Technician: ND

Reviewer: RMW

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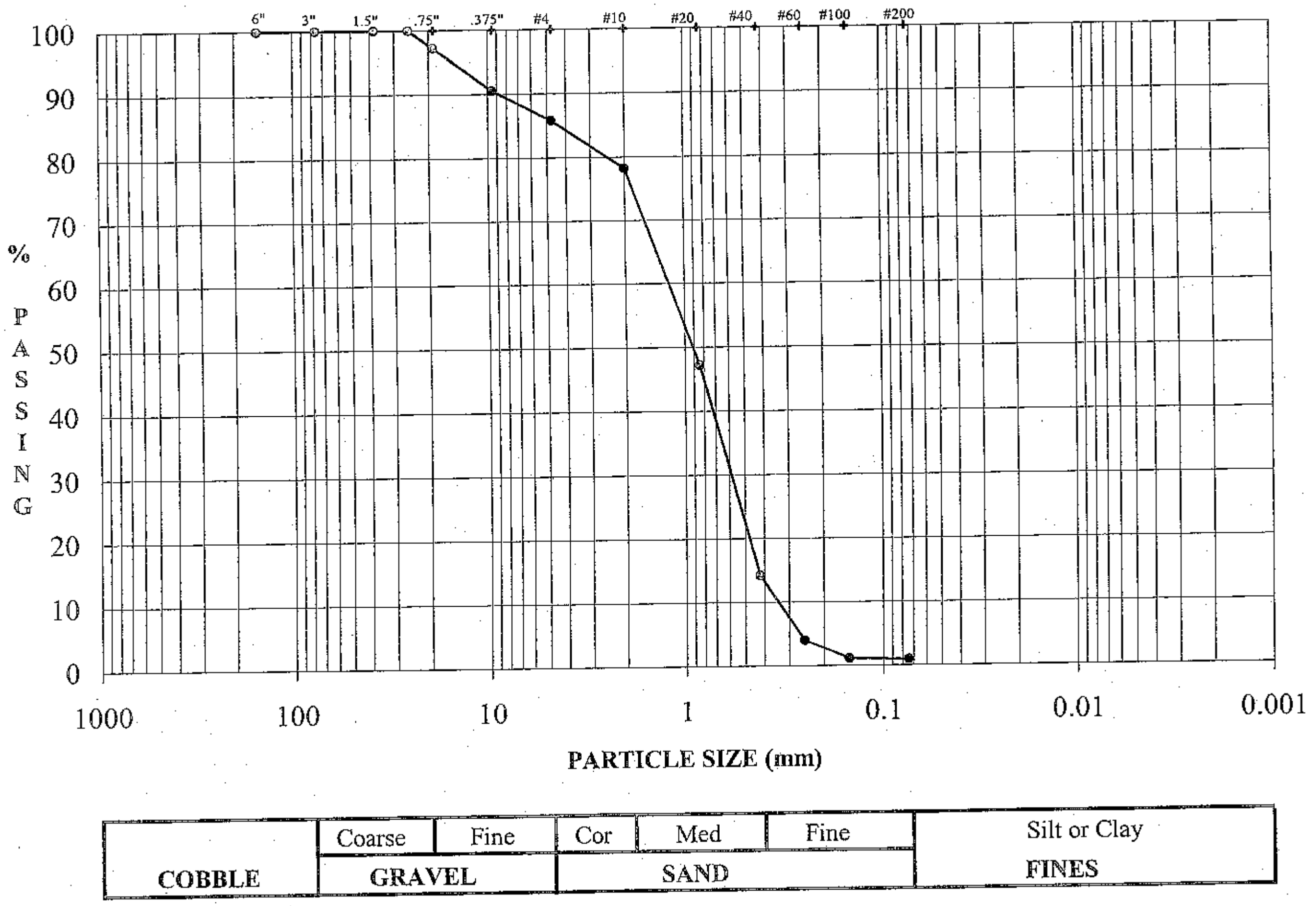

Sample Data	
% Gravel	14.2
% Sand	84.8
% Fines	1.0
C_C	0.8
C_U	3.8
LL	-
PL	-
PI	-
USCS	SP
w (%)	16.7

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	97.2%
3/8"	90.5%
#4	85.8%
#10	78.2%
#20	47.2%
#40	14.2%
#60	3.9%
#100	1.2%
#200	1.0%

COMMENTS:

DESCRIPTION

Sample: GAL-10

Depth: 20'

Wet Color: Strong brown

Description: Poorly graded sand

Date: 07/16/04

Technician: AW

Reviewer: RMW

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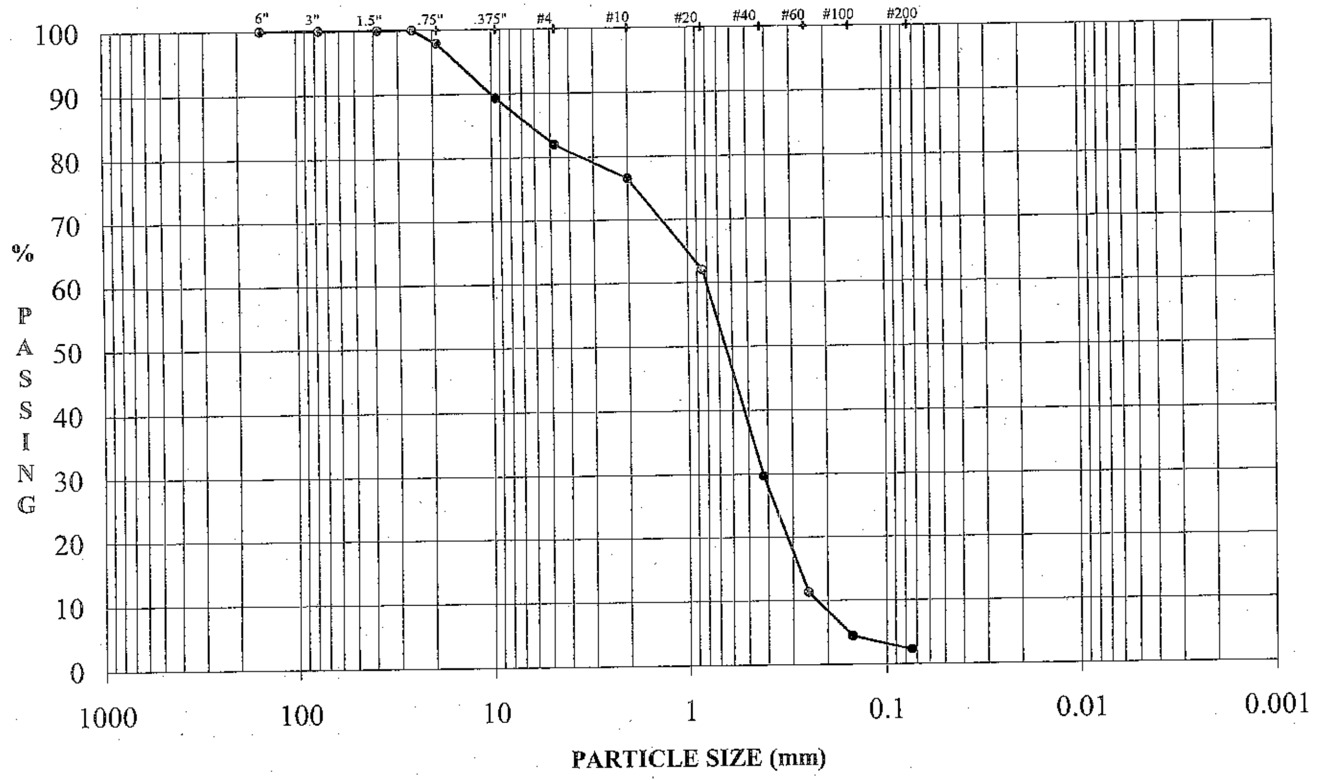

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	18.0
% Sand	79.7
% Fines	2.3
C_C	1.0
C_U	3.6
LL	-
PL	-
PI	-
USCS	SP
w (%)	15.9

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	97.9%
3/8"	89.3%
#4	82.0%
#10	76.5%
#20	62.0%
#40	29.6%
#60	11.3%
#100	4.5%
#200	2.3%

COMMENTS:

DESCRIPTION

Sample: GAL-10

Depth: 13'

Wet Color: Strong brown

Description: Poorly graded sand with gravel

Date: 07/16/04

Technician: AW

Reviewer: RMW

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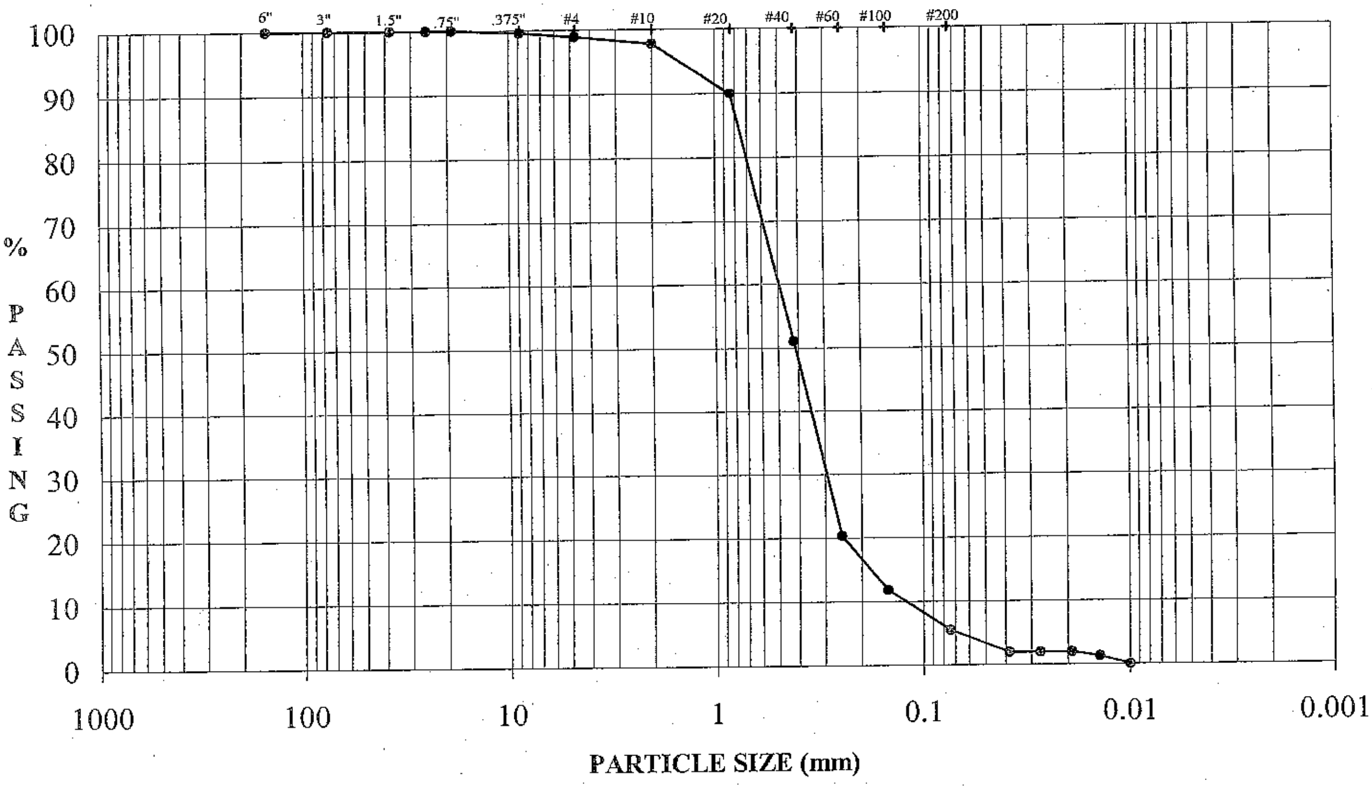


COBBLE	Coarse	Fine	Cor	Med	Fine	Silt or Clay
	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	99.6%
#4	98.9%
#10	97.8%
#20	89.9%
#40	51.1%
#60	20.4%
#100	11.8%
#200	5.5%

Hydrometer Data

Particle Diameter	% Finer
0.038	2.0%
0.027	2.0%
0.019	2.0%
0.014	1.3%
0.010	0.0%

DESCRIPTION

Sample:	GAL-09	Depth:	23'
		USCS:	SP-SM
Wet Color:	Olive brown		
Description:	Poorly graded sand with silt		
Comments:			

SAMPLE DATA

W_C (%):	10.3		C_C	1.5
G_S:	2.65	(ASSUMED)	C_U	4.1
% Gravel	1.1		LL	-
% Sand	93.5		PL	-
% Fines	5.5		PI	-

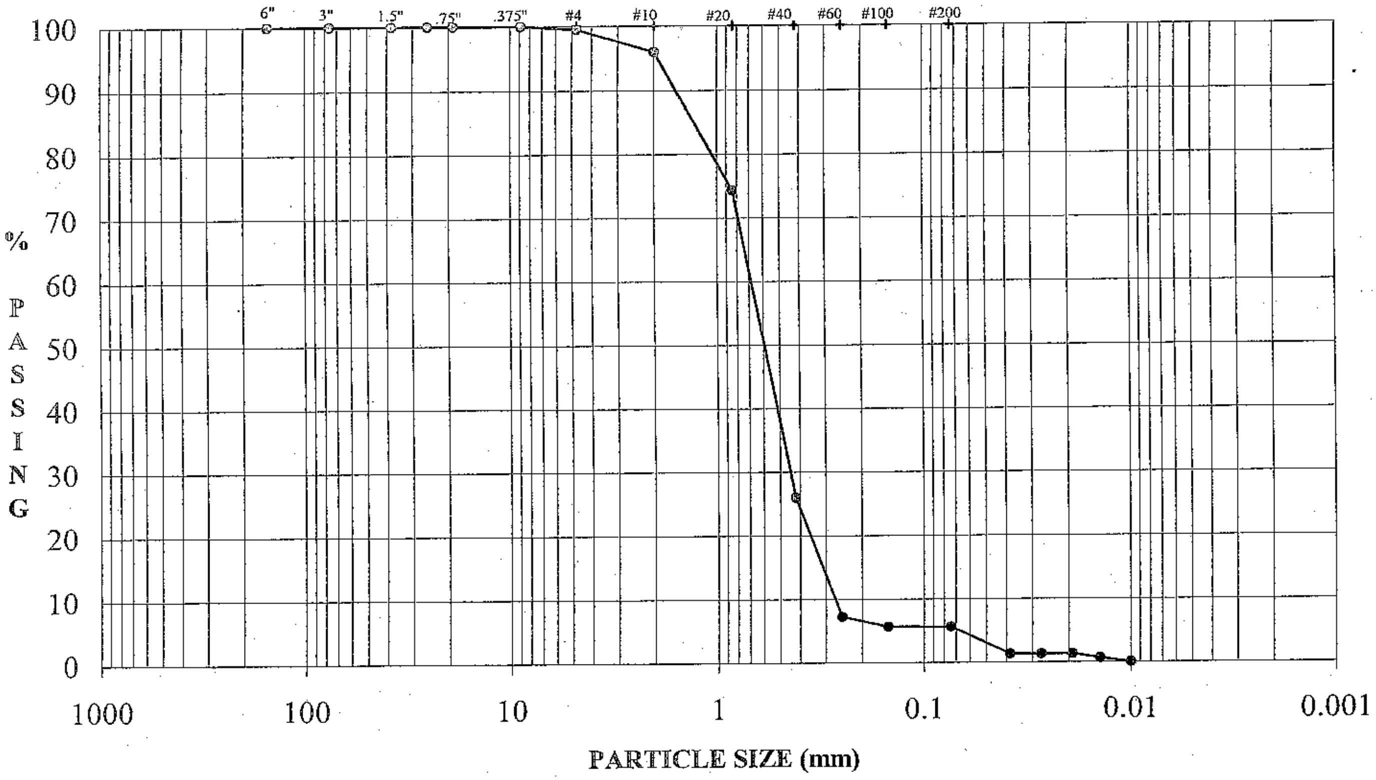
Date: 08/31/04
Technician: AM
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

PARTICLE-SIZE DISTRIBUTION TM D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.5%
#10	96.0%
#20	74.3%
#40	26.0%
#60	7.3%
#100	5.7%
#200	5.6%

Hydrometer Data

Particle Diameter	% Finer
0.038	1.3%
0.027	1.3%
0.019	1.3%
0.014	0.7%
0.010	0.0%

DESCRIPTION

Sample:	GAL-09	Depth:	20'
		USCS:	SP-SM
Wet Color:	Strong brown		
Description:	Poorly graded sand with silt		
Comments:			

SAMPLE DATA

W_C (%):	3.1		C_C	1.0
G_S:	2.65	(ASSUMED)	C_U	2.4
% Gravel	0.5		LL	-
% Sand	93.9		PL	-
% Fines	5.6		PI	-

Date: 08/31/04
Technician: AM
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

GOLDER ASSOCIATES INC.
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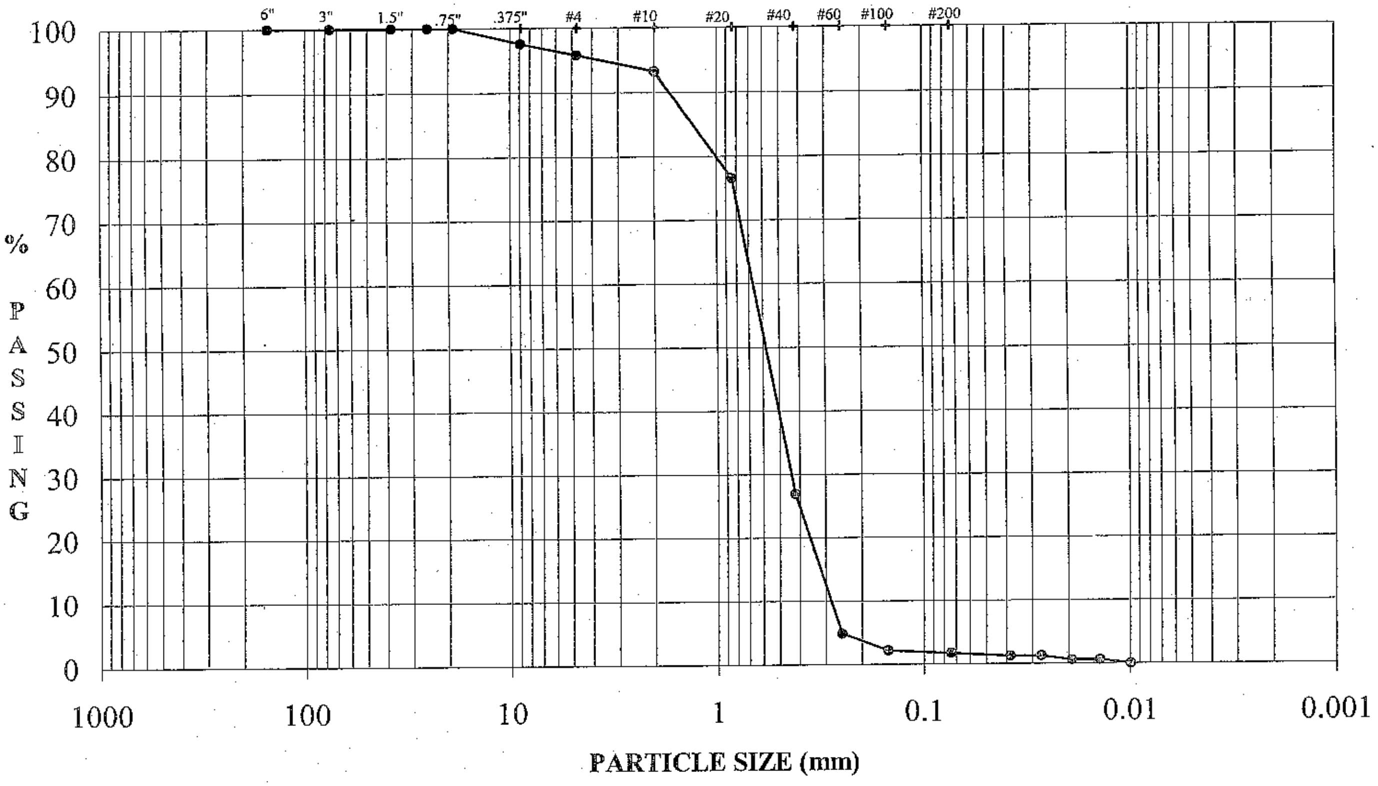

