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11:39 am, Sep 10, 2010

Alameda County
Environmental Health

September 1, 2010

Mr. Paresh Khatri
Alameda County Health Care Services
Environmental Health Services
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Subject: **RO0000289**
FEASIBILITY STUDY, OWENS-BROCKWAY GLASS CONTAINER FACILITY. 3600 ALEMEDA AVENUE, OAKLAND, CALIFORNIA.

Dear Mr. Khatri:

Owens-Brockway Glass Container Corporation is pleased to submit the attached Feasibility Study for the above site.

I declare under penalty of perjury that the information and recommendations contained in the attached report are true and correct to the best of my knowledge.

If you have any questions or require additional information feel free to call me at (567) 336-8682.

Sincerely,

Mark Tussing
Manager, Environmental Affairs

FEASIBILITY STUDY
for
FUEL RELEASES

Owens-Brockway Glass Container Facility
3600 Alameda Avenue
Oakland, California

CKG Environmental, Inc.
P.O Box 246
St. Helena, CA 94574

A Report Prepared for:

Mr. Mark Tussing
Owens-Brockway Glass Container, Inc.
One Michael Owens Way
Perrysburg, OH 43551-2999

FEASIBILITY STUDY FOR
FUEL RELEASE

Owens-Brockway Glass Container Facility
3600 Alameda Avenue
Oakland, California

August 27, 2010

Prepared by:

REGISTERED GEOLOGIST
CHRISTINA J. KENNEDY
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STATE OF CALIFORNIA

Christina J. Kennedy R.G.

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FEASIBIILITY STUDY FOR
FUEL RELEASE
Owens-Brockway Glass Container Facility
3600 Alameda Avenue
Oakland, California

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1.0 INTRODUCTION

This report presents an evaluation of feasible remediation alternatives to address historical fuel oil/diesel and gasoline releases at the Owens-Brockway Glass Container facility in Oakland, California (Plate 1). CKG Environmental, Inc. has prepared this report on behalf of Owens-Brockway Glass Container, Inc. in response to a letter from the Alameda County Department of Environmental Management (ACDEM) dated May 8, 2009. The ACDEM letter requested that a feasibility study be submitted to address petroleum hydrocarbon impacts at the site. This feasibility study addresses only groundwater because CKGs Data Gap Investigation Report dated February 3, 2010, recommended an interim remedial action that included excavating and removing soil source areas of petroleum hydrocarbons.

This report responds to the ACDEM letter by compiling site data collected to date, developing a three dimensional model of the fuel releases in soil and groundwater, and evaluating potential remedial technologies to reduce petroleum hydrocarbons in groundwater. Based on the findings of this report and concurrence by the ACDEM, CKG will prepare a Remedial Action Work Plan to submit to the ACDEM.

This report is organized as follows:

- Site description including location, geologic and hydrologic setting.
- Site background including a discussion of site history and previous environmental investigation (as compiled in CKG's Site Conceptual Model dated April 3, 2009)
- Previous Investigations and Project Chronology
- Subsurface conditions including lithology, groundwater movement, and distribution of contaminants in the subsurface
- A discussion of remediation measures implemented to date and the status of these efforts
- A statement of remedial action objectives
- A screening of remedial technologies to reduce petroleum hydrocarbons in groundwater
- An evaluation of remedial action alternatives
- Selection of the preferred remedial action.
- Limitations and references

2.0 SITE DESCRIPTION

The Owens-Brockway glass manufacturing facility is located at 3600 Alameda Avenue in Oakland, California (Plate 1). The site is located to the north of the Oakland Estuary with Fruitvale Avenue to the west, a Home Depot to the east and residences to the north. Onsite facilities include the operating glass manufacturing plant, warehouses, and offices (Plate 2).

Two former underground fuel storage tank (UST) areas existed at the Oakland plant (Plate 2). The first UST area was located on the west side of the plant and included three fuel oil USTs and potentially one small waste oil UST. Also in this area is a former lube oil tank located adjacent to the plant, between the Batch Building and the Furnace Building. Releases of fuel oil to the subsurface were observed when the USTs were removed.

The second UST area was located near the central part of the plant adjacent to the compressor building. Originally there were four USTs in this area and upon removal a gasoline release to the subsurface was observed. Two 24,000 gallon fuel oil USTs were installed in this area following the removal of the original four USTs, and these two USTs were removed in 1998.

2.1 SITE HISTORY AND OPERATIONS

Prior to the construction of the glass container manufacturing plant in 1938 the property was undeveloped. The Southern Pacific Railroad line ran parallel to what is now Highway 880 with an auxiliary line down Fruitvale Avenue then east along Alameda Avenue. The glass plant location was selected because of its proximity to the railroad line. The plant consisted of the furnace building with five furnaces and associated stacks. Immediately behind the furnace building was the bottle forming building and warehouses. To the east of the furnace building was an engineering building. Over time additional warehouses were constructed on the west side of the property and the engineering building was replaced by warehouses. Residential properties to the north of the engineering building were acquired and developed with more warehouses. Plate 2 illustrates the modern facility plan with building numbers and other structures identified.