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	97.6%
#4	95.8%
#10	93.2%
#20	76.5%
#40	26.9%
#60	4.8%
#100	2.2%
#200	1.8%

Hydrometer Data

Particle Diameter	% Finer
0.038	1.2%
0.027	1.2%
0.019	0.6%
0.014	0.6%
0.010	0.0%

DESCRIPTION

Sample:	GAL-09	Depth:	12'
		USCS:	SP
Wet Color:	Brownish yellow		
Description:	Poorly graded sand		
Comments:			

SAMPLE DATA

W_C (%):	3.0		C_C	1.0
G_S:	2.65	(ASSUMED)	C_U	2.4
% Gravel	4.2		LL	-
% Sand	94.0		PL	-
% Fines	1.8		PI	-

Date: 08/31/04
Technician: AM
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
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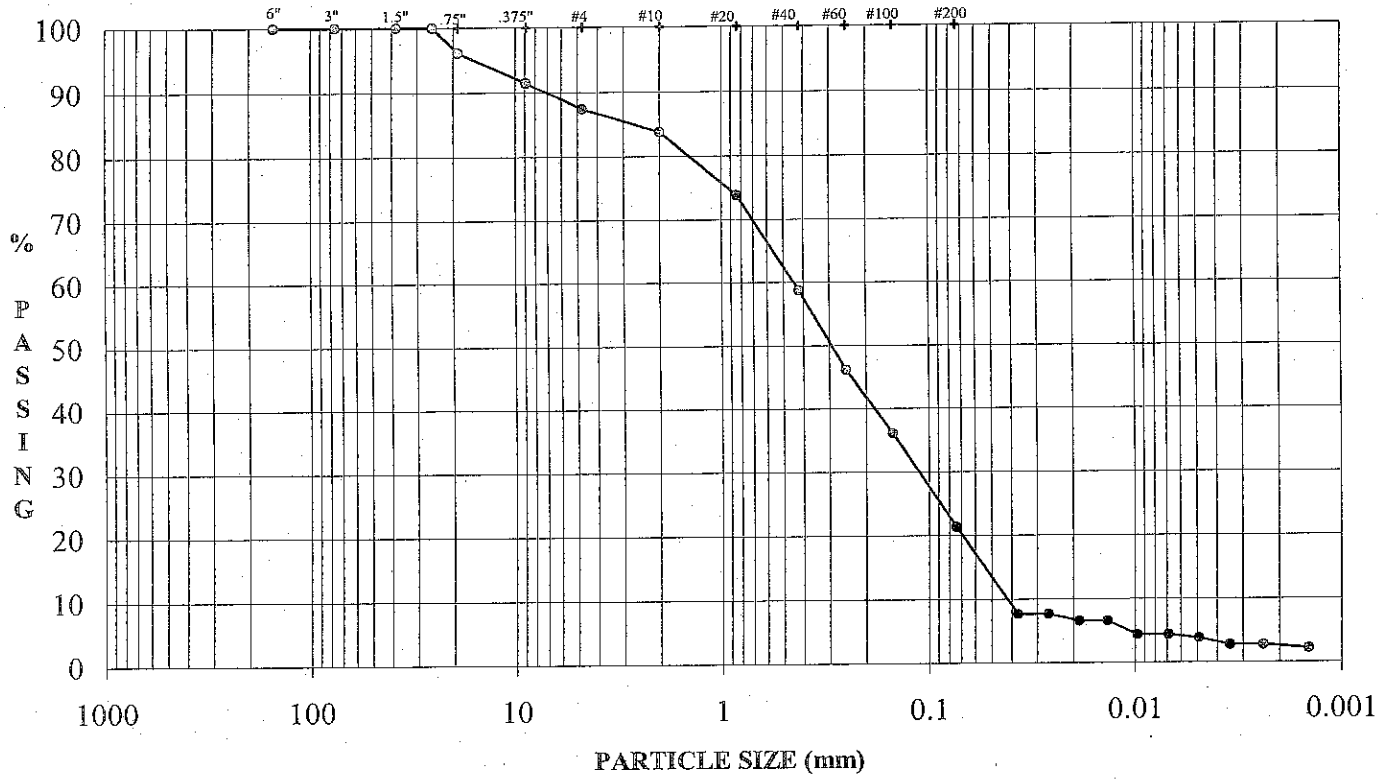

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	96.1%
3/8"	91.5%
#4	87.4%
#10	83.7%
#20	73.8%
#40	58.8%
#60	46.2%
#100	36.1%
#200	21.4%

Hydrometer Data

Particle Diameter	% Finer
0.037	7.6%
0.026	7.6%
0.019	6.5%
0.014	6.5%
0.010	4.3%
0.007	4.3%
0.005	3.8%
0.003	2.7%
0.002	2.7%
0.001	2.2%

DESCRIPTION

Sample: GAL-09

Depth: 8'

USCS: -

Wet Color: Light olive brown

Description: m-f Sand, some fines, little gravel

Comments:

SAMPLE DATA

W_C (%):	13.7		C_C	N/A
G_S:	2.65	(ASSUMED)	C_U	N/A
% Gravel	12.6		LL	-
% Sand	66.0		PL	-
% Fines	21.4		PI	-

Date: 08/31/04

Technician: KL

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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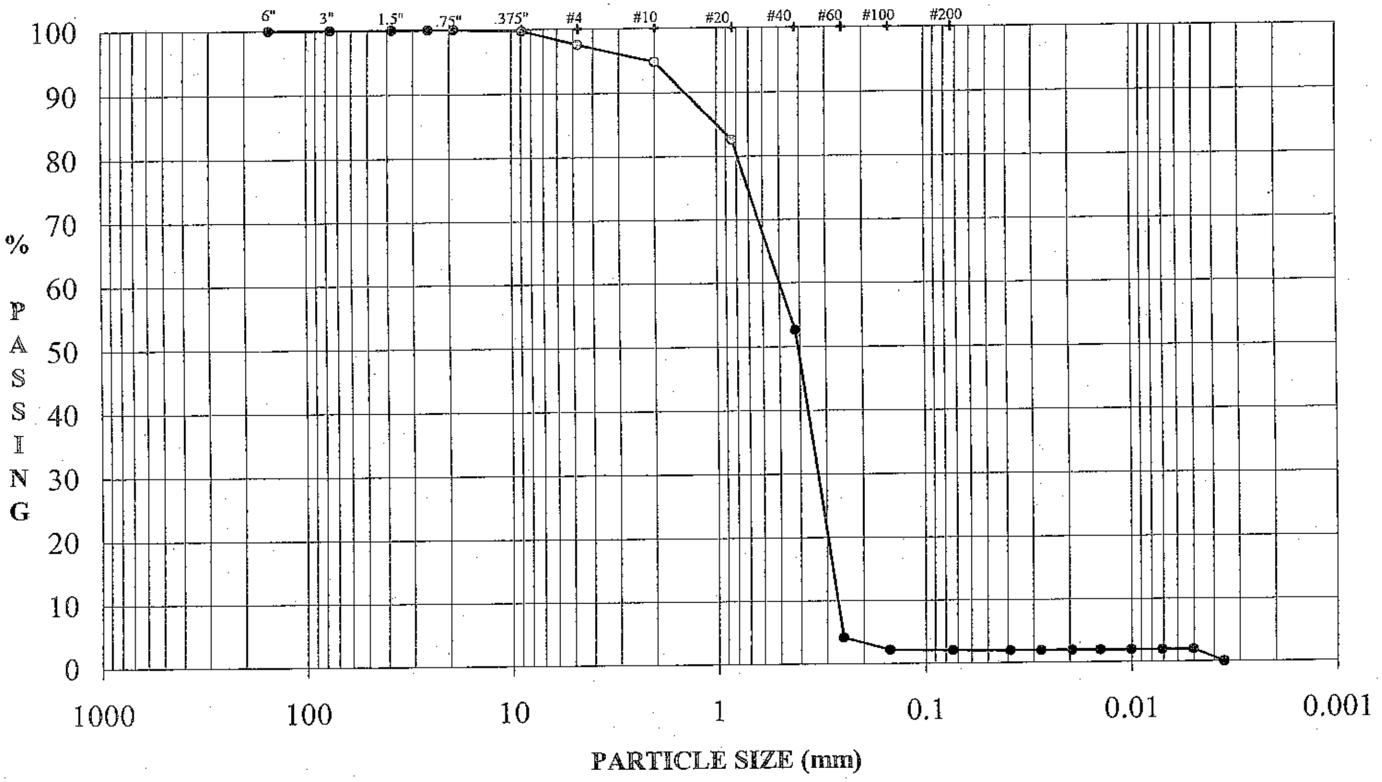
US STANDARD SIEVE OPENING SIZES



COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sieve Data	
Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	99.7%
#4	97.5%
#10	94.8%
#20	82.6%
#40	52.6%
#60	4.2%
#100	2.2%
#200	2.0%

Hydrometer Data	
Particle Diameter	% Finer
0.039	1.9%
0.027	1.9%
0.019	1.9%
0.014	1.9%
0.010	1.9%
0.007	1.9%
0.005	1.9%
0.004	0.0%

DESCRIPTION

Sample:	GAL-01R	Depth:	21'
		USCS:	SP
Wet Color:	Dark olive		
Description:	Poorly graded sand		
Comments:			

SAMPLE DATA

W_C (%):	10.7		C_C	0.9
G_S:	2.65	(ASSUMED)	C_U	1.9
% Gravel	2.5		LL	-
% Sand	95.5		PL	-
% Fines	2.0		PI	-

Date:	08/20/04
Technician:	KL
Reviewer:	RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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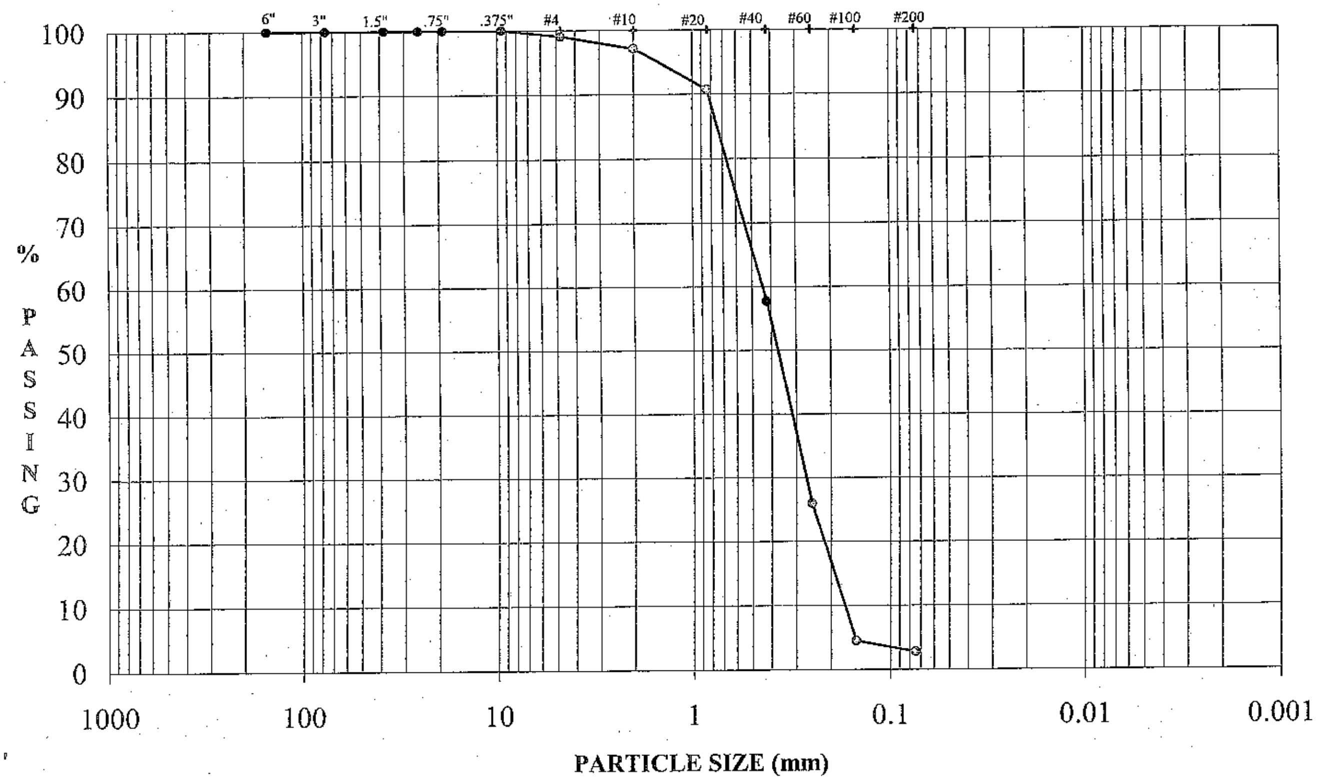
US STANDARD SIEVE OPENING SIZES



COBBLE	Coarse	Fine	Cor	Med	Fine	Silt or Clay
	GRAVEL		SAND			FINES

Sample Data	
% Gravel	1.0
% Sand	96.2
% Fines	2.8
C_C	0.9
C_U	2.6
LL	-
PL	-
PI	-
USCS	SP
w (%)	17.5

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.0%
#10	97.1%
#20	90.7%
#40	57.8%
#60	25.9%
#100	4.5%
#200	2.8%

COMMENTS:

DESCRIPTION

Sample: GAL-13

Depth: 17'

Wet Color: Olive brown

Description: Poorly graded sand

Date: 07/21/04

Technician: AW

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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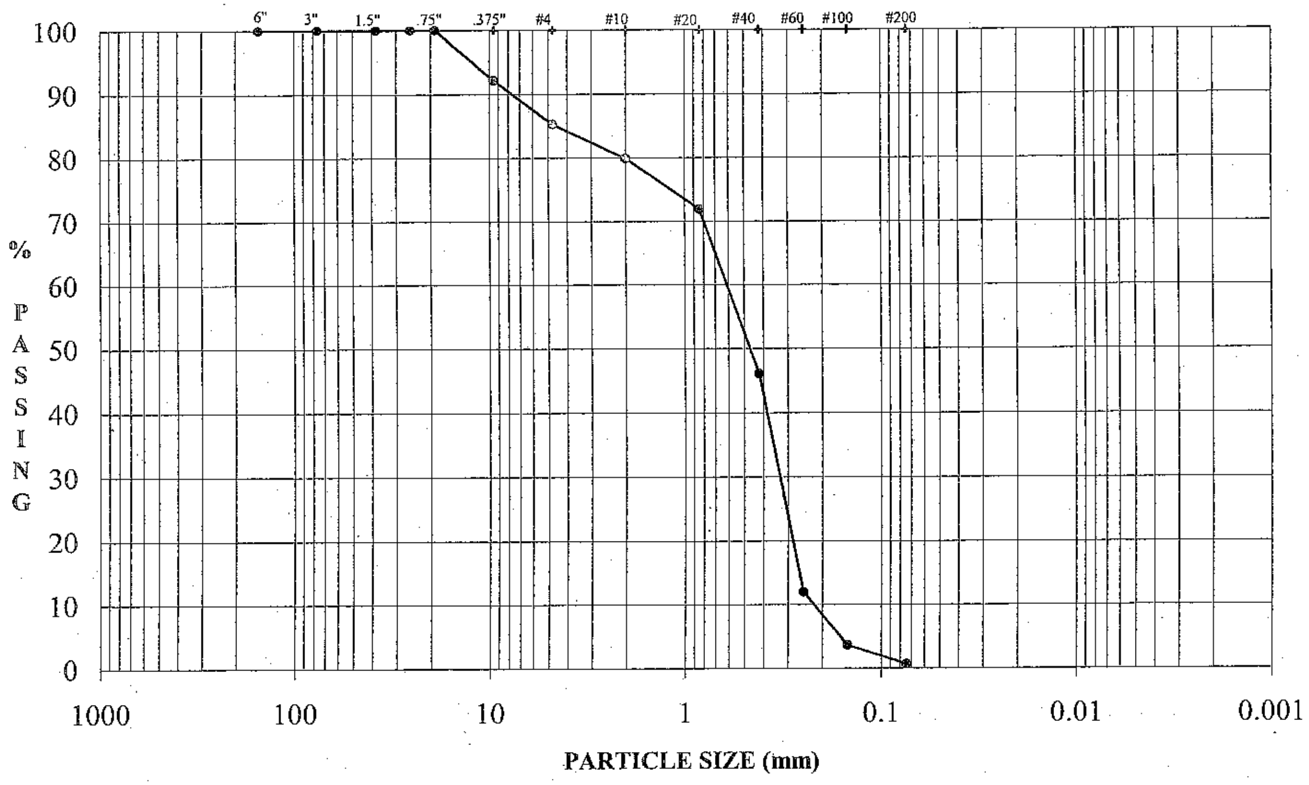
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	14.7
% Sand	84.6
% Fines	0.7
C_C	0.8
C_U	2.8
LL	-
PL	-
PI	-
USCS	SP
w (%)	15.8

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	92.2%
#4	85.3%
#10	79.9%
#20	71.9%
#40	46.0%
#60	12.0%
#100	3.7%
#200	0.7%

COMMENTS:

DESCRIPTION

Sample: GAL-17

Depth: 20'

Wet Color: Olive brown

Description: Poorly graded sand

Date: 07/16/04

Technician: KL

Reviewer: RMW

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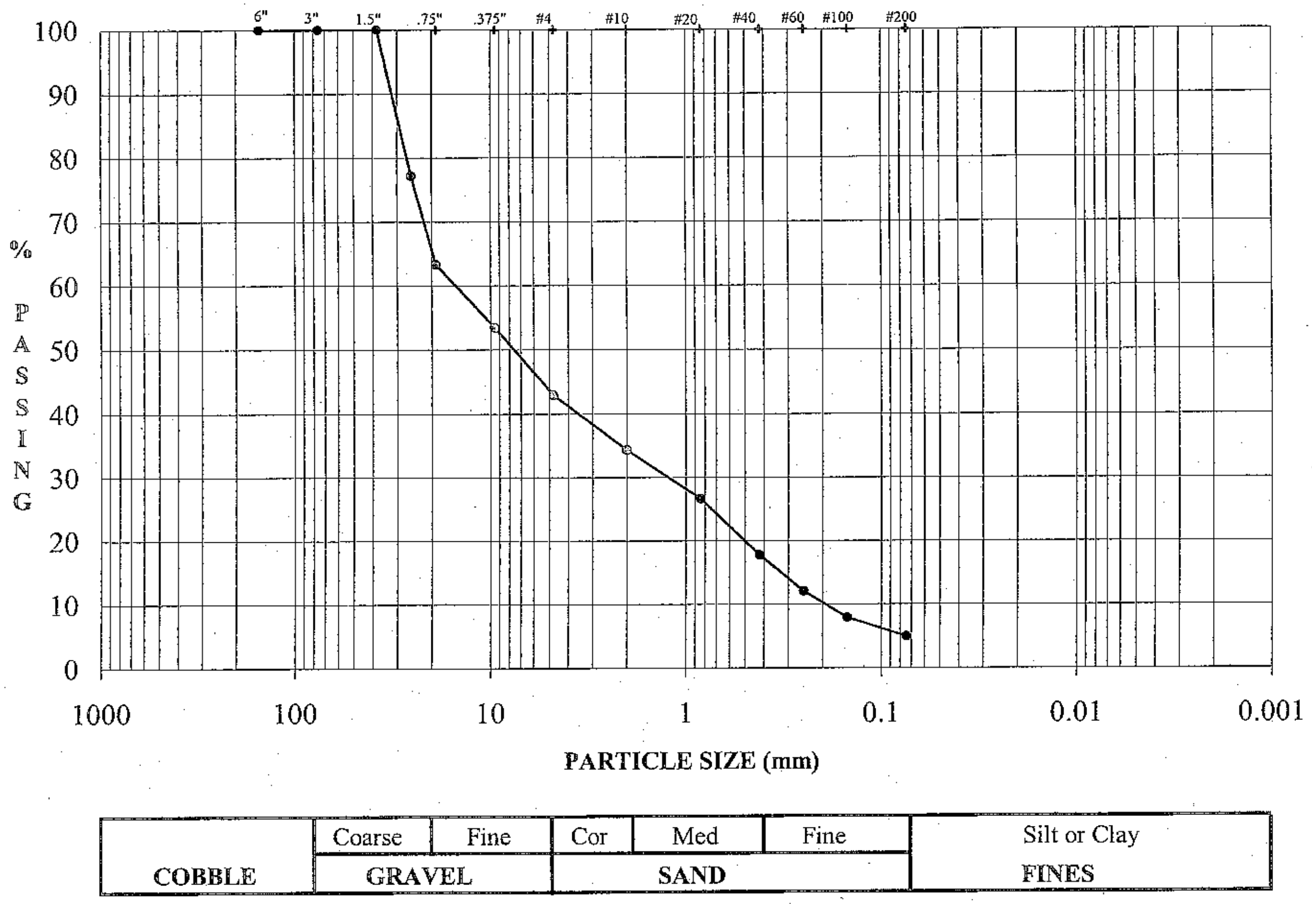

Sample Data	
% Gravel	57.1
% Sand	38.0
% Fines	4.9
C_C	0.5
C_U	80.7
LL	-
PL	-
PI	-
USCS	GP
w (%)	9.3

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	77.2%
3/4"	63.3%
3/8"	53.5%
#4	42.9%
#10	34.3%
#20	26.6%
#40	17.7%
#60	12.0%
#100	7.9%
#200	4.9%

COMMENTS:

DESCRIPTION

Sample: GAL-17

Depth: 15'

Wet Color: Olive brown

Description: Poorly graded gravel with sand

Date: 07/16/04

Technician: KL

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

GOLDER ASSOCIATES INC.
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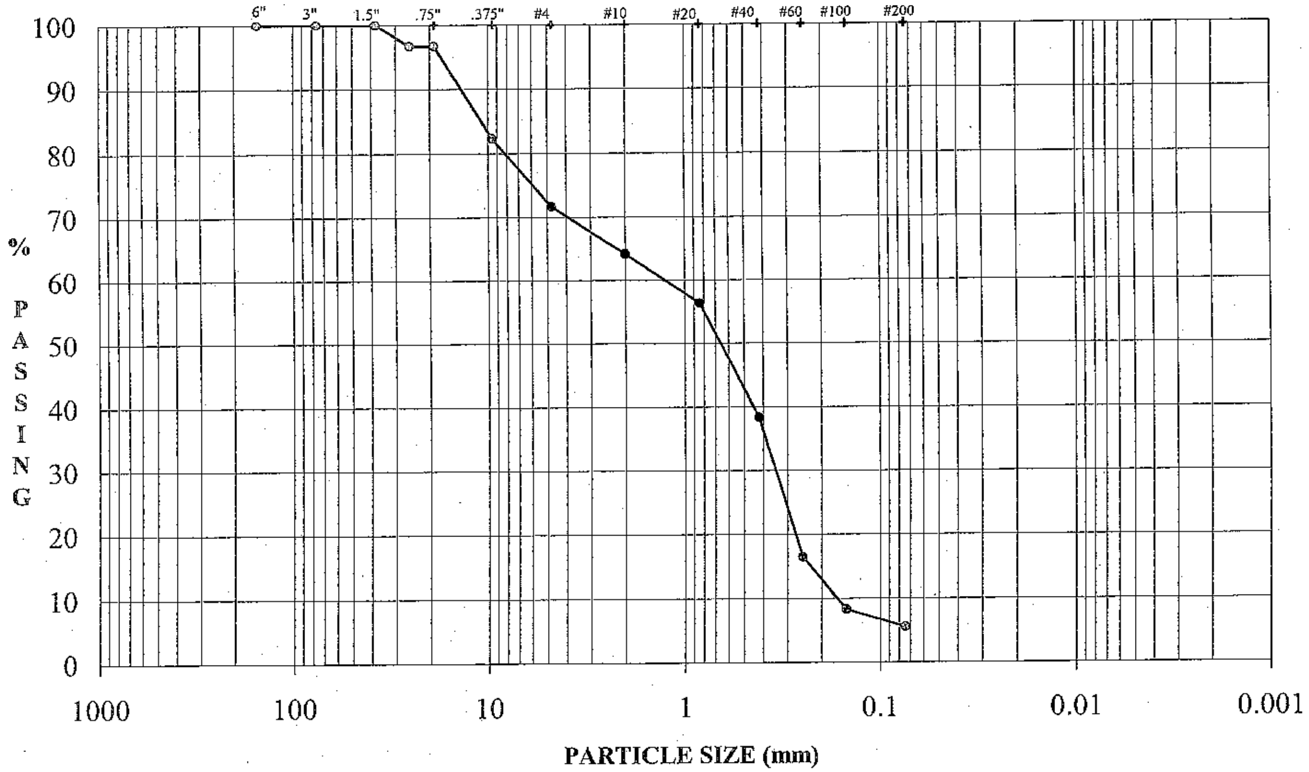


	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data

% Gravel	28.3
% Sand	66.2
% Fines	5.5
C_C	0.6
C_U	7.7
LL	-
PL	-
PI	-
USCS	SP
w (%)	11.9

Percent Finer

3"	100.0%
1 1/2"	100.0%
1"	96.7%
3/4"	96.7%
3/8"	82.3%
#4	71.7%
#10	64.2%
#20	56.4%
#40	38.3%
#60	16.5%
#100	8.2%
#200	5.5%

COMMENTS:

DESCRIPTION

Sample: GAL-17

Depth: 10'

Wet Color: Olive brown

Description: Poorly graded sand with gravel

Date: 07/16/04

Technician: KL

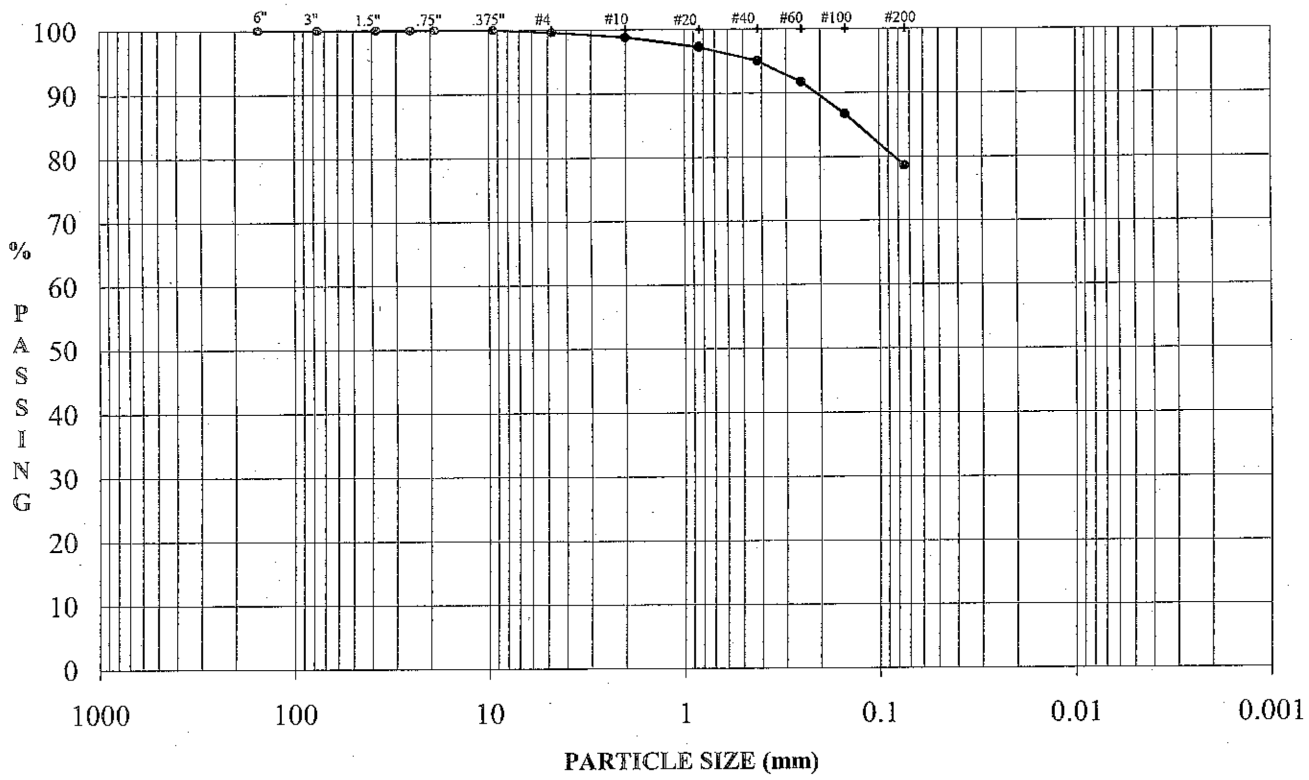
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data

% Gravel	0.4
% Sand	20.9
% Fines	78.6
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	32.9

Percent Finer

3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.6%
#10	98.7%
#20	97.2%
#40	95.0%
#60	91.7%
#100	86.7%
#200	78.6%

COMMENTS:

DESCRIPTION

Sample: GAL-15

Depth: 29'

Wet Color: Reddish yellow

Description: Fines, some f sand, trace gravel

Date: 07/16/04

Technician: AW

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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CHERRY HILL, NEW JERSEY

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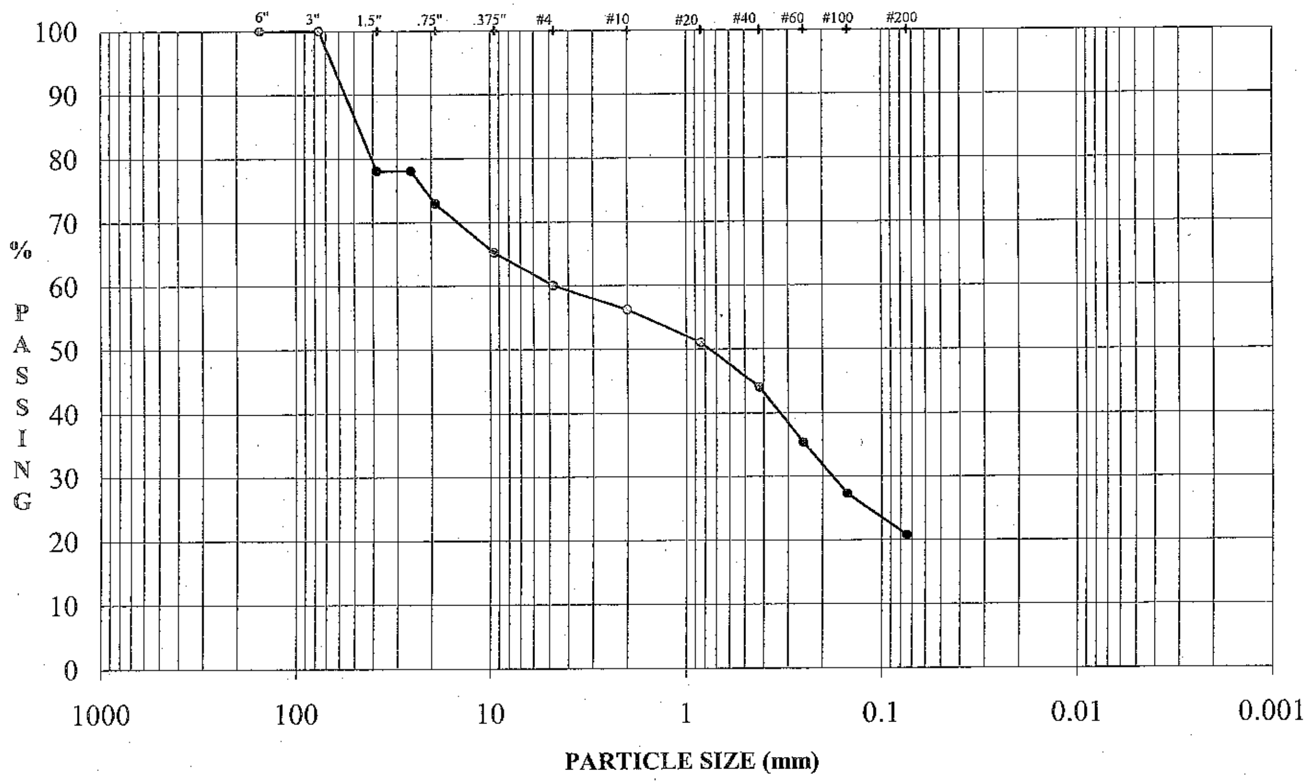
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	40.0
% Sand	39.3
% Fines	20.7
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	13.3

Percent Finer	
3"	100.0%
1 1/2"	78.0%
1"	78.0%
3/4"	72.9%
3/8"	65.2%
#4	60.0%
#10	56.2%
#20	51.0%
#40	44.0%
#60	35.3%
#100	27.3%
#200	20.7%

COMMENTS:

DESCRIPTION

Sample: GAL-15

Depth: 20'

Wet Color: Dark olive

Description: c-f Gravel and m-f Sand, some fines

Date: 07/16/04

Technician: KL

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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CHERRY HILL, NEW JERSEY

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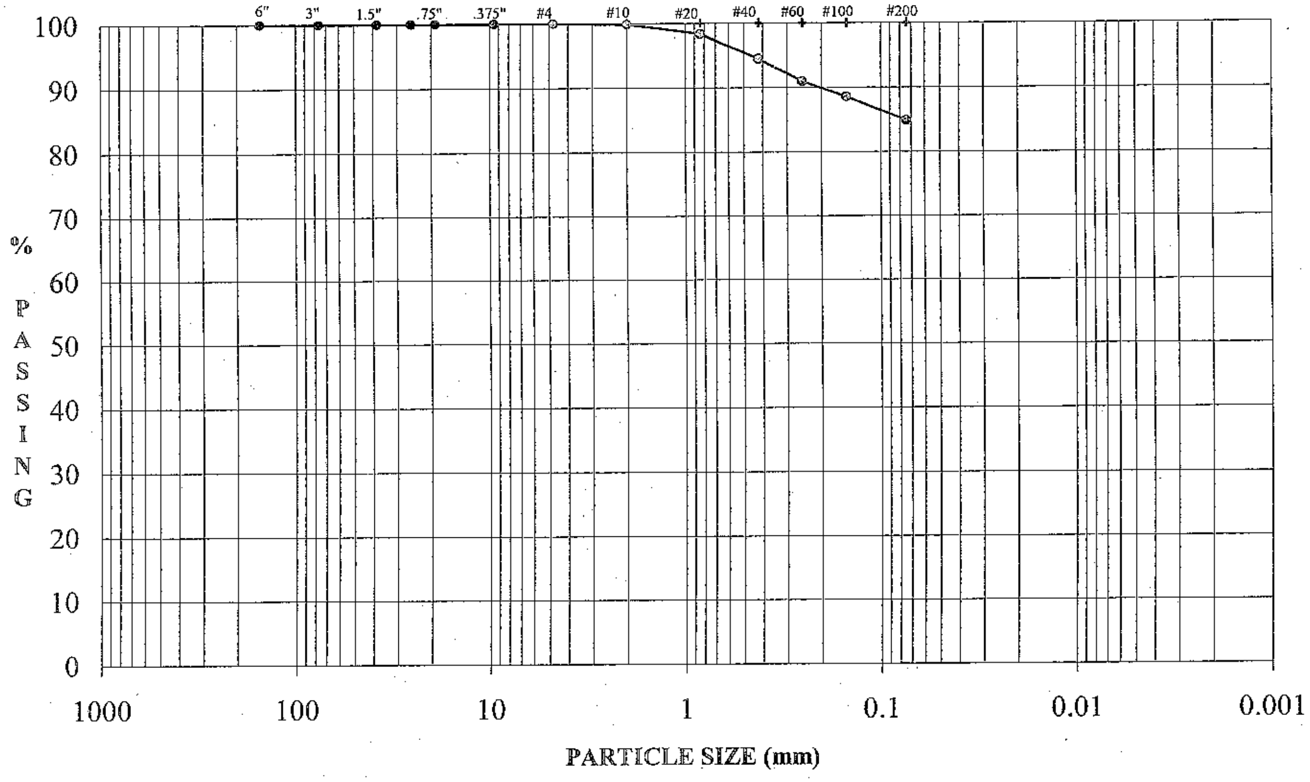

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	0.0
% Sand	15.2
% Fines	84.8
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	36.1

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	99.9%
#20	98.3%
#40	94.4%
#60	91.0%
#100	88.5%
#200	84.8%

COMMENTS:

DESCRIPTION

Sample: GAL-15

Depth: 18'

Wet Color: Reddish yellow

Description: Fines,
some sand

Date: 07/16/04

Technician: KL

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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CHERRY HILL, NEW JERSEY

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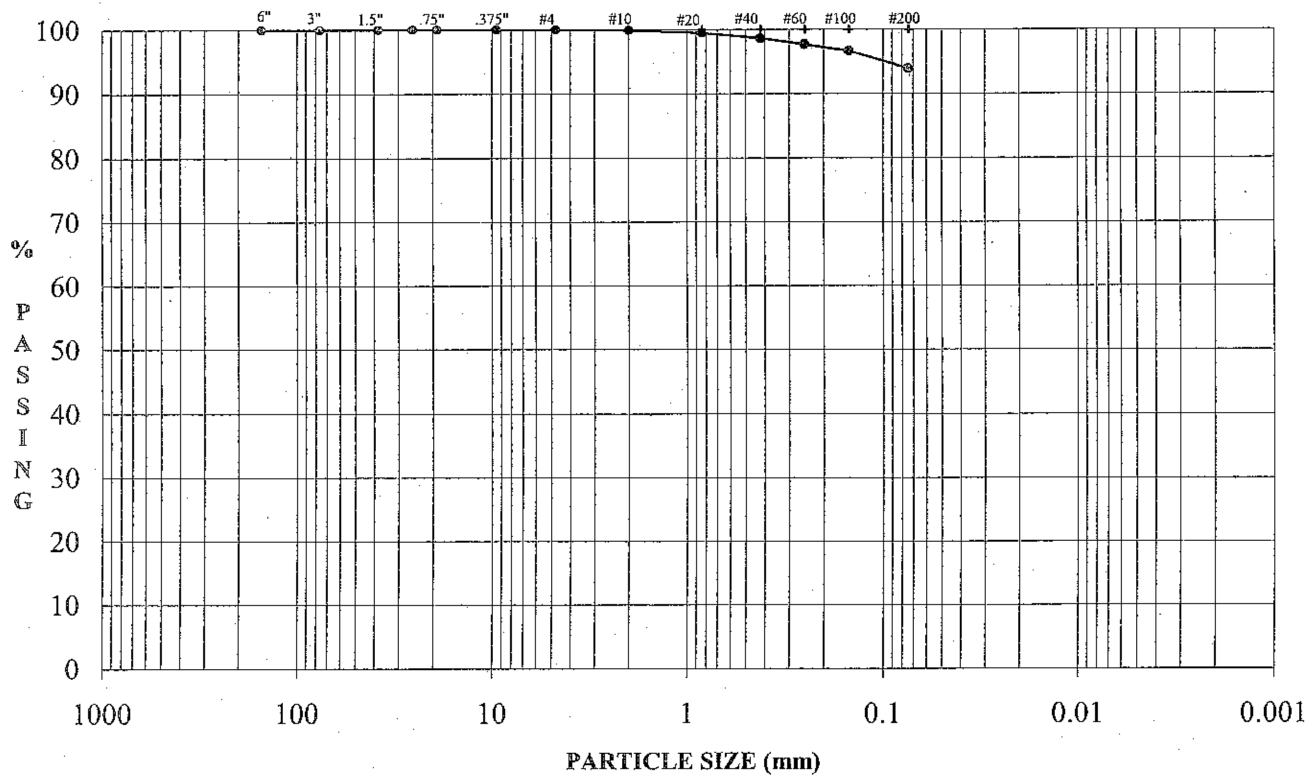

COBBLE	Coarse	Fine	Cor	Med	Fine	Silt or Clay
	GRAVEL		SAND			FINES

Sample Data	
% Gravel	0.0
% Sand	6.1
% Fines	93.9
C_C	N/A
C_U	N/A
LL	-
PL	-
PI	-
USCS	-
w (%)	34.5