2.2 SITE SETTING

2.2.1 Regional Physiographic Setting

The property is located adjacent to the Oakland Estuary on the east side of the San Francisco Bay. Prior to development and backfilling, the environmental setting of the Bay margin was estuarine with substantial beaches, and dunes formed. The estuary was later developed as the Oakland Harbor separating Alameda from the Oakland waterfront. Historically the estuary was significantly wider until filling on both sides resulted in the relatively narrow modern channel. Topography slopes slightly towards the southwest.

2.2.2 Soil Conditions

Interbedded clays, clayey silts and sands, sands, and gravels underlie the site. In localized areas fill soil has been placed for building pads or pavement. The fill is underlain by sandy and silty clays to depths of 9-14 feet and may form gradational contacts with underlying sandy clay, gravelly clay, and sandy silt. Geologic cross-sections were developed for the Site Conceptual Model (SCM) dated April 3, 2009 and for the data gap investigation dated February 3, 2010, and presented in Appendix A. The locations of the cross-sections are shown on Plate 2.

2.2.3 Geologic Conditions

Geologic mapping by Helley and others (1972) show the region to be underlain by the Quaternary Merritt Sand, and sand, silt and clay of younger fluvial deposits. A review of map data compiled by Nichols and Wright (1971) shows numerous meandering marsh land stream channels existed very near the site which deposited fluvial sediments. These old channels have subsequently been obscured by recent development which has obliterated all surface expression

2.2.4 Groundwater Conditions

Groundwater is encountered from 13 to 15 feet below ground surface. Groundwater monitoring initiated in 1986 shows a consistent flow gradient to the south-southwest toward the Oakland Estuary.

2.3 PETROLEUM HYDROCARBON STORAGE

Petroleum hydrocarbons were stored in underground storage tanks located in various areas of the site as shown on Plate 2

2.3.1 Western Fuel Storage Area

One UST site is located on the west side of the plant and included three former USTs, which were used to contain fuel as follows:

- 8,300 gallon lube oil
- 24,000 gallon fuel oil
- 24,000 gallon fuel oil

At the time these USTs were removed in 1987 it was discovered that fuel oil had been released to the subsurface. Owens-Brockway excavated impacted soil at the time the USTs were removed. Past efforts to remove floating hydrocarbon product associated with the fuel oil release have been unsuccessful. This lack of success is mainly due to the clay rich nature of the subsurface and the viscosity of the product. Groundwater monitoring has been ongoing since 1987.

A smaller waste oil UST is thought to have been located adjacent to the forklift ramp next to the bottling plant. The size and status of this UST is not known.

A lube oil UST was formerly located between the Furnace Building and the Batch Building. Details regarding this tank are unknown except that it was reportedly removed.

2.3.2 Central Fuel Storage Area

The second UST area is located near the central part of the plant adjacent to the compressor building. Originally there were four fuel USTs in the area as follows:

- 500 gallon diesel
- 4,000 gallon diesel

- 4,000 gallon gasoline
- 15,000 gallon diesel

When they were removed in 1986 a gasoline release to the subsurface was observed. Owens-Brockway excavated impacted soil at the time these USTs were removed. Two 24,000 gallon fuel oil USTs were installed in this area following the removal of the original four USTs, and these two USTs were removed in 1998. No indications of fuel releases were noted at that time..

2.4 PRIMARY RELEASE MECHANISM

The sources of hydrocarbon contamination are suspected to be the aforementioned underground storage tanks. Releases from these USTs are suspected to have occurred prior to their discovery in 1986. Releases from the tanks resulted in hydrocarbon impacted soil and groundwater.

2.5 SECONDARY SOURCES OF CONTAMINATION

The Oakland estuary has a long history of industrial activity, much of it along the waterfront in the vicinity of the Owens-Brockway glass plant. CKG completed a Phase I Environmental Site Assessment of the Owens-Brockway property in August 2006. A number of off-site historical sources of potential fuel contamination were documented in that report. These include the following:

- A fuel pipeline originated at a Shell bulk facility to the west and paralleled Fruitvale Avenue along the west side of the site. A feeder line ran from the Fruitvale pipe onto the site directly to the former 16,000 gallon fuel oil UST. That pipeline was permanently closed in 1973

- Directly west of the plant on the west side of Fruitvale Avenue was a large aboveground fuel storage tank that fueled a power plant. The tank was surrounded by an earthen berm. The power plant and tank had been removed by 1948. Potential leaks or over spillage that may have originated at that tank are not known.