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	99.9%
#20	99.4%
#40	98.5%
#60	97.6%
#100	96.6%
#200	93.9%

COMMENTS:

DESCRIPTION

Sample: GAL-15

Depth: 15'

Wet Color: Reddish yellow

Description: Fines,
little sand

Date: 07/16/04

Technician: KL

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
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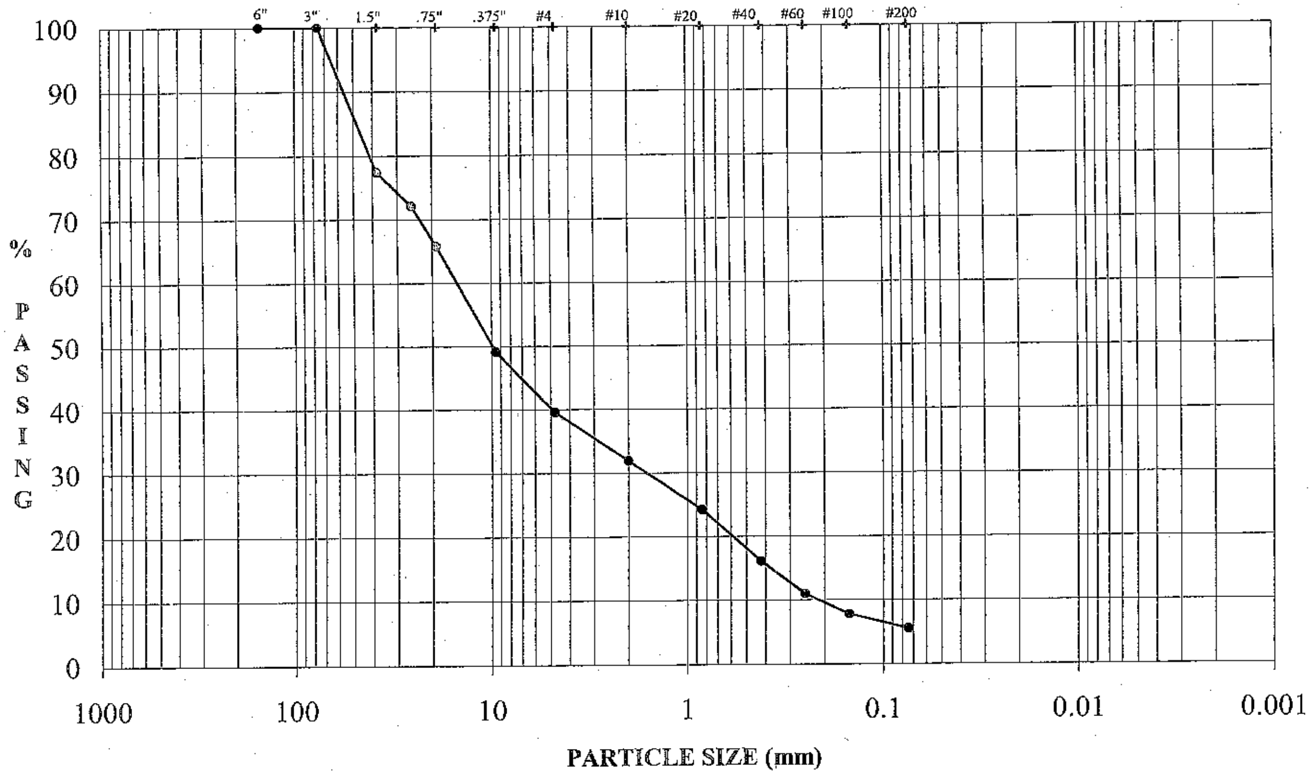

COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sample Data	
% Gravel	60.5
% Sand	34.0
% Fines	5.5
C_C	0.7
C_U	67.6
LL	-
PL	-
PI	-
USCS	GP-GM
w (%)	7.7

Percent Finer	
3"	100.0%
1 1/2"	77.5%
1"	72.1%
3/4"	65.8%
3/8"	49.1%
#4	39.5%
#10	31.9%
#20	24.2%
#40	16.1%
#60	10.9%
#100	7.8%
#200	5.5%

COMMENTS:

DESCRIPTION

Sample: GAL-15

Depth: 10"

Wet Color: Dark olive

Description: Poorly graded gravel with silt and sand

Date: 07/16/04

Technician: AW

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
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CHERRY HILL, NEW JERSEY

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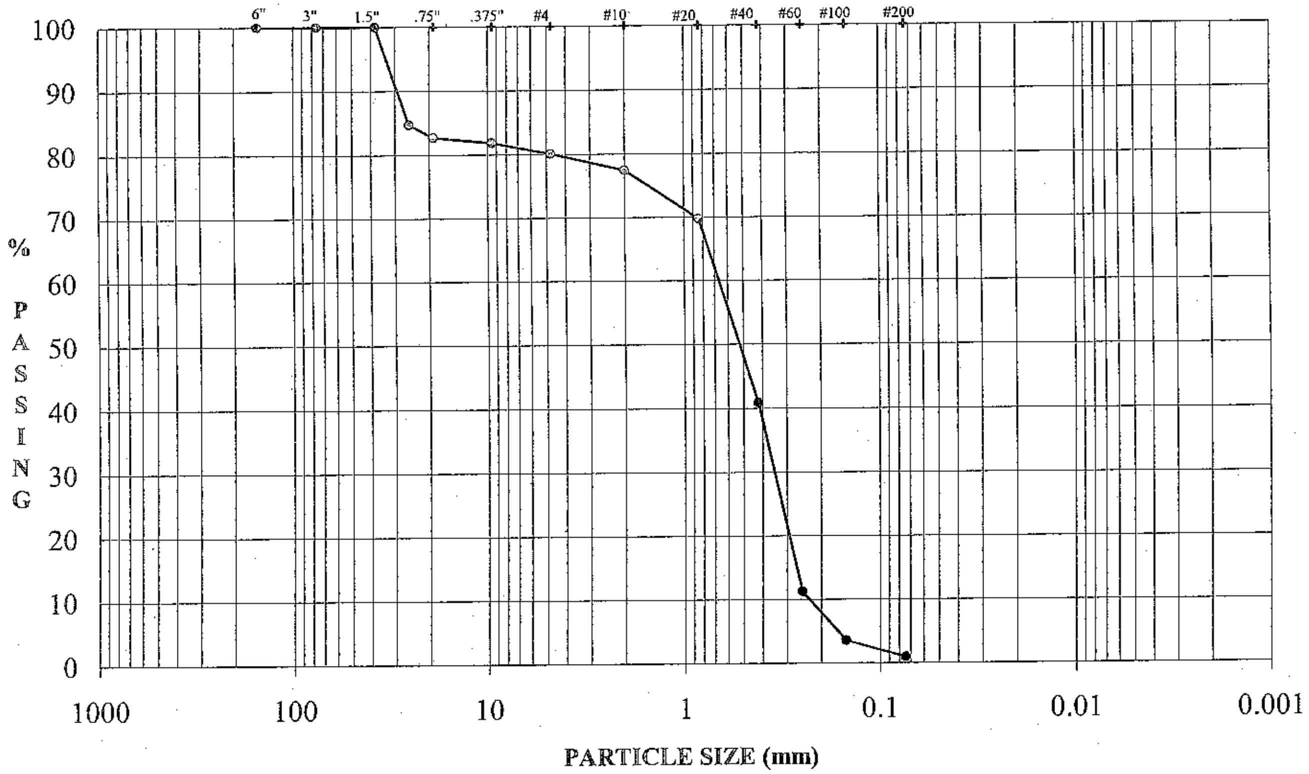

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	19.9
% Sand	79.2
% Fines	1.0
C_C	0.8
C_U	3.0
LL	-
PL	-
PI	-
USCS	SP
w (%)	15.7

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	84.7%
3/4"	82.7%
3/8"	81.9%
#4	80.1%
#10	77.5%
#20	69.8%
#40	40.9%
#60	11.2%
#100	3.6%
#200	1.0%

COMMENTS:

DESCRIPTION

Sample: GAL-14

Depth: 27'

Wet Color: Dark yellowish brown

Description: Poorly graded sand with gravel

Date: 07/19/04

Technician: ND

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
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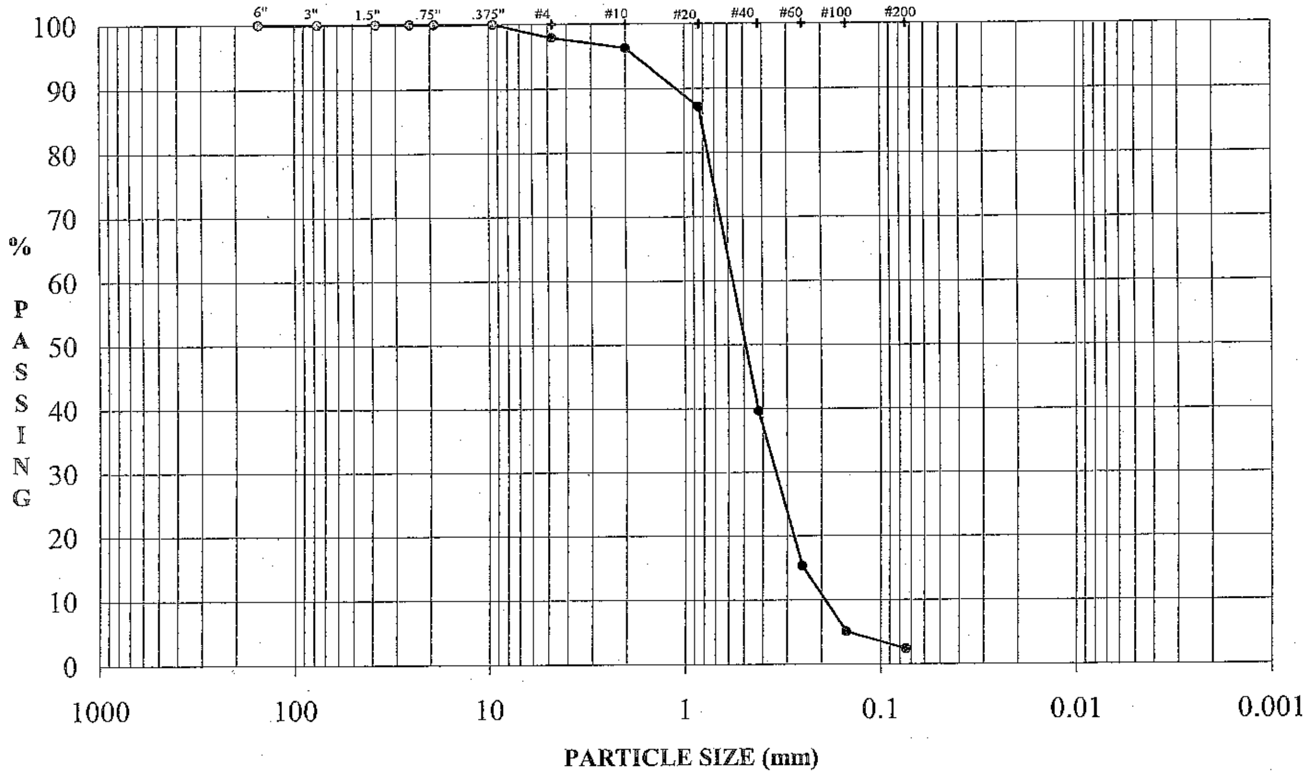

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	2.0
% Sand	95.6
% Fines	2.4
C_C	1.0
C_U	2.8
LL	-
PL	-
PI	-
USCS	SP
w (%)	46.6

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	98.0%
#10	96.3%
#20	87.1%
#40	39.6%
#60	15.3%
#100	5.0%
#200	2.4%

COMMENTS:

DESCRIPTION

Sample: GAL-14

Depth: 21'

Wet Color: Dark yellowish brown

Description: Poorly graded sand

Date: 07/19/04

Technician: AM

Reviewer: RMW

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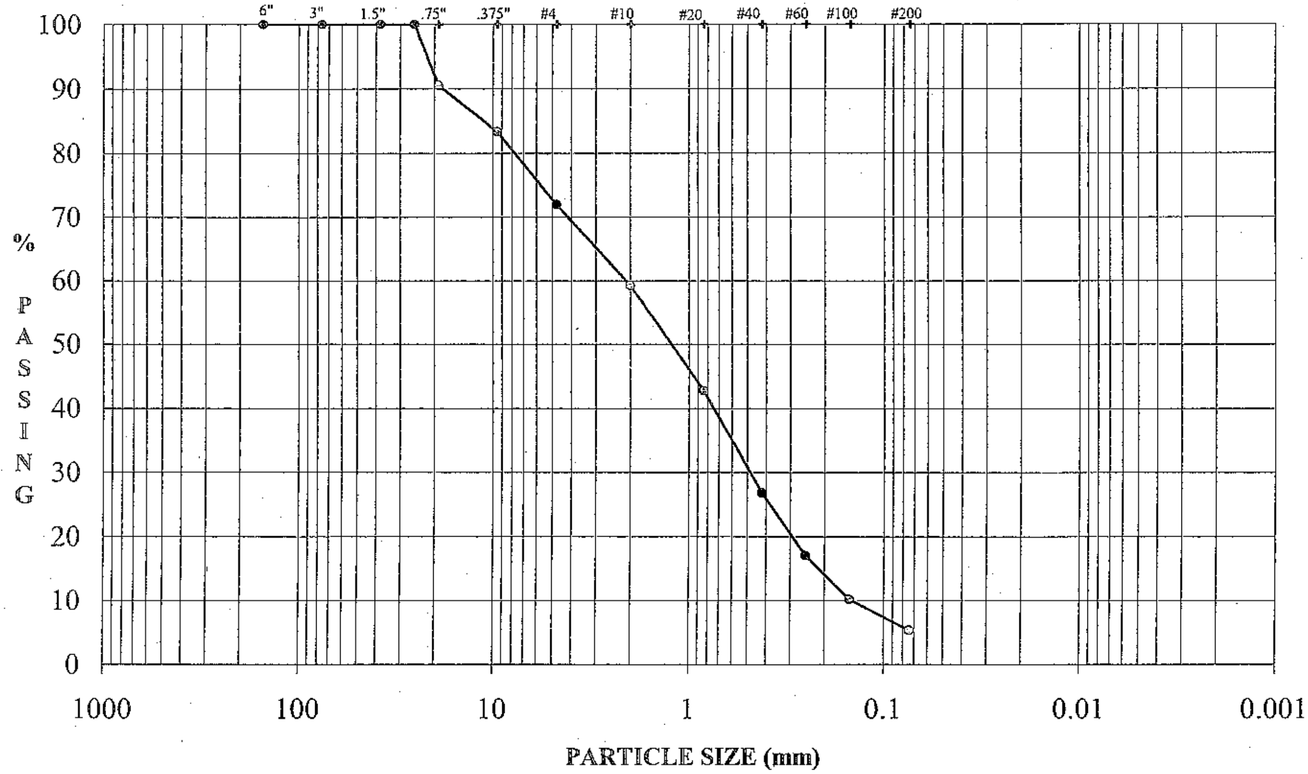

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	28.0
% Sand	66.7
% Fines	5.3
C_C	0.8
C_U	14.6
LL	-
PL	-
PI	-
USCS	SP-SM
w (%)	12.2

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	90.5%
3/8"	83.4%
#4	72.0%
#10	59.3%
#20	42.8%
#40	26.8%
#60	17.1%
#100	10.2%
#200	5.3%

COMMENTS:

DESCRIPTION

Sample: GAL-14

Depth: 14'

Wet Color: Dark yellowish brown

Description: Poorly graded sand with silt and gravel

Date: 07/19/04

Technician: ND

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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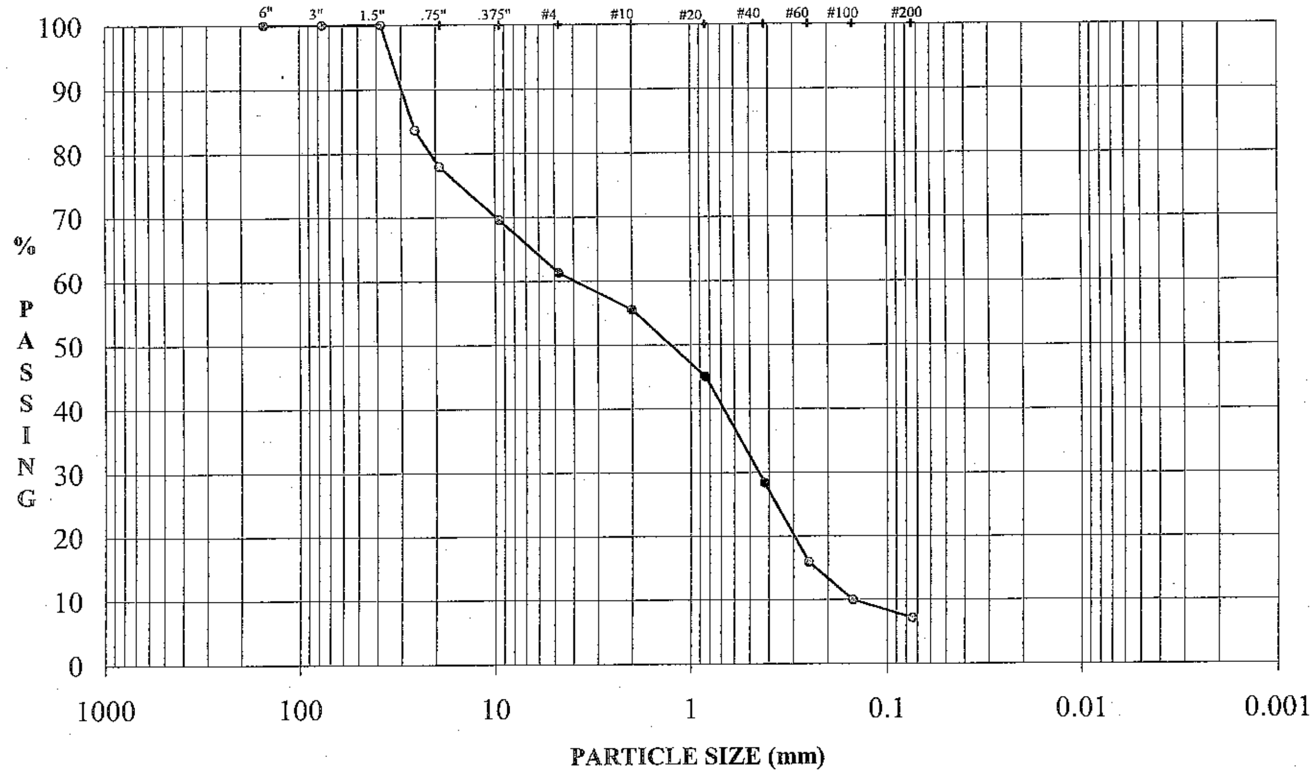
US STANDARD SIEVE OPENING SIZES



COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sample Data	
% Gravel	38.7
% Sand	54.2
% Fines	7.1
C_C	0.3
C_U	26.6
LL	-
PL	-
PI	-
USCS	SP-SM
w (%)	48.0

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	83.7%
3/4"	77.9%
3/8"	69.6%
#4	61.3%
#10	55.5%
#20	45.1%
#40	28.4%
#60	15.9%
#100	9.9%
#200	7.1%

COMMENTS:

DESCRIPTION

Sample: GAL-14

Depth: 9'

Wet Color: Dark yellowish brown

Description: Poorly graded sand with silt and gravel

Date: 07/19/04

Technician: ND

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

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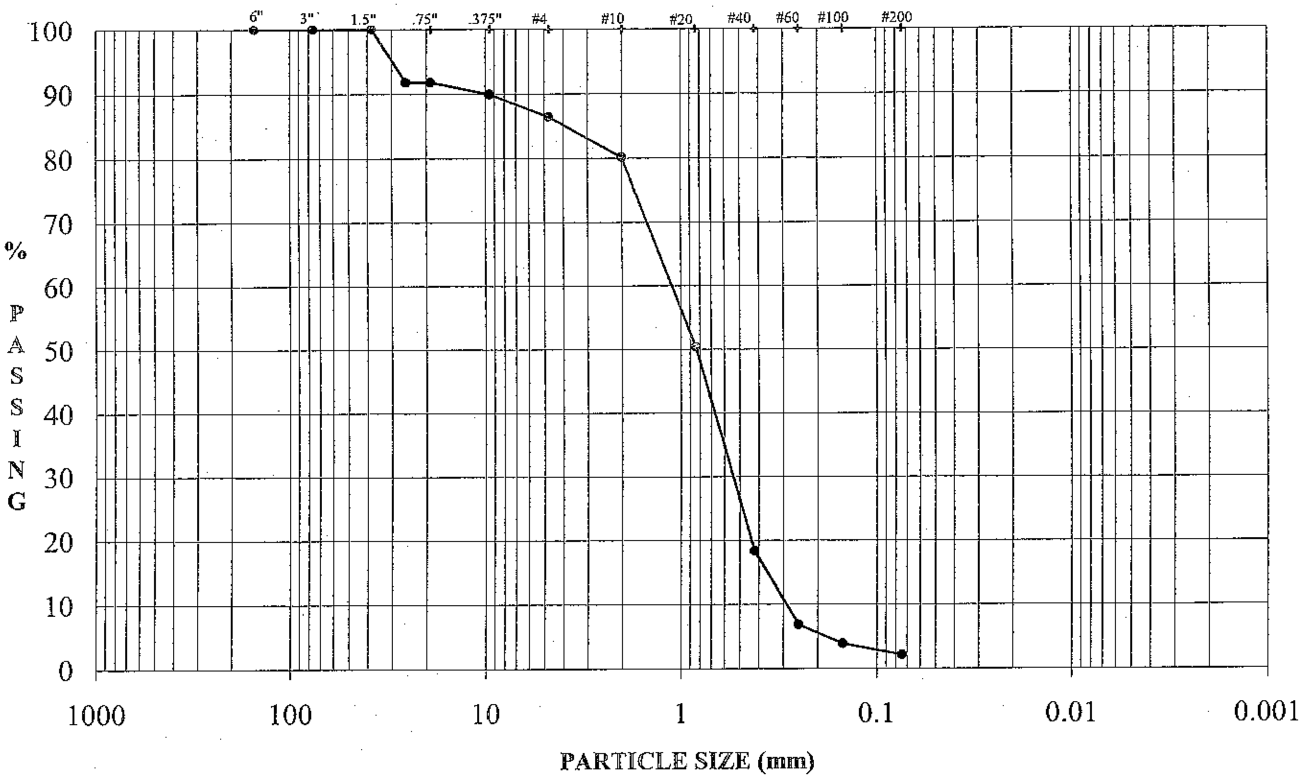

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	13.5
% Sand	84.3
% Fines	2.2
C_C	1.0
C_U	4.0
LL	-
PL	-
PI	-
USCS	SP
w (%)	20.4

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	91.8%
3/4"	91.8%
3/8"	90.0%
#4	86.5%
#10	80.1%
#20	50.4%
#40	18.3%
#60	6.9%
#100	3.9%
#200	2.2%

COMMENTS:

DESCRIPTION

Sample: GAL-13

Depth: 26'

Wet Color: Olive brown

Description: Poorly graded sand

Date: 07/21/04

Technician: AW

Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY

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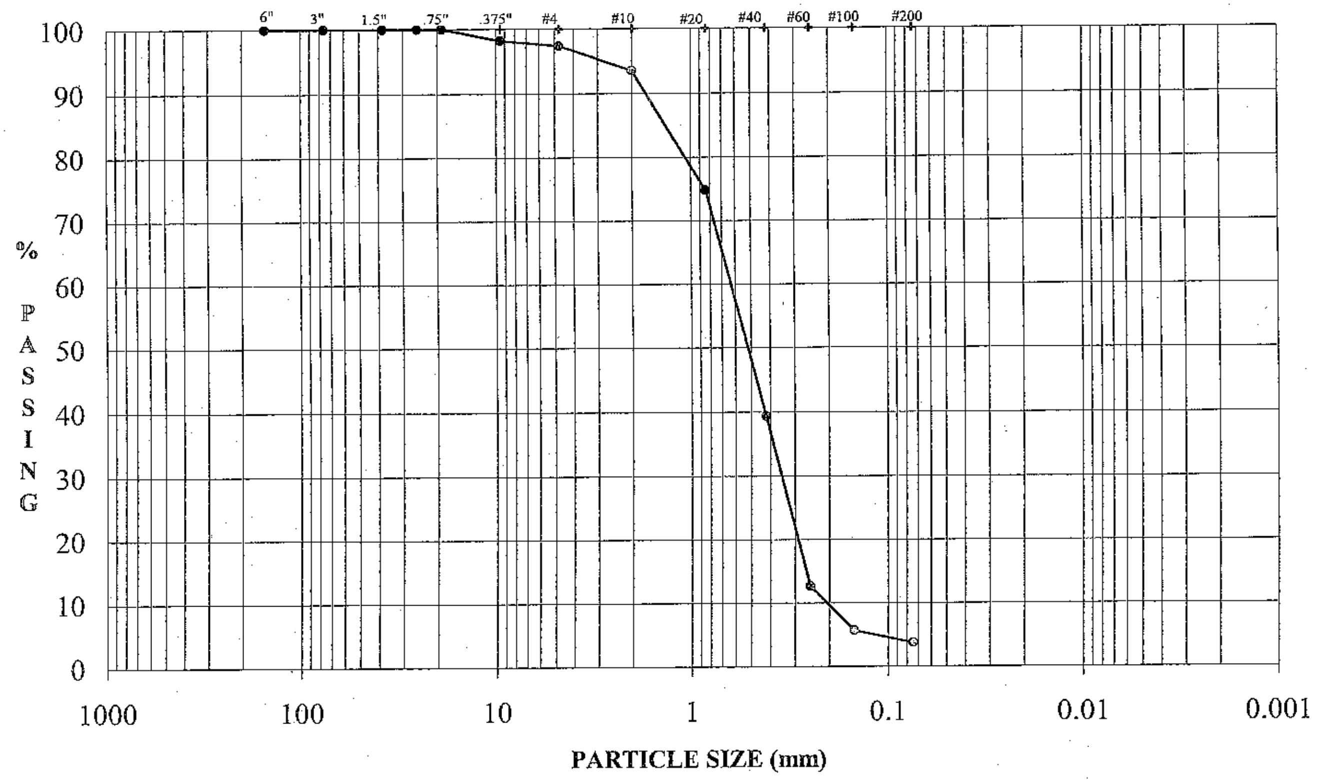

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	2.6
% Sand	93.6
% Fines	3.8
C_C	0.8
C_U	2.8
LL	-
PL	-
PI	-
USCS	SP
w (%)	17.0

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	98.3%
#4	97.4%
#10	93.6%
#20	74.8%
#40	39.3%
#60	12.7%
#100	5.7%
#200	3.8%

COMMENTS:

DESCRIPTION

Sample: GAL-13

Depth: 20'

Wet Color: Olive brown

Description: Poorly graded sand

Date: 07/21/04

Technician: AW

Reviewer: RMW

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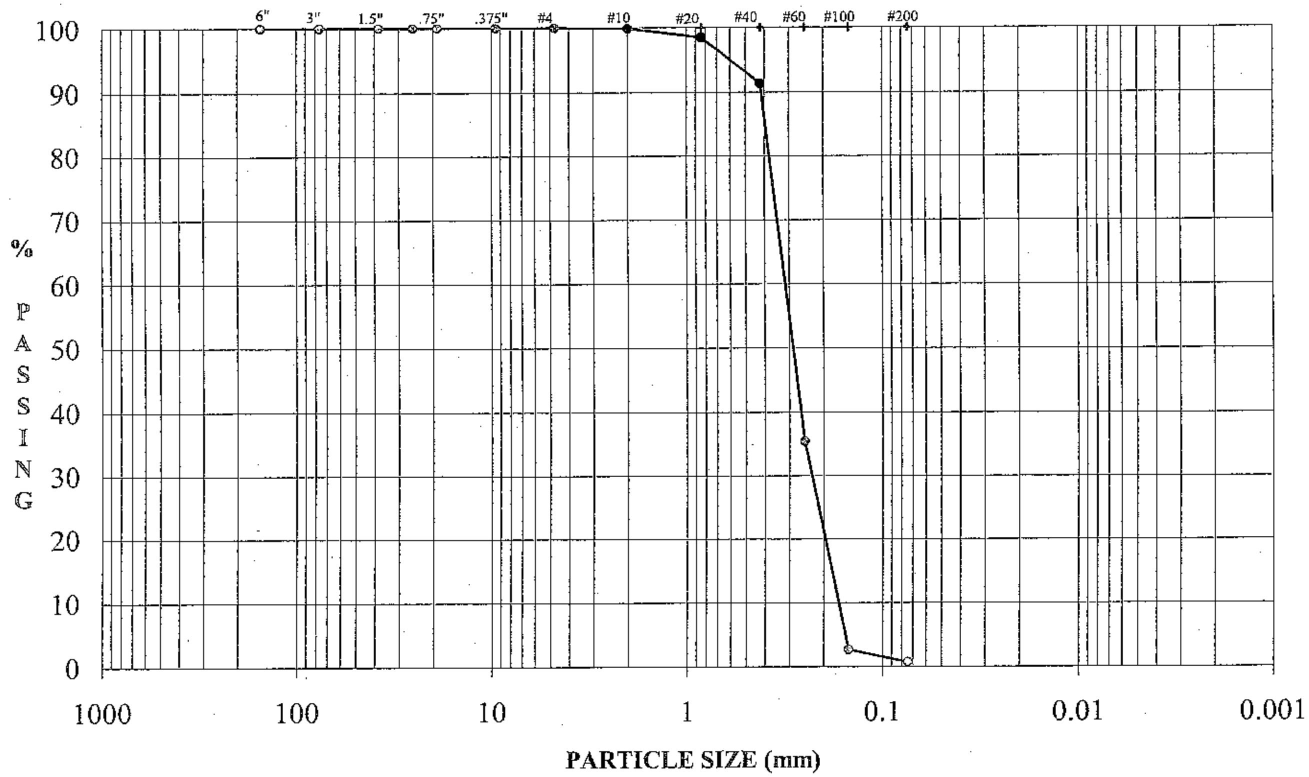

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sample Data	
% Gravel	0.0
% Sand	99.3
% Fines	0.7
C_C	1.0
C_U	1.9
LL	-
PL	-
PI	-
USCS	SP
w (%)	20.0

Percent Finer	
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	99.8%
#20	98.5%
#40	91.3%
#60	35.4%
#100	2.6%
#200	0.7%

COMMENTS:

DESCRIPTION

Sample: GAL-17

Depth: 27'

Wet Color: Light olive brown

Description: Poorly graded sand

Date: 07/16/04

Technician: KL

Reviewer: RMW

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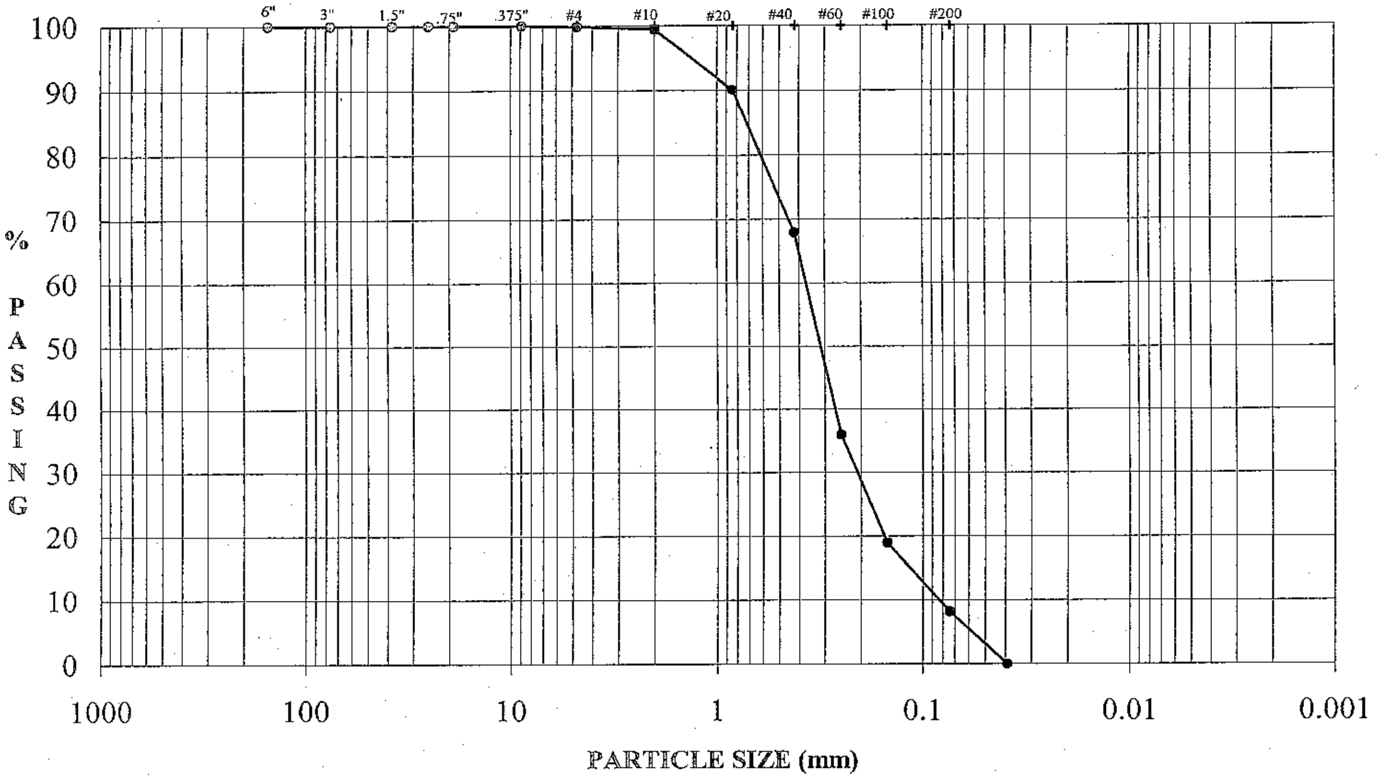

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.9%
#10	99.5%
#20	90.1%
#40	67.9%
#60	35.9%
#100	18.9%
#200	8.1%

Hydrometer Data

Particle Diameter	% Finer
0.039	0.0%

DESCRIPTION

Sample:	SB-15	Depth:	21'
		USCS:	SP-SM
Wet Color:	Dark olive		
Description:	Poorly graded sand with silt		
Comments:			

SAMPLE DATA

W$_C$ (%):	18.9		C$_C$	1.5
G$_S$:	2.65	(ASSUMED)	C$_U$	4.3
% Gravel	0.1		LL	-
% Sand	91.7		PL	-
% Fines	8.1		PI	-

Date:	08/20/04
Technician:	RD
Reviewer:	RMW

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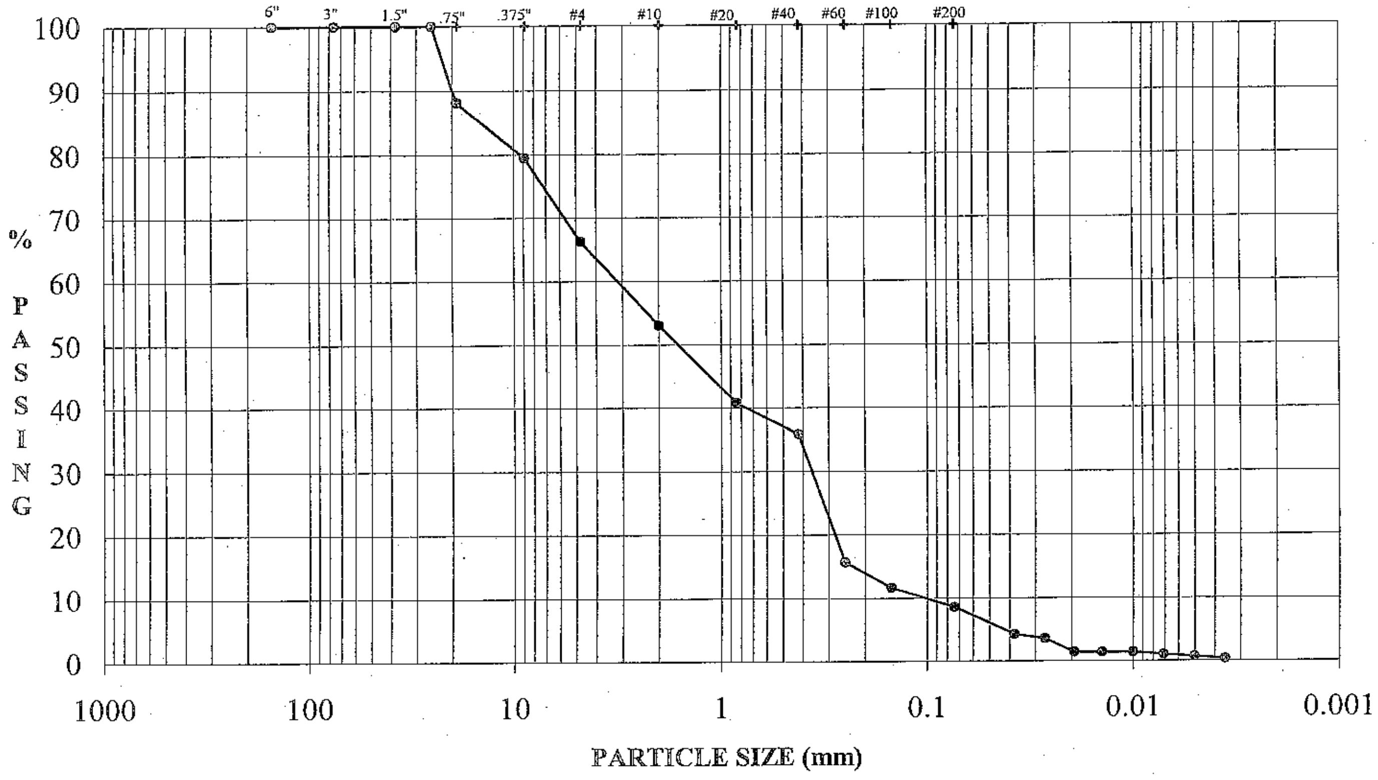

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	88.1%
3/8"	79.5%
#4	66.3%
#10	53.0%
#20	40.7%
#40	35.8%
#60	15.7%
#100	11.7%
#200	8.6%

Hydrometer Data

Particle Diameter	% Finer
0.038	4.3%
0.027	3.6%
0.019	1.4%
0.014	1.4%
0.010	1.4%
0.007	1.1%
0.005	0.7%
0.004	0.4%

DESCRIPTION

Sample:	SB-15	Depth:	18'
		USCS:	SP-SM
Wet Color:	Dark olive		
Description:	Poorly graded sand with silt and gravel		
Comments:			

SAMPLE DATA

W_C (%):	17.9		C_C	0.4
G_S:	2.65	(ASSUMED)	C_U	33.2
% Gravel	33.7		LL	-
% Sand	57.7		PL	-
% Fines	8.6		PI	-