- The City of Oakland operated an 8000 gallon fuel UST (gasoline?) within the Alameda Avenue right-of –way just east of the Fruitvale Bridge. This tank was removed in 1973. Potential releases associated with that tank are not known.

In addition to the potential offsite sources residual fuel contamination in soil in the vicinity of the two 24,000 gallon fuel USTs which were subsequently removed in 1998 is a potential continuing source of contamination to groundwater.

2.6 CONTAMINANT TRANSPORT MECHANISMS AND POTENTIAL RECEPTORS

2.6.1 Subsurface Soil

Constituents of concern (COCs) in subsurface soil may be expected to desorb in utility trenches, and adsorb to soil. The COCs do not include volatile constituents with a high vapor pressure, therefore, volatilization to indoor air is not considered probable. The historic data indicates that the highest concentrations of volatile organic constituents in soil are limited to the vicinity of the former recovery well RW-1. Subsurface soil is not exposed at the facility. A completed pathway between the impacted soil and human contact is limited to circumstances where excavation is occurring (i.e. for underground utility repairs or additions).

2.6.2 Groundwater:

COCs in groundwater do not include volatile organic constituents with a high vapor pressure; therefore, volatilization to indoor air is unlikely. A completed pathway between the impacted groundwater and human contact is limited to circumstances where excavation is occurring (i.e. for underground utility repairs or additions), and is deep enough to encounter the groundwater.

The unconfined water-bearing aquifer layer ranges from approximately 13 to 15 ft bgs and consists primarily of silt ranging from clayey silt to sandy silt. Because of the proximity of the site to the Oakland Estuary it is possible that there is a complete pathway between impacted groundwater and surface water at the estuary and therefore to aquatic organisms.

3.0 HISTORIC INVESTIGATION/REMEDIATION SUMMARY

Two underground fuel storage tank (UST) areas existed at the Oakland plant (Plate 2). The first UST area is located on the west side of the plant and included three fuel oil USTs. In July 1986 construction of a new forklift ramp exposed soil impacted with petroleum hydrocarbons. This discovery triggered Owens-Brockway to assess all the USTs at the facility and to investigate potential hydrocarbon impacted soil and groundwater. The initial work was completed by Exceltech who later became Ensco. Starting in July of 1986 Exceltech completed subsurface investigations that included completing 16 soil borings and installing 18 monitoring wells. The locations of these borings and wells are shown on Plate 3. Exceltech also oversaw the removal of the USTs over the following nine months.

The second UST area is located near the central part of the plant adjacent to the compressor building. Originally there were four USTs in this area. When they were removed and replaced by two new USTs a gasoline release to the subsurface was observed. The following summarizes the dates of assessment and remediation activities associated with each UST area.

3.1 WESTERN FUEL STORAGE AREA

In September 1986 Exceltech removed a 16,000 gallon fuel oil UST along with 148 cubic yards of impacted soil. Also at that time they installed a 36-inch product recovery well (PR-1) in the excavation in an attempt to recover free phase fuel oil. Approximately six months after the product recovery well was installed Exceltech installed a product skimmer however no measurable quantity of product was recovered. The difficulty reportedly arose because the recovery equipment could not handle the viscosity of the product. Exceltech implemented triennial groundwater monitoring through 1987 and 1988.

In 1989 the equipment in the first product recovery well was upgraded and a second product recovery well (PR-2) was installed near MW-2. Product recovery efforts were still unsuccessful and abandoned.

In 1997 Kennedy Jenks Consultants (Kennedy Jenks) was retained to resume annual groundwater monitoring and to continue investigative and remediation work at the facility. In August 1997 a limited quantity of free floating product was removed from wells (MW-2, MW-5, and MW-6) using bailers and absorbent pads.

In January 1999 Kennedy Jenks completed an offsite investigation in which five Geoprobe ™ borings were installed on the south side of Alameda Avenue to assess the downgradient extent of petroleum hydrocarbon impacted soil and groundwater. Three of the five borings indicated detectable concentrations of petroleum hydrocarbons.

In June 1999 Kennedy Jenks installed a Petro-Trap™ product skimmer but again the product recovery effort had limited success. In December 2000 Soakease™ absorbent pads were installed in MW-2, MW-5, MW-6, MW-7, MW-8 and MW-9. These pads are still in use. Also in December 2000 Kennedy Jenks installed MW-20 and incorporated it into the monitoring program.

In July 2001 CKG Environmental, Inc. (CKG) was retained to destroy the two unused product recovery wells. This action was taken because of concerns that the wells could act as migration pathways for surface water infiltration.