Date:	08/20/04
Technician:	RD
Reviewer:	RMW

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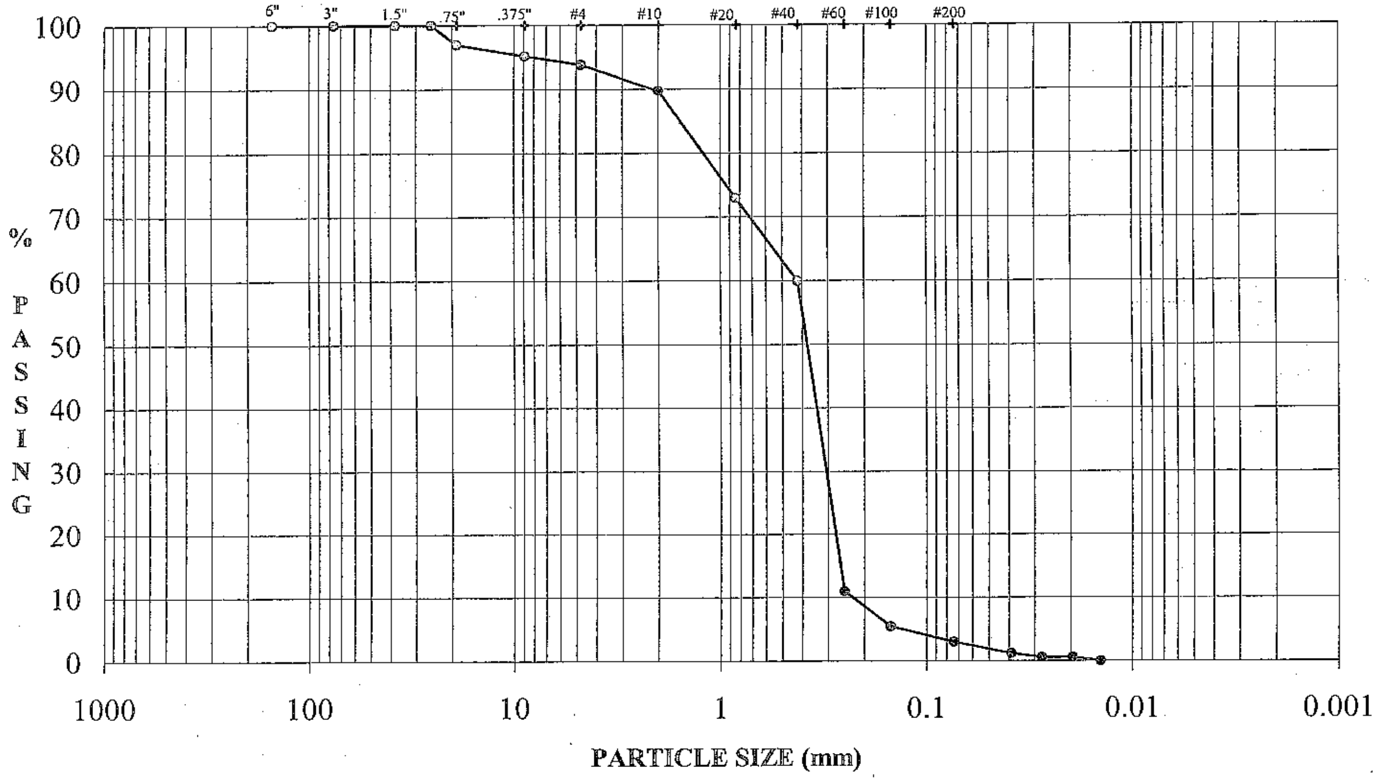

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	97.0%
3/8"	95.2%
#4	93.8%
#10	89.7%
#20	72.9%
#40	60.0%
#60	11.0%
#100	5.4%
#200	3.0%

Hydrometer Data

Particle Diameter	% Finer
0.039	1.2%
0.028	0.6%
0.020	0.6%
0.014	0.0%

DESCRIPTION

Sample:	SB-15	Depth:	25'
		USCS:	SP
Wet Color:	Dark olive		
Description:	Poorly graded sand		
Comments:			

SAMPLE DATA

W_C (%):	19.3		C_C	0.8
G_S:	2.65	(ASSUMED)	C_U	1.8
% Gravel	6.2		LL	-
% Sand	90.8		PL	-
% Fines	3.0		PI	-

Date: 08/20/04
Technician: RD
Reviewer: RMW

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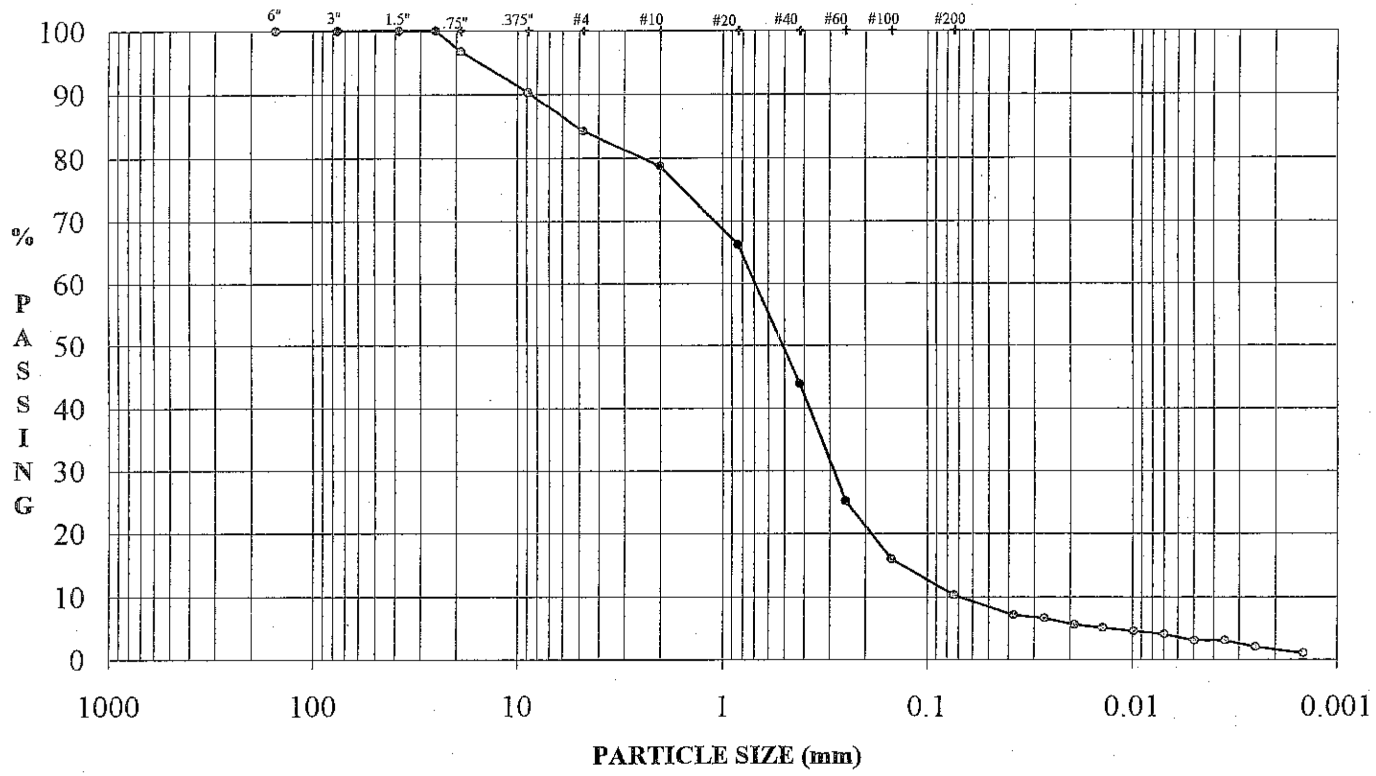

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	96.8%
3/8"	90.3%
#4	84.2%
#10	78.7%
#20	66.3%
#40	44.0%
#60	25.3%
#100	16.0%
#200	10.3%

Hydrometer Data

Particle Diameter	% Finer
0.038	7.1%
0.027	6.6%
0.019	5.6%
0.014	5.1%
0.010	4.5%
0.007	4.0%
0.005	3.0%
0.004	3.0%
0.003	2.0%
0.001	1.0%

DESCRIPTION

Sample: GAL-20 Depth: 15'
USCS: SW-SM
Wet Color: Light olive brown
Description: Well graded sand with silt and gravel
Comments:

SAMPLE DATA

W_C (%):	10.5		C_C	1.7
G_S:	2.65	(ASSUMED)	C_U	10.0
% Gravel	15.8		LL	-
% Sand	74.0		PL	-
% Fines	10.3		PI	-

Date: 03/18/05
Technician: RD
Reviewer: RMW

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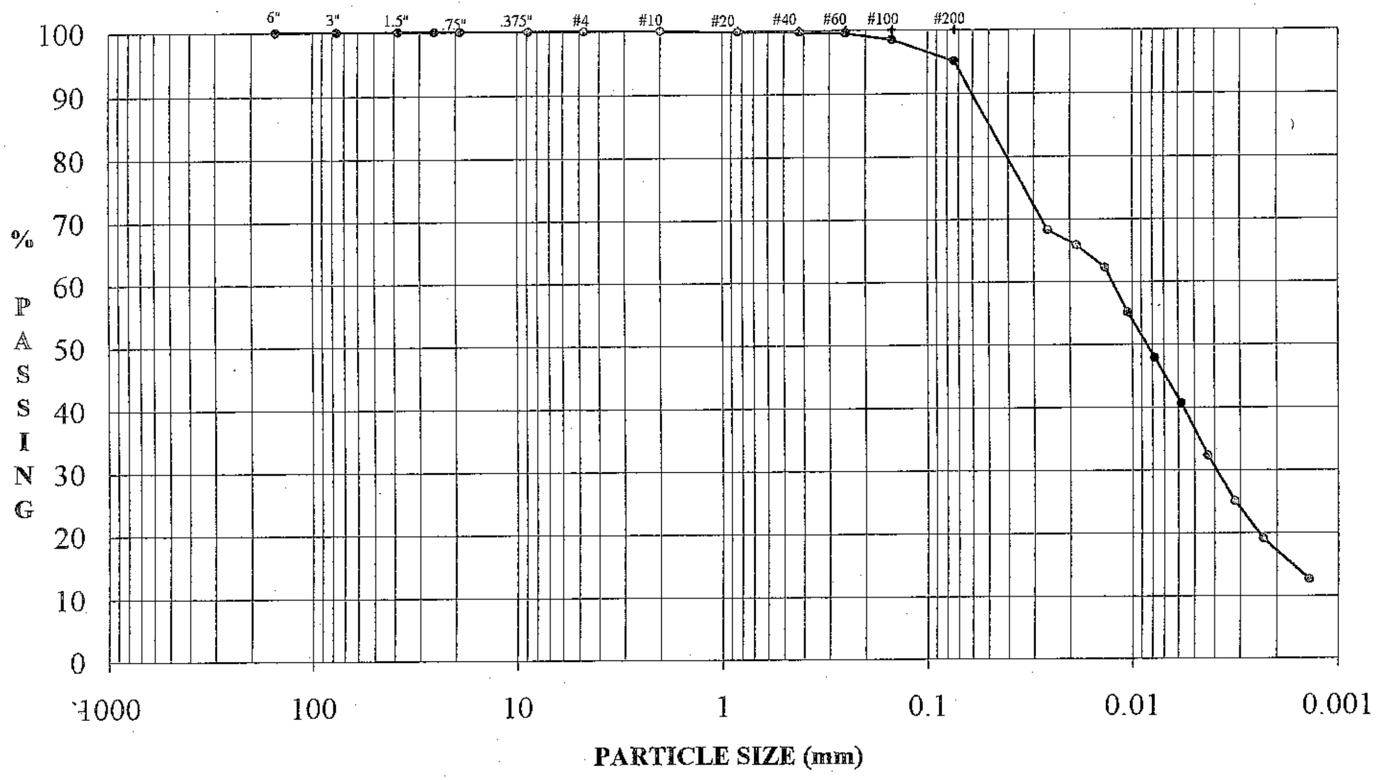

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Dat	
Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	100.0%
#20	99.8%
#40	99.7%
#60	99.5%
#100	98.4%
#200	95.2%

Hydrometer Data	
Particle Diameter	% Finer
0.026	68.3%
0.019	65.9%
0.014	62.3%
0.010	55.1%
0.008	47.9%
0.006	40.7%
0.004	32.3%
0.003	25.1%
0.002	19.2%
0.001	12.6%

DESCRIPTION

Sample:	GAL-20	Depth:	19'
		USCS:	-
Wet Color:	Olive brown		
Description:	Fines, trace sand		
Comments:			

SAMPLE DATA

W_C (%):	43.1		C_C	N/A
G_S:	2.65	(ASSUMED)	C_U	N/A
% Gravel	0.0		LL	-
% Sand	4.8		PL	-
% Fines	95.2		PI	-

Date:	03/18/05
Technician:	RD
Reviewer:	RMW

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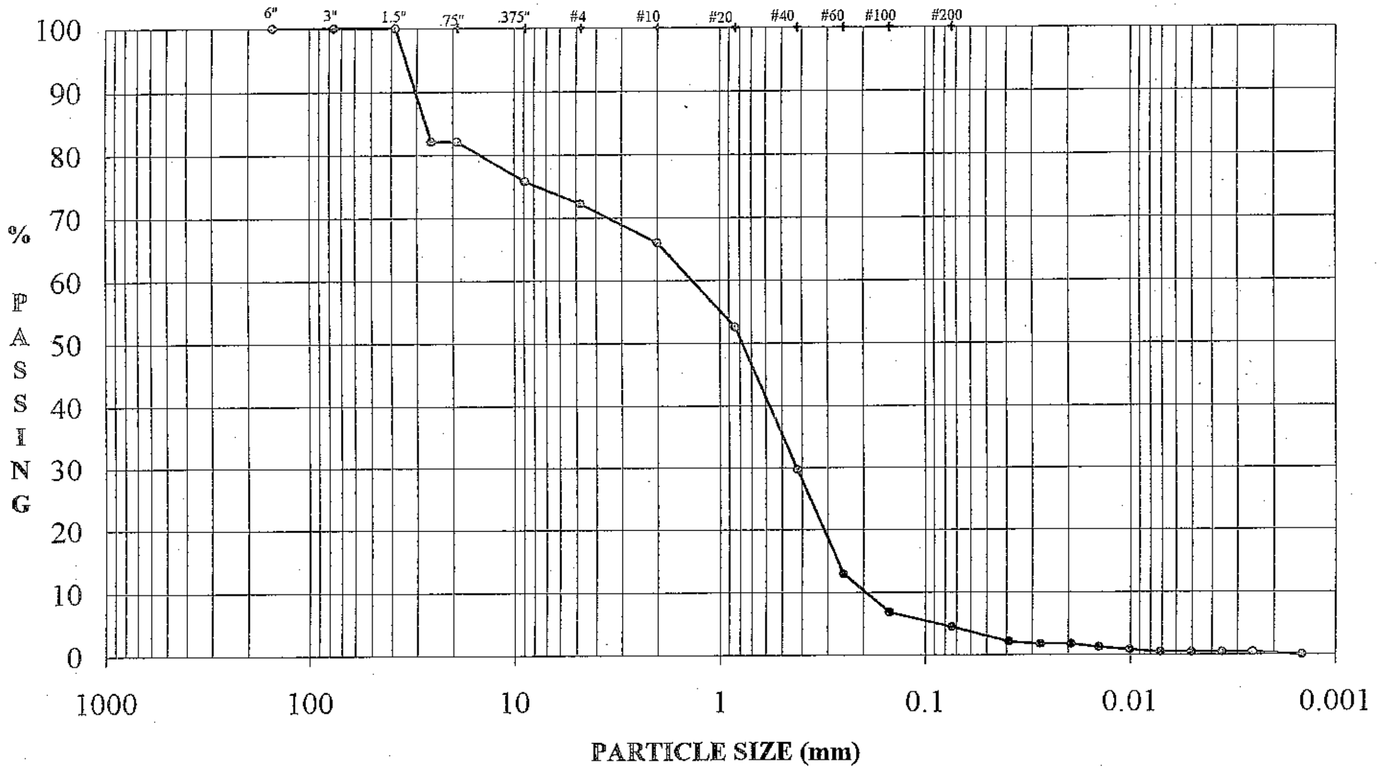

COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sieve Data	
Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	82.1%
3/4"	82.1%
3/8"	75.8%
#4	72.3%
#10	66.0%
#20	52.6%
#40	29.7%
#60	12.9%
#100	6.8%
#200	4.4%

Hydrometer Data	
Particle Diameter	% Finer
0.039	2.1%
0.027	1.7%
0.019	1.7%
0.014	1.3%
0.010	0.8%
0.007	0.4%
0.005	0.4%
0.004	0.4%
0.003	0.4%
0.001	0.0%

DESCRIPTION

Sample:	GAL-20	Depth:	20'-25'
		USCS:	SP
Wet Color:	Dark olive		
Description:	Poorly graded sand with gravel		
Comments:			

SAMPLE DATA

W_C (%):	6.7		C_C	0.6
G_S:	2.65	(ASSUMED)	C_U	7.0
% Gravel	27.7		LL	-
% Sand	67.8		PL	-
% Fines	4.4		PI	-

Date: 03/18/05
Technician: RD
Reviewer: RMW

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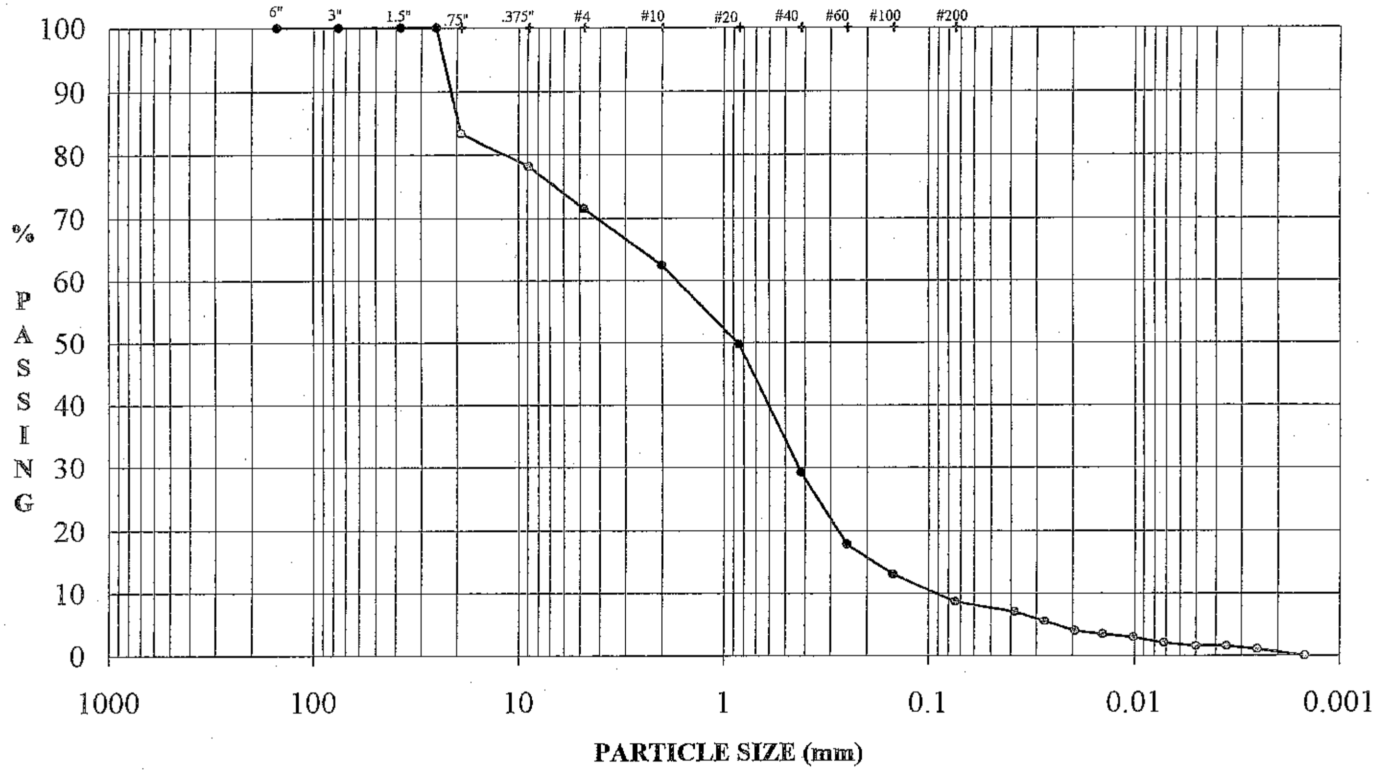

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	83.4%
3/8"	78.2%
#4	71.5%
#10	62.4%
#20	49.7%
#40	29.2%
#60	17.8%
#100	13.1%
#200	8.6%

Hydrometer Data

Particle Diameter	% Finer
0.038	7.0%
0.027	5.5%
0.019	4.0%
0.014	3.5%
0.010	3.0%
0.007	2.0%
0.005	1.5%
0.004	1.5%
0.003	1.0%
0.001	0.0%