In May 2003 CKG installed MW-19 on the south side of Alameda Avenue and incorporated it in the annual monitoring program which CKG has been implementing since that time. Additionally, in May 2003 CKG completed Cone Penetration Testing (CPT) to evaluate the distribution of petroleum hydrocarbons in the fuel oil release area and to investigate potential preferential contaminant pathways related to the granular backfill surrounding underground utilities. Fifteen CPT points were installed and soil and groundwater samples were collected.

In April 2006, a work plan to prepare a site conceptual model was submitted to the Alameda County Department of Environmental Health (ACDEH) by CKG. ACDEH responded to the site conceptual model work plan in a letter dated June 20, 2008.

The remediation activities at the site indicate free-phase product at the western UST area. This fuel oil has been difficult to extract from the subsurface due to the subsurface soil conditions at the site which have low permeability and hydraulic transmissivity.

3.2 CENTRAL FUEL STORAGE AREA

In 1986 three USTs (one 350 gallon, two 8,000 gallon and one 12,000 gallon) were removed and replaced with two double walled USTs (one for gasoline and one for diesel which were later removed in 1998). At the time the USTs were removed in 1986 a visible release from the gasoline UST was observed and 350 cubic yards of soil impacted soil were removed. No releases were reported from the tank removal in 1998.

In 1986 Exceltech conducted a subsurface investigation to determine potentially impacted soil and groundwater associated with the gasoline release. The results indicated impacted soil and groundwater, however, free-phase hydrocarbon product was not observed. The three wells located in the gasoline release area were incorporated into the triennial groundwater monitoring program. No other investigations or remedial actions have taken place in the gasoline release area. All boring logs for monitoring wells, Geoprobe™ borings and soil borings are included in Appendix B.

3.3 SITE CONCEPTUAL MODEL AND DATA GAP ANALYSIS

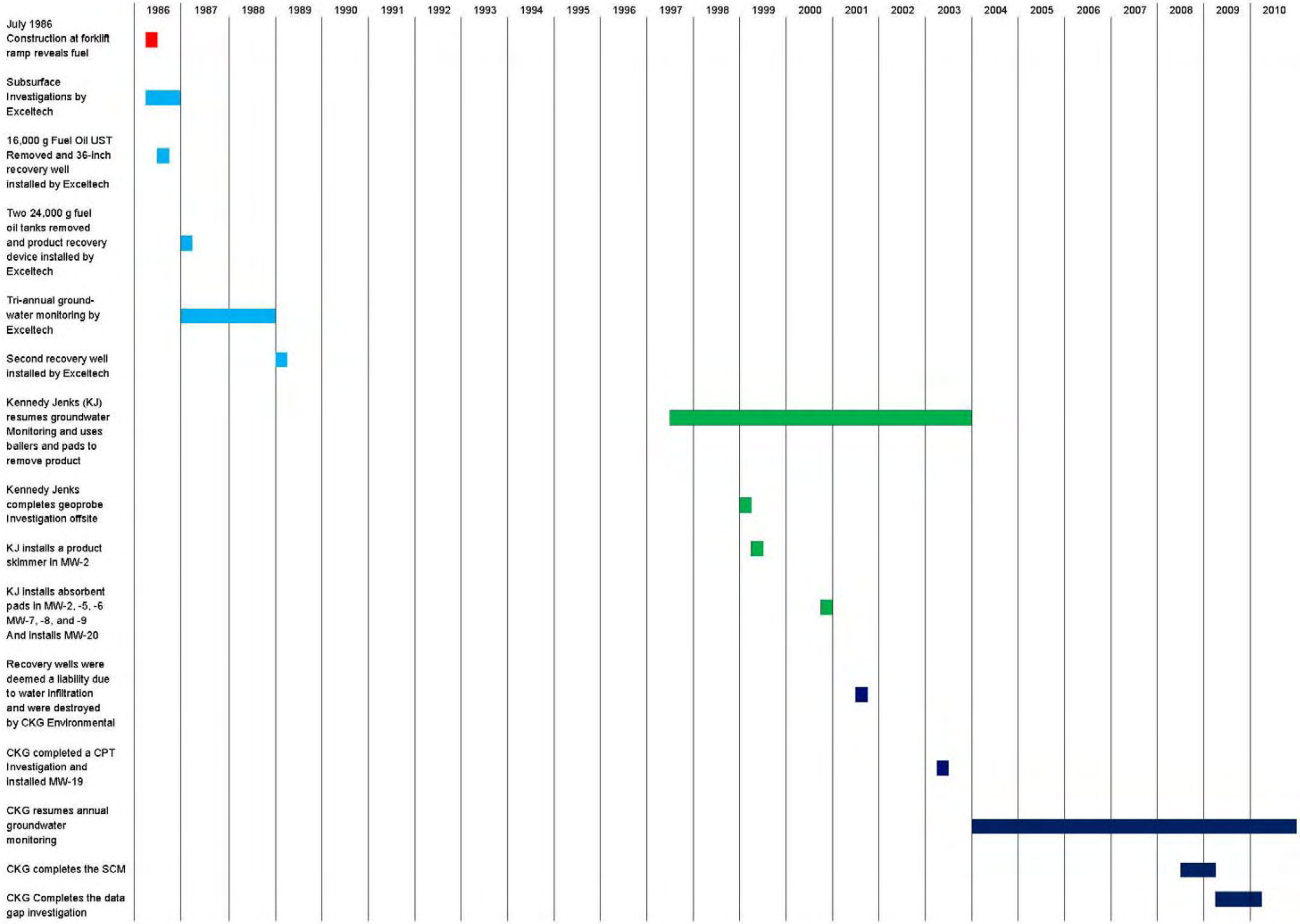
CKG prepared a Site Conceptual Model (SCM), dated April 3, 2009 which compiled the historical data to evaluate its thoroughness and applicability to present regulatory requirements. In the SCM, CKG identified a number of data gaps as follows:

- Fuel oil distribution in soil and groundwater in the vicinity of MW-3
- The status and potential release history of a small waste oil UST that was reported to exist adjacent to the forklift ramp
- Concentrations of TPHd or TPHmo in soil in the western fuel storage area had not been obtained in earlier investigations. This data is necessary to complete a fate and transport model if needed, and to compare with current clean up criteria

- The potential impact that two off site sources (near KB-1 and at the corner of Alameda and Fruitvale Avenue), may be contributing to impacts downgradient of the site.
- Potential small sources that are a function of subsurface utilities may be present near MW-1, MW-10, and in the shallow soil near MW-2
- Soil and groundwater in the vicinity of MW-17 (Central UST site) and the nearby former diesel UST, needed to be assessed.

To address the data gaps identified in the SCM CKG completed a data gap investigation commencing in August 2009. The data gap investigation included a comprehensive utility survey to accurately map out subsurface utilities. CKG then installed 41 soil borings using a Geoprobe™ rig. Soil and groundwater samples were collected for quantitative chemical analysis.

The figure below illustrates a time line for assessment and remediation activities that have occurred at the site starting with the initial discovery of the releases. The light blue lines represent work completed by Exceltech/Ensco. The green lines represent work completed by Kennedy Jenks and the dark blue lines represent work completed by CKG.


1986
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1997
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2003
2004
2005
2006
2007
2008
2009
2010
July 1986 Construction at forklift ramp reveals fuel
Subsurface Investigations by Exceltech
16,000 g Fuel Oil UST Removed and 36-inch recovery well installed by Exceltech
Two 24,000 g fuel oil tanks removed and product recovery device installed by Exceltech
Tri-annual ground-water monitoring by Exceltech
Second recovery well installed by Exceltech
Kennedy Jenks (KJ) resumes groundwater Monitoring and uses bailers and pads to remove product
Kennedy Jenks completes geoprobe investigation offsite
KJ installs a product skimmer in MW-2
KJ installs absorbent pads in MW-2, -5, -6 MW-7, -8, and -9 And installs MW-20
Recovery wells were deemed a liability due to water infiltration and were destroyed by CKG Environmental
CKG completed a CPT investigation and installed MW-19
CKG resumes annual groundwater monitoring
CKG completes the SCM
CKG Completes the data gap investigation

4.0 ANALYTICAL DATA SUMMARY

With the exception of the 2009 data gap investigation CKG compiled soil and groundwater data collected at the site and presented it in the SCM dated April 3, 2009. The historical soil data employed analytical methods that are no longer used for comparison to current regulatory standards. CKG has included the historical data in Appendix A for reference. Soil data from the data gap investigation is summarized in Table 1. Petroleum hydrocarbon distribution as TPHd in soil is illustrated on Plate 4. To illustrate the distribution of petroleum hydrocarbon in groundwater the most recent 2009 groundwater monitoring event (Table 2) was combined with the data from the data gap investigation. Petroleum hydrocarbon distribution as TPHd in groundwater is illustrated on Plate 5. Plate 6 illustrates the distribution of TPHg in groundwater.