DESCRIPTION

Sample:	GAL-25	Depth:	14 ft
	GSA-14	USCS:	SW-SM
Wet Color:	Very dark gray		
Description:	Well graded sand with silt and gravel		
Comments:			

SAMPLE DATA

W_C (%):	9.7		C_C	1.1
G_S:	2.65	(ASSUMED)	C_U	17.9
% Gravel	28.5		LL	-
% Sand	62.8		PL	-
% Fines	8.6		PI	-

Date:	04/15/05
Technician:	RD
Reviewer:	RMW

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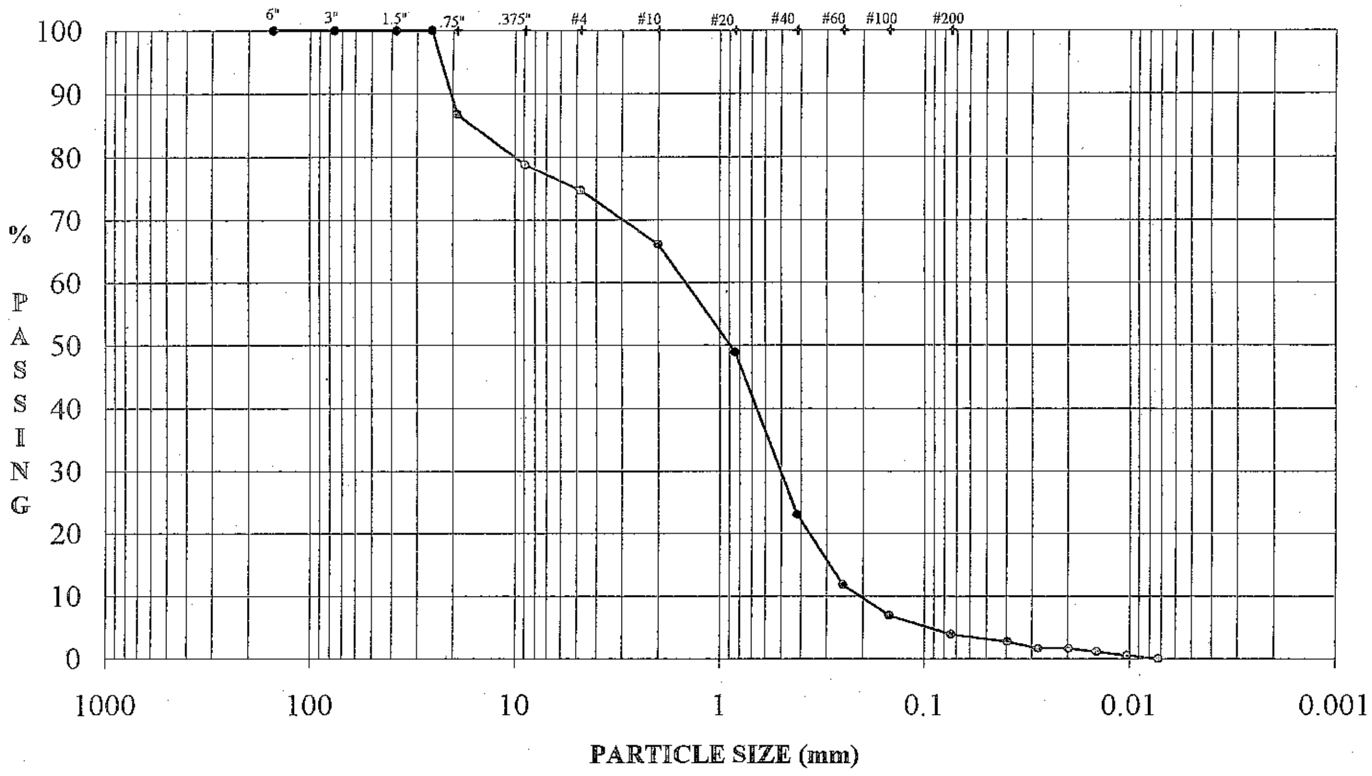

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	86.8%
3/8"	78.7%
#4	74.6%
#10	66.1%
#20	49.0%
#40	23.1%
#60	11.8%
#100	6.9%
#200	3.8%

Hydrometer Data

Particle Diameter	% Finer
0.039	2.8%
0.028	1.7%
0.020	1.7%
0.014	1.1%
0.010	0.6%
0.007	0.0%

DESCRIPTION

Sample:	GAL-25	Depth:	16 ft
	GSA-16	USCS:	SP
Wet Color:	Dark grayish brown		
Description:	Poorly graded sand with gravel		
Comments:			

SAMPLE DATA

W_C (%):	8.9		C_C	0.8
G_S:	2.65	(ASSUMED)	C_U	7.0
% Gravel	25.4		LL	-
% Sand	70.8		PL	-
% Fines	3.8		PI	-

Date: 04/15/05
Technician: RD
Reviewer: RMW

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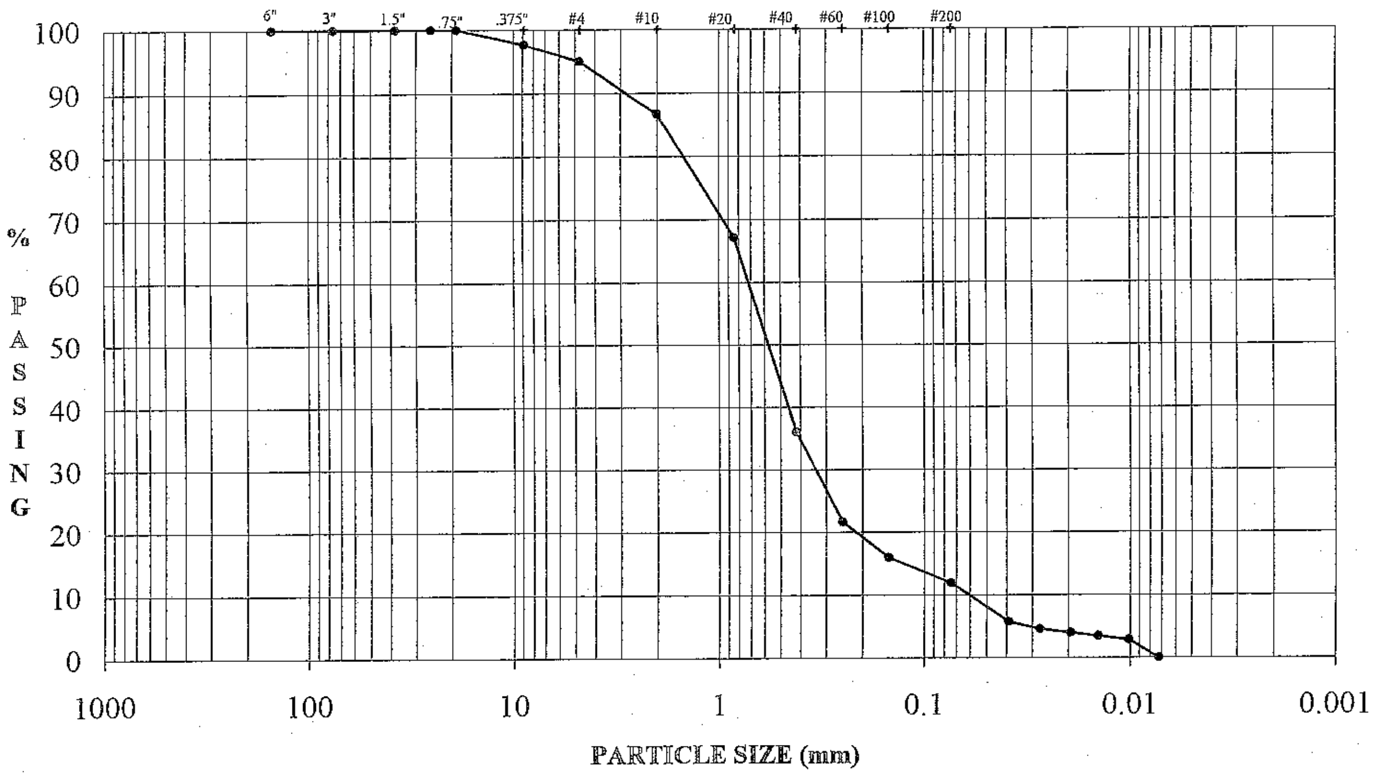

COBBLE	GRAVEL		SAND			FINES
	Coarse	Fine	Cor	Med	Fine	Silt or Clay

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	97.7%
#4	95.0%
#10	86.7%
#20	67.1%
#40	36.0%
#60	21.7%
#100	15.9%
#200	11.9%

Hydrometer Data

Particle Diameter	% Finer
0.039	5.7%
0.027	4.6%
0.020	4.0%
0.014	3.4%
0.010	2.8%
0.007	0.0%

DESCRIPTION

Sample:	GAL-25	Depth:	18 ft
	GSA-18	USCS:	SW-SM
Wet Color:	Dark grayish brown		
Description:	Well graded sand with silt		
Comments:			

SAMPLE DATA

W_C (%):	14.9		C_C	2.8
G_S:	2.65	(ASSUMED)	C_U	12.5
% Gravel	5.0		LL	-
% Sand	83.1		PL	-
% Fines	11.9		PI	-

Date: 04/15/05
Technician: RD
Reviewer: RMW

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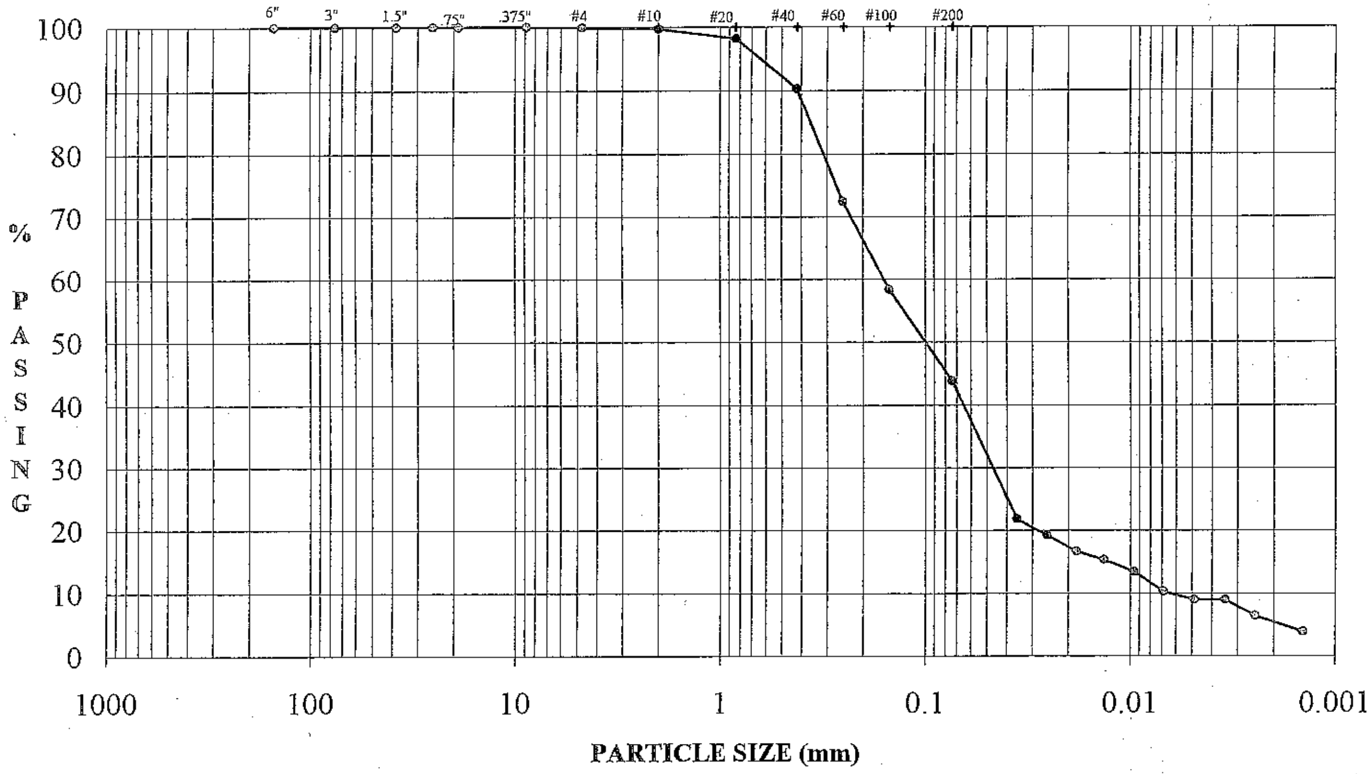

	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.9%
#10	99.7%
#20	98.1%
#40	90.4%
#60	72.4%
#100	58.3%
#200	43.9%

Hydrometer Data

Particle Diameter	% Finer
0.036	21.8%
0.025	19.3%
0.018	16.7%
0.013	15.4%
0.010	13.5%
0.007	10.3%
0.005	9.0%
0.003	9.0%
0.002	6.4%
0.001	3.9%

DESCRIPTION

Sample:	GAL-27	Depth:	15'
		USCS:	-
Wet Color:	Light olive brown		
Description:	f Sand and Fines, trace gravel		
Comments:			

SAMPLE DATA

W_C (%):	21.1		C_C	N/A
G_S:	2.65	(ASSUMED)	C_U	N/A
% Gravel	0.1		LL	-
% Sand	56.1		PL	-
% Fines	43.9		PI	-

Date: 03/18/05
Technician: RD
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
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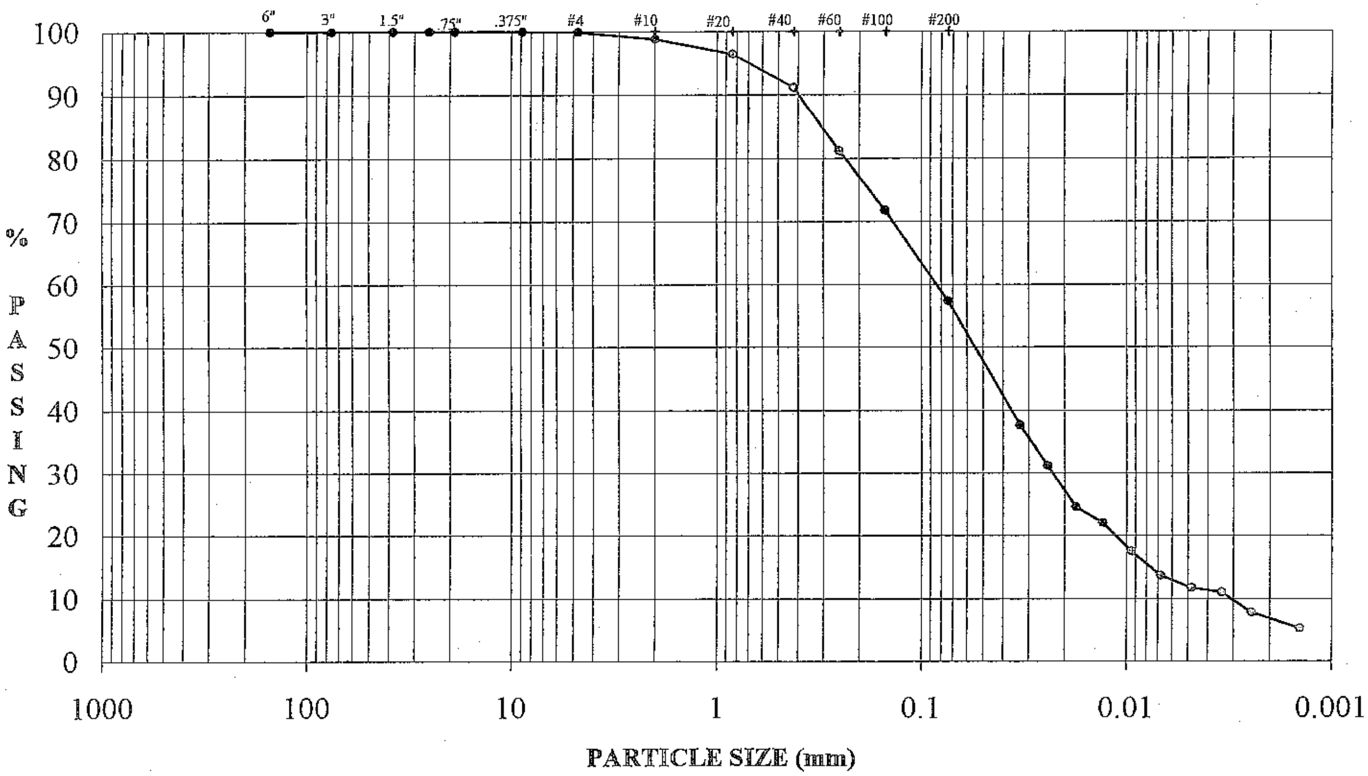
PARTICLE-SIZE DISTRIBUTIO[illegible]TM D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.9%
#10	98.8%
#20	96.5%
#40	91.2%
#60	81.2%
#100	71.7%
#200	57.4%

Hydrometer Data

Particle Diameter	% Finer
0.033	37.6%
0.024	31.1%
0.018	24.6%
0.013	22.0%
0.009	17.5%
0.007	13.6%
0.005	11.7%
0.003	11.0%
0.002	7.8%
0.001	5.2%

DESCRIPTION

Sample:	GAL-27	Depth:	20'
		USCS:	-
Wet Color:	Olive brown		
Description:	Fines and f Sand, trace gravel		
Comments:			

SAMPLE DATA

W_C (%):	55.6		C_C	N/A
G_S:	2.65	(ASSUMED)	C_U	N/A
% Gravel	0.1		LL	-
% Sand	42.5		PL	-
% Fines	57.4		PI	-

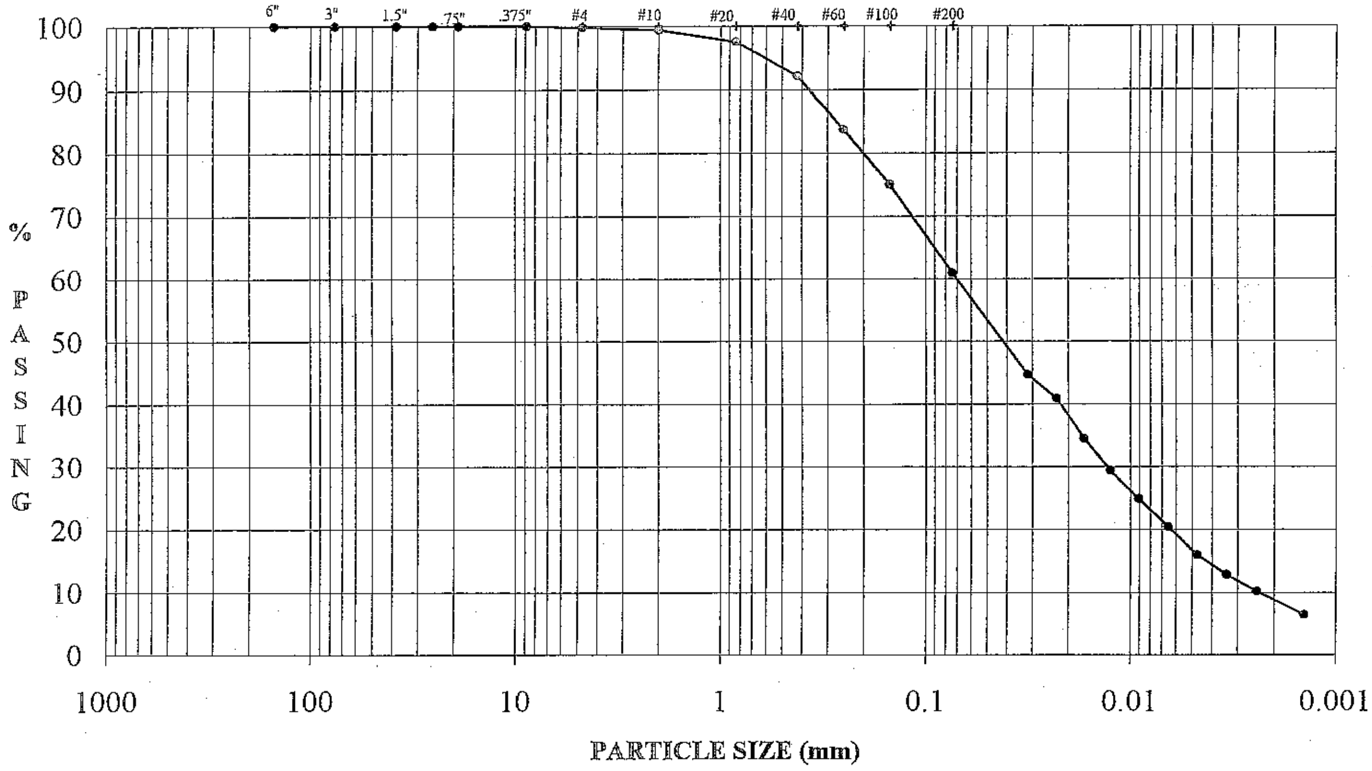
Date: 03/18/05
Technician: RD
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