4.1 SOIL DATA INTERPRETATION/CONSTITUENTS OF CONCERN

Concentrations of contaminants in soil and groundwater were compared with the May 2008 Environmental Screening Levels (ESLs) established by the San Francisco Bay Region of the Regional Water Quality Control Board (SFRWQCB). For the purposes of this comparison CKG selected Table B-2, Shallow Soil Screening Levels, Commercial/Industrial Land Use and Table F-1b Groundwater Screening Levels (groundwater is not a current or potential drinking water resource). These ESLs most accurately reflect current land use conditions at the site. The following summarizes the established ESLs for the constituents detected during the 2009 investigation:

ESL Table	B-2	F-1b
Constituent of Concern	**mg/kg**	**µg/l**
Benzene	0.27	46
Ethylbenzene	4.7	43
Toluene	9.3	130
Xylenes	11	100
TPHg	180	210
TPHd	180	210
TPHmo	180	210
Acetone	0.50	1500
2-butanone (MEK)	13	14,000
T-butyl alcohol	110	18,000
Chloroethane	0.85	12
Methyl-t-butyl ether (MTBE)	8.4	1800
2 Methylnaphthalene	0.25	2.1
Naphthalene	2.8	24

4.1.1 Central UST Area

Field observations made during the subsurface explorations and analytical laboratory reports indicate that the fuel release originally reported for the former gasoline UST is larger than originally concluded. In addition, the 1986 data did not detect a diesel release associated with the former diesel USTs, however, the 2009 data indicates that soil and groundwater in the vicinity and downgradient of the former diesel/lube oil USTs has been impacted with petroleum hydrocarbon in the diesel and motor oil ranges. This finding explains the source of the elevated TPHd concentrations observed in MW-17 beginning with the 2004 groundwater monitoring event.

Borings B1 through B7 were advanced in the vicinity of the Central UST Area. As illustrated on Tables 1 and 2, constituents related to gasoline and diesel/motor oil exceed the ESLs in soil and groundwater. Shallower soil impacts at B1 and B2 probably reflect proximity to the original UST source areas. Plate 7 illustrates an approximate outline of the potential source area.

4.1.2 Western UST Area

Soil borings B8 through B41 were advanced to assess the Western UST Area and included offsite downgradient sampling locations. Tables 1 and 2 and Plates 5 and 6 indicate that groundwater in the area is impacted with petroleum hydrocarbons that exceed the ESLs. The highest concentrations of COCs are in the diesel range. The lack of BTEX constituents suggests that there are no gasoline releases in the Western UST Area High concentrations of gasoline range organics likely reflect the overlap of diesel components into the gasoline range of the chromatogram.

A review of Plate 4 indicates concentrations of diesel range petroleum hydrocarbons in soil above the water table. CKG considers impacted soil above 10 feet in depth to be potential source areas. Deeper soil samples probably reflect groundwater impacting soil in the capillary fringe.

Based on soil data and field observations, potential soil source areas may occur at the following locations:

- B23 and B24 - At the location of a former lube oil UST. Access to this area is very limited due to its location immediately adjacent to the glass plant, underneath the rail spur and between two smokestacks associated with the glass furnaces.

- B25, B26, B37 and B38 – In the vicinity of the former Maintenance Building and east of former fuel oil USTs. This area has impacted shallow soil which may be the result of historical surface releases.

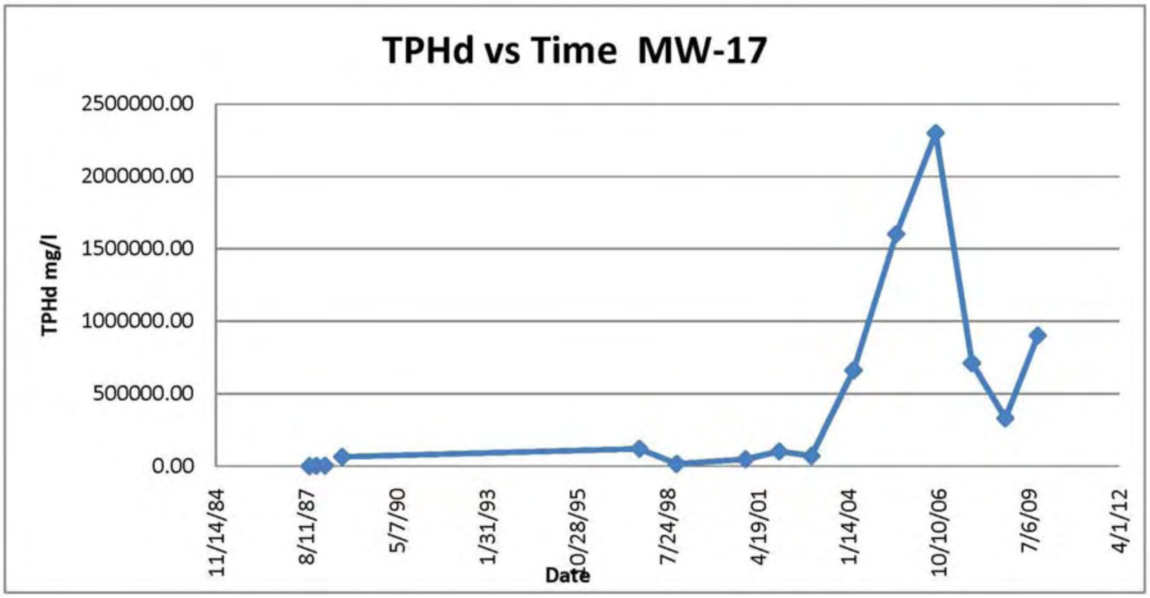
- B12, B33 and B40 – The former location of two fuel oil USTs near the former Maintenance Building

- B8 – Adjacent to an alleged former waste oil tank. There or no records confirming that such a tank existed however shallow soil at B8 suggest a potential source in the vicinity.