PARTICLE-SIZE DISTRIBUTION TM D 422

US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay
COBBLE	GRAVEL		SAND			FINES

Sieve Data

Particle Diameter	% Finer
3"	100.0%
1 1/2"	100.0%
1"	100.0%
3/4"	100.0%
3/8"	100.0%
#4	99.8%
#10	99.4%
#20	97.5%
#40	92.2%
#60	83.7%
#100	74.9%
#200	60.9%

Hydrometer Data

Particle Diameter	% Finer
0.032	44.7%
0.023	40.9%
0.017	34.5%
0.013	29.4%
0.009	24.9%
0.007	20.4%
0.005	16.0%
0.003	12.8%
0.002	10.2%
0.001	6.4%

DESCRIPTION

Sample: GAL-27

Depth: 23'

USCS: -

Wet Color: Olive

Description: Fines and f Sand, trace gravel

Comments:

SAMPLE DATA

W_C (%):	37.9		C_C	N/A
G_S:	2.65	(ASSUMED)	C_U	N/A
% Gravel	0.2		LL	-
% Sand	38.9		PL	-
% Fines	60.9		PI	-

Date: 03/18/05
Technician: RD
Reviewer: RMW

QUANTA RESOURCES/RI/FS/QUEENS, NY
023-6151.002A

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

APPENDIX L

ESTIMATION OF SPECIFIC FREE-PRODUCT VOLUMES AT AN LNAPL MONITORING WELL

APPENDIX L

ESTIMATION OF SPECIFIC FREE-PRODUCT VOLUME, TOTAL AND RESIDUAL LNAPL VOLUMES, TOTAL PETROLEUM HYDROCARBON MASS, AND LNAPL VELOCITIES

L.1 Estimation of Specific-Free Product Volumes

In 2004, the American Petroleum Institute (API) published a document on LNAPL (API, 2004) that states… "In the past, a common misconceptualization of the vertical distribution of free product at the water table was based on the idea that LNAPL occurs as a distinct lens in which the drainable pore space is completely saturated with LNAPL. This was often referred to as the "pancake layer" conceptualization. Under the pancake layer paradigm, LNAPL saturations are 100 percent. This paradigm predicts large free oil volumes, high mobilities, and large recoverable volumes." Conversely, the LNAPL occupies the soil pore space with water and sometimes air. Thus, the LNAPL saturation is never 100% and is variable depending on a variety of conditions, such as the depth of the plume, soil type, hydrogeological conditions, and LNAPL properties. In addition, the measured thickness of LNAPL in a monitoring well is influenced by a number of these same factors as well as groundwater table fluctuations. Based on these considerations, the API considers that "an updated paradigm that is more representative of typical soil capillarity is referred to as the "multiphase" conceptualization, in which LNAPL saturation decreases continuously with depth" (API, 2004).

Based on the API's "multiphase" conceptualization, the measured thickness of LNAPL in a well may not be representative of the total volume of LNAPL in the soil at that location. In fact, the volume of LNAPL in the formation is often much less than the measured LNAPL thickness at a monitoring well might suggest (API, 2004). A better, more realistic expression of the volume of LNAPL in soil at a well location has been developed by the API and is called the "specific free-product volume." The specific free-product volume is defined as the total volume of LNAPL per unit area in the vicinity of a monitoring well. This total volume comprises a non-mobile portion (residual phase or residual LNAPL) that is bound within the soil matrix and a potentially mobile portion (free phase or free LNAPL). It is important to note that while a free phase LNAPL may exist at a well, it is not necessarily mobile, since a driving force is necessary for LNAPL migration to occur.

Over the years, different approaches have been developed to estimate the specific free-product volume of LNAPL in soil. Today, one of the most widely used methods and the one recommended by API is the Charbeneau approach. Charbeneau et al. (2000) developed a calculation model where the measured thickness of LNAPL in a well is used to estimate the specific free-product volume of LNAPL in soil. This method also incorporates some of the site-specific physical properties of soil and LNAPL. Site-specific data has been collected during the remedial investigation to support this method as discussed in Section 5.3 and 5.4 of this RI Report. The publication, "*Models for Design of Free-Product Recovery Systems for Petroleum Hydrocarbons Liquids*" distributed by the API (API, 2003) provides a description of the calculation method and details of the assumptions, limitations and equations used.

The model involved in the calculations is based on the capillary model of van Genuchten (van Genuchten, 1980) and the permeability model of Mualem (Mualem, 1976). Soil capillary properties have been defined based on soil boring description, grain size analysis (see Section 5.3.6 of this RI Report) and compared to typical literature values from soil databases (i.e., Carsel and Parrish, 1988; Rawls and Brakensiek, 1985). LNAPL density, interfacial tension, and surface tension were obtained through chemical analysis (see Section 5.4.1 of this RI Report). LNAPL residual saturations in soil were obtained by chemical analysis (TPH measurement in soil) and compared to typical literature values (Mercer and Cohen, 1990).

The primary equation leading to an estimate of the specific free-product volume of LNAPL in soil is given below (API, 2003).

$$D_o(b_o) = \int_{z_{ow}}^{z_{max}} nS_o(z)(dz)$$

Where D_o is the specific free-product volume, b_o is the measured LNAPL thickness in the monitoring well, n is the soil porosity, S_o is the LNAPL saturation in soil, z_{max} is the maximum free-product elevation and z_{ow} is the elevation of the water-LNAPL interface.

This equation gives an estimate of the specific free-product volume of LNAPL in soil for a specific monitoring well. For each monitoring well where LNAPL is detected, one value of D_o is obtained and represents the approximate volume of LNAPL in cubic feet within a 1-foot by 1-foot area around the monitoring well in question. To estimate the total volume of LNAPL in soil, the specific free product volume values obtained at each well are interpolated over the impacted area.

For each monitoring well, a sensitivity analysis was conducted on some of the main parameters of the model. This sensitivity analysis was then performed for each calculation of D_o where the predicted LNAPL saturations by the model were compared to the LNAPL saturations estimated using the soil chemical analysis TPH measurements in soil and adjusted if necessary (see Section 5.3.5 of this RI Report).

The total estimated volume of LNAPL in soil is a sum that includes a residual LNAPL volume (non-mobile) and a free LNAPL volume (potentially mobile). The residual volume is considered to be non-mobile and corresponds to volume of LNAPL trapped in soil pores. Residual LNAPL may be found in soil in the vadose and saturated zones both above and below the groundwater surface as a result of seasonal and other fluctuations of the groundwater table. Typically, a large portion of the total predicted LNAPL volume consists of non-recoverable residual LNAPL that is trapped within soil pores.

The residual volume has been estimated at each well location by using the following equation (API, 2003):

$$V_{res} = \left(\left(\left(1-\rho_o\right)\cdot b_o \cdot n \cdot S_{orv}\right) + \left(\rho_o \cdot b_o \cdot n \cdot S_{ors}\right)\right)$$

Where V_{res} is the residual volume, b_o is the measured LNAPL thickness in the monitoring well, n is the soil porosity, S_{orv} is the LNAPL saturation in soil in the vadose zone, S_{ors} is the LNAPL saturation in soil in the saturated zone, and ρ_o is the LNAPL density.

It is important to note that residual saturation is a theoretical end-point for a LNAPL recovery system that will not likely be achieved on a field-scale (EPA, 2005). It is likely that there will be considerably more LNAPL remaining in the formation than predicted by the residual saturation. The heterogeneity of the subsurface, inefficiencies in the remedial technologies, and variability in the estimation of residual saturation will result in uncertainties in the prediction of the amount of unrecoverable LNAPL. The previous equation does not take into account the efficiency of a specific remedial technology, which is often considerably less than 100%, to address the estimated theoretical recoverable volume. As a result, the final residual volume of LNAPL (residual volume plus unrecoverable volume) is not only influenced by soil capillary properties or seasonal fluctuations, but also by the recovery technology efficiency and will likely be considerably higher than the previous equation may estimate.

Table L-1 below presents the values of the specific free-product volume calculated for each monitoring well based on LNAPL measurements made in April 2005 (Model Predictions) and adjusted for TPH measured in soil during the remedial investigation (Model Predictions Adjusted).

Table L-1
Specific Free-Product Volume of LNAPL in Soil for Each Monitoring Wells

Monitoring Well	Specific-Free Product Volume		Residual Volume (ft)
	Model Predictions (D_o) ft	Model Predictions Adjusted (D_o) ft	
GAGW-04	0.102	0.042	0.013
GAL-01R	0.683	0.683	0.216
GAL-02	0.723	0.420	0.158
GAL-03	0.933	0.592	0.166
GAL-04	0.175	0.096	0.052
GAL-05	0.77	0.547	0.187
GAL-06	0.286	0.263	0.082
GAL-07	1.577	1.327	0.363
GAL-08	0.112	0.112	0.048
GAL-09	0.597	0.276	0.075
GAL-10	0.168	0.066	0.008
GAL-11	0.992	0.306	0.037
GAL-12	0.639	0.294	0.028
GAL-13	0.345	0.125	0.027
GAL-14	0.308	0.149	0.078
GAL-15	0	0	0
GAL-16	1.676	1.035	0.151
GAL-17	0.504	0.193	0.074
GAL-18	0.449	0.157	0.042
GAL-19	0.776	0.479	0.139
GAL-20	0.319	0.248	0.080
GAL-21	0.675	0.397	0.058
GAL-22	0.16	0.101	0.046
GAL-23	0.464	0.132	0.052
GAL-24	0.102	0.037	0.007
GAL-25	0	0	0
GAL-26	0.019	0.019	0.014
GAL-27	0	0	0
GAL-28	0	0	0
MW-4R	0.704	---	0.040
MW-10	0.548	0.206	0.149
MW-8	0.922	0.452	0.141

Notes

(1) No TPH saturation data were collected at MW-10 and thus the model predicted value was adjusted based on data collected at GAL-21, GAl-22, GAL-23 and GAL-24. No TPH saturation data were collected at MW-8 and thus the model predicted value was adjusted based on data collected at GAL-14.

(2) The adjusted value for MW-4R was not calculated due to a TPH concentration value that is not consistent with other field data collected (TPH concentration of 202,000 mg/kg @ 15 ft).

L.2 Estimation of Total LNAPL Volume

The specific free-product volume values were interpolated over the plume area and between well locations to estimate the total LNAPL volume within the impacted area. Table L-2 presents the results of the total volume estimation. The volumes presented in Table L-2 are based on the Model Predictions Adjusted specific free product volumes (values adjusted using site-specific TPH data). Using model predictions without adjusting for site-specific TPH concentration would result in a prediction of higher volumes.

Table L-2
Total and Residual LNAPL Volume of LNAPL in Soil for each Properties

Property	Total LNAPL Volume (gal)	Residual LNAPL Volume (gal)
	Model Predicted Adjusted	
Quanta	261,000	75,025
Phoenix	44,400	12,150
North Capasso	167,750	39,900

L.3 Estimation of Total Petroleum Hydrocarbon Mass

A different analysis was performed to estimate the total petroleum hydrocarbon (TPH) mass in soil. This analysis was based on an interpolation of TPH concentration profiles measured during the RI as described below.

During the installation of each LNAPL monitoring well, several soil samples were collected and analyzed for their TPH content. In total, 438 soil samples were analyzed during the remedial investigation which included approximately 11 samples per soil boring location. Table 13E presents the TPH data per well and per depth sampled. This procedure provided a TPH concentration profile with depth at all well locations. These TPH concentration profiles were introduced into a geostatistical model and a three dimensional interpolation of those TPH concentration profiles was conducted. The geostatistical analysis led to an estimate of the total mass of petroleum hydrocarbons on each property. The interpolation was limited to the vertical zone located between elevation +8 and elevation -18 feet MSL, i.e., the horizon where the majority of the TPH data were collected. In general, the elevation of the ground surface over the interpolation domain is +15 MSL. The horizon located between elevation +15 MSL and elevation +8 MSL corresponds to the urban fill material. This urban fill horizon was not considered in the mass estimation[1]. The horizontal interpolation domain comprises the Quanta Resources property, the North Capasso property and the portion of the Phoenix Beverages property in which soil borings/wells were installed and TPH data were collected. This analysis provided estimates of the total TPH mass on each property (within the interpolation domain) as shown in Table L-3 below.

Further, analysis was conducted to provide an estimate of the mass of residual petroleum hydrocarbons in soil. This further analysis considered a TPH (LNAPL) saturation of 10% or less to correspond to residual LNAPL. Thus, TPH concentrations corresponding to a LNAPL saturation of 10% or less were removed from the total petroleum hydrocarbon mass to estimate the amount (and proportion) of residual petroleum hydrocarbons. A breakdown of the total and residual petroleum hydrocarbon mass in both the vadose zone and the saturated zone was also conducted using the groundwater surface elevation as measured in April 2005. The following table presents the petroleum hydrocarbon mass estimates.

Table L3
Estimates of Petroleum Hydrocarbon Mass in Soil

	Mass of Petroleum Hydrocarbons in soil (lb)			
	Quanta	Phoenix	North Capasso	Estimated Totals
Total Mass	7,920,000	1,870,000	5,940,000	15,730,000
Mean deviation	±528,000	±286,000	±726,000	NA
Total Mass in the vadose zone	4,070,000	880,000	2,420,000	7,370,000
Total Mass in the Saturated Zone	3,850,000	990,000	3,520,000	8,360,000
Residual Mass in the vadose zone (Saturation = or less than 0.1 or 10%)	1,100,000	550,000	1,980,000	3,630,000
Residual Mass in the Saturated Zone	3,850,000	990,000	3,520,000	8,360,000

Note

The total mass in the vadose zone (residual mass) may be underestimated as the urban fill zone was generally not included in the vertical interpolation domain.

The LNAPL in the saturated zone is considered as non-mobile and thus non-recoverable. All the mass in the saturated zone has then been considered residual. It may be possible following seasonal water table fluctuation that the smearing zone be partially desaturated and therefore a part of the mass in the saturated zone may contribute to the total recoverable mass.

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[1] Since the urban fill was not included in the interpolation zone, the petroleum hydrocarbon mass in the vadose zone may be underestimated.

L.4 Estimation of LNAPL Velocities

The equation used to estimate the LNAPL velocity is expresses as (API, 2003b):

$$v_{oil} = K_{eo} * i_o / n_e$$

Where K_{eo} is the effective LNAPL conductivity, i_{oil} is the LNAPL gradient (driving force), and n_e is the effective porosity. The effective LNAPL conductivity has been estimated using baildown tests and their interpretation with the Huntley model that uses a modified Bower-Rice equation to estimate LNAPL conductivities (Huntley, 2000).

For the Phoenix Beverages property, the estimation of the effective LNAPL conductivity was completed using a different method since no baildown tests were conducted[2]. The following summarize the methodology used.

The effective LNAPL conductivity (K_{eo}) has been estimated using the following equation (API, 2003b):

$$K_{eo}(S_n, S_w) = \frac{k_{rO} * K_{sO} * \rho_O * g}{\mu_o}$$

Where k_{ro} is the relative permeability of LNAPL, K_{so} is the LNAPL conductivity at saturation, ρ_o is the LNAPL density, μ_o is the LNAPL viscosity, and g is the gravitational constant.

To estimate the relative permeability of LNAPL, the van Genuchten capillary model (van Genuchten, 1980) is integrated into the Mualem equation for permeability (Mualem, 1976). The resulting equation is given below (Charbeneau *et al.,* 2000):

$$k_{ro} = (1 - S_{ew})^{1/2} * [\ 1 - (S_{ew})^{1/m}]^{2m}$$

Where S_{ew} is the effective water saturation and m is the van Genuchten parameter. This parameter *(m)* is a function of the soil properties. This parameter *(m)* was estimated using the compilation of soil capillary properties of Carsel and Parrish (1988) and the results of the grain size analysis from soil samples sampled on site.

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[2] Because of limited property accessibility, baildown tests have not been conducted.

The effective water saturation is expresses as:

$$S_{ew} = \frac{S_w - S_{rw}}{S_m - S_{rw}}$$

Where S_w is the water saturation within the LNAPL plume, S_{rw} is the irreducible water saturation, and S_m is the maximum water saturation.

To be able to estimate the LNAPL conductivity at saturation (K_{so}), the intrinsic permeability of the soil was first estimated using the groundwater hydraulic conductivity (groundwater hydraulic conductivity was obtained by the interpretation of slug tests conducted on-site).

$$k_i = \frac{K_w * \mu_w}{\rho_w * g}$$

Where k_i is the soil intrinsic permeability, K_w is the hydraulic conductivity of water, μ_w is the water viscosity, ρ_w is the water density, and g is the gravitational constant.

The LNAPL conductivity at saturation (K_{so}) was evaluated with the following equation:

$$K_{so} = \frac{k_i * \rho_o * g}{\mu_o}$$

Where k_i is the intrinsic permeability of soil, ρ_o is the LNAPL density, μ_o is the LNAPL viscosity, and g is the gravitational constant.

The LNAPL gradient may be different than the hydraulic gradient and must be evaluated using field data. The top of the saturation profiles defined using the measured TPH concentrations in soils at each well location are used to establish the top of the LNAPL body at that location. The elevation of the top of the LNAPL body at each well location was then used to calculate the LNAPL gradient over the area of LNAPL impact.

In summary, the LNAPL located on the Quanta property, as well as on the Phoenix Beverages and North Capasso properties, presents zones with different viscosities and LNAPL saturations. Therefore, LNAPL velocity is variable over the entire area of LNAPL impact. To estimate the LNAPL velocities, LNAPL effective conductivities have been estimated using baildown tests results for the monitoring wells located on those properties or calculated for wells in which baildown tests could not be completed. The LNAPL gradient has been estimated using the saturation profiles defined at each well location using the TPH concentration in soil. All of these factors were used in calculating LNAPL velocities.

The following presents the estimated LNAPL effective conductivities, transmissivities, and velocities.

Table L-4
LNAPL Conductivities, Transmissivities, and Velocities

Well	Location	LNAPL Conductivity(1)	LNAPL Transmissivity(1)	LNAPL flow velocity
		ft/day	ft^2/day	ft/year
GAGW-04	Review Avenue	-	-	-
GAL-01R	Quanta	0.054	0.138	
GAL-02	Quanta	0.007	0.122	0.12
GAL-03	Quanta	0.036	0.092	0.50
GAL-04	Quanta	0.001	0.086	0.04
GAL-05	Quanta	0.147	0.083	2.01
GAL-06	Quanta	0.036	0.070	0.10
GAL-07	Quanta	0.213	0.298	1.83
GAL-09	Quanta	0.396	0.044	-
GAL-16	Quanta	0.072	0.211	0.08
GAL-20	Quanta	0.027	0.115	0.51
GAL-10	North Capasso	0.210	0.021	-
GAL-11	North Capasso	0.259	0.026	19.40
GAL-12	North Capasso	0.057	0.110	1.50
GAL-13	North Capasso	0.234	0.020	-
GAL-18	North Capasso	0.163	0.023	9.40
GAL-21	North Capasso	0.396	0.195	5.69
GAL-22	North Capasso	0.565	0.064	3.48
GAL-23	North Capasso	0.424	0.064	4.48
GAL-24	North Capasso	0.229	0.052	-
MW-4R	North Capasso	0.089	0.221	3.80
GAL-14	Phoenix	0.002	-	0.04

Note: (1) Estimated with the interpretation of baildown tests except at GAL-14