Plate 7 illustrates approximate outlines of these potential source areas with the exception of impacts in the vicinity of B8. This particular location is difficult to pinpoint because the alleged waste oil tank is not located on site plans and it does not appear in site records. Also, this location is beneath a concrete ramp into the basement of the manufacturing building. The ramp itself may present a location where surface spills may have accumulated in the past and provided an opportunity to impact soil and groundwater below the ramp.

4.2 CONTAMINANT TRANSPORT INFORMATION

Aquifer testing has not been performed at the Oakland facility however some basic contaminant transport information can be interpreted through groundwater monitoring. At MW-17 concentrations of TPHd were relatively stable from 1986 until 2004 when they increased. Groundwater monitoring data has been tabulated and presented in Appendix A. CKG has plotted TPHd concentration versus time for MW-17 as shown below. The increase in TPHd concentration is observed starting in March 2004. Based on the original 1986 subsurface investigation the only known source of petroleum hydrocarbons in the vicinity was the former gasoline tank. The investigation in 2009 indicated that a diesel release had occurred at the former diesel UST which was approximately 90 feet upgradient of MW-17.



It is not known when the releases occurred from the former diesel UST but soil discoloration and visual appearance suggested historical releases occurring several years earlier. CKG has not been able to obtain information regarding when the diesel UST was originally installed. Considering that the plant was constructed in 1938 it is very possible that the fuel storage facilities were installed at the time of facility construction. If the release had occurred at that time of installation it would be 66 years before it moved 90 feet to reach MW-17, or approximately 1.5 feet per year. At the latest the release occurred in 1986 before the tank was removed. If that is the case the diesel plume moved 90 feet in 18 years or approximately 5 feet/year. On that basis CKG estimates that contaminants are migrating in the groundwater from 1.5 to 5 feet per year, probably along the thin sandy layers that occur in the otherwise silty clay rich soils. Efforts to remove free product from recovery wells installed in the past had limited success because the groundwater did not readily flow into the recovery pumps, suggesting low groundwater conductivity in the subsurface soils.

4.3 GROUNDWATER DATA INTERPRETATION

Concentrations of COCs in groundwater are summarized on Plates 5 and 6. TPHd concentrations have attenuated significantly at B-21 and B-35. It appears that impacted groundwater extends as far as the Oakland Estuary. On the southwest side of the Western UST Area, at Fruitvale Avenue, historic data indicates no impact to groundwater across Alameda Avenue or Fruitvale Avenue. CKG suspects that the Sausal Creek storm sewer acts as a hydraulic barrier to contaminant migration to the southwest. The storm sewer is an 8 foot diameter concrete pipe with the bottom below the water table. Based on the most recent groundwater monitoring event, (October 16, 2009), static groundwater was encountered at depths of 9 – 12 feet below ground surface.

4.4 INTERIM REMEDIATION

CKGs 2009 data Gap Investigation proposed to implement an interim remediation action that includes soil excavation at the source areas as illustrated on Plate 7. This action is included in the following discussion of remedial alternatives.

5.0 FEASIBILITY ASSESSMENT OF REMEDIAL TECHNOLOGIES

This feasibility study (FS) evaluates several potential remedial alternatives. ACDEH's approval of the adequacy of the feasibility study and the selected remedial technology for the site is requested.

The FS addresses sub-surface petroleum hydrocarbon contamination that is present as a dissolved product in the groundwater. Separate phase fuel product (hereinafter “free product”) is present on the water table at the site mainly as small globules in the vicinity of MW-5 and 6 and MW-2. Absorbent socks are used in these wells to collect as much free product as possible. Past efforts to extract free product have had limited success, therefore, free product recovery is not proposed.

5.1 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are generally established that are protective of human health and the environment and reduce the potential for exposure to petroleum hydrocarbons in shallow soil encountered at the site. A single RAO has been selected for the site which is intended to address both short term and long term cleanup standards. The following statement is the RAO and proposed cleanup goal for the site:

> Removal or degradation of petroleum hydrocarbons in groundwater to achieve the agreed groundwater remediation goal, or an asymptotic minimum that stabilizes after the selected remediation effort has been implemented.

CKG suggests the following short term and long term cleanup goals unless the site conditions suggest that a stable asymptotic minimum has been achieved.

Groundwater Cleanup Standards

Constituent	Standard (µg/l)	Basis
Short-Term Cleanup Goals[a]		
TPH-diesel	2,500	ESL-Solubility
TPH-gasoline	5,000	ESL-Nuisance Odors
TPH-motor oil	2,500	ESL-Nuisance
Benzene	2000	ESL-Nuisance Odors
Xylenes	5,300	ESL-Nuisance Odors
Naphthalene	210	ESL-Nuisance Odors
Long-Term Cleanup Goals[a]		
TPH-diesel	210	Aquatic Habitat
TPH-gasoline	210	Aquatic Habitat
TPH-motor oil	210	Aquatic Habitat
Benzene	46	Aquatic Habitat
Xylenes	100	Aquatic Habitat
Naphthalene	24	Aquatic Protection

[a]Short-term goals are based on May 2008 Table I-2 ESLs for Gross Contamination Ceiling Levels for groundwater that is NOT a current or potential drinking water resource; long-terms goals are ESLs for based on Table F1-b groundwater that is NOT a current or potential drinking water resource.

5.2 ALTERNATIVE EVALUATION CRITERIA

The criteria listed below were used during this evaluation process.

5.2.1 Effectiveness

Ability to meet the RAO.

5.2.2 Implementability

Capability of the alternative to be implemented with respect to administrative and technical feasibility to site conditions (i.e. space limitations, equipment availability, resource availability, utility requirements, monitoring concerns, and operation and maintenance [O&M]).

The ability of the remedial alternative to meet applicable federal, state, and local regulations and permitting requirements.

5.2.3 Cost

Assess the relative cost of each alternative based on estimated capital cost for construction or initial implementation and ongoing O&M costs.

5.3 IDENTIFICATION AND EVALUATION OF REMEDIAL ACTION ALTERNATIVES

This FS has been prepared to analyze and select a remedial alternative to address the RAO, reduce petroleum hydrocarbon concentrations in groundwater. The current site action and five alternatives were considered for the site. A planning period of 30 years was used to develop the costs. A screening process was then used to evaluate the applicability of options to treat or otherwise remediate the petroleum hydrocarbons based on the following evaluation criteria: effectiveness, implementability, and cost.

The following alternatives were identified and developed for the site. Other remedial alternatives were considered for application at this site but were eliminated early in the process without detailed evaluation. These eliminations were based on past experience at this or other similar sites and on engineering judgment that indicated that they would either be less effective in achieving RAOs, inappropriate technologies for remediating the petroleum hydrocarbons, or could not be implemented in a cost-effective manner.

The present remedial action that is currently underway and three proposed remedial action alternatives were evaluated in detail and are discussed below. These are:

- Current Action – Monitored Natural Attenuation With Petroleum Hydrocarbon Absorbent Socks
- Alternative 1 – No Action
- Alternative 2 –Groundwater Extraction and Treatment/Disposal
- Alternative 3 –Targeted Excavations at Soil Source Areas and the Current Action
- Alternative 4 –In Situ Chemical Oxidation (ISCO) and the Current Action
- Alternative 5 – Targeted Excavations at Soil Source Areas, In Situ Chemical Oxidation (ISCO) and the Current Action

5.3.1 Current Action 1 – Monitored Natural Attenuation with Petroleum Hydrocarbon Absorbent Socks

5.3.1.1 Description

MNA is a process option that relies on naturally occurring *in situ* processes (e.g., biodegradation, chemical transformation, volatilization, dilution, dispersion, and adsorption) to achieve RAOs within a reasonable time frame. These natural processes act to reduce the mass, toxicity, mobility, or volume of impacted groundwater. Groundwater monitoring is performed to assess the progress of attenuation.

MNA is generally applied as a stand-alone technology when it can be effective in a reasonable and predictable time frame, relative to other remedial options, to restore an aquifer to its designated beneficial uses (U.S. EPA 1999).

Source removal or source control is a key component of an effective MNA program. The proposed interim remediation action of excavating impacted soil in source areas will remove significant quantities of the remaining source material.

Another component of an effective MNA program is extensive baseline MNA data collection. Groundwater monitoring has been conducted at the site for many years, so trends of free product thickness and water table elevation are well understood at the site. Additional monitoring to assess competing biological processes and availability of essential nutrients would also need to be conducted. Baseline MNA testing could include nitrate, nitrite, ammonia, total Kjeldahl Nitrogen, sulfate, phosphate, total dissolved solids, etc.

Multiple, distinct, but diverging lines of evidence have been used in recent years to demonstrate natural attenuation mechanisms (Wiedemeier et al. 1998; U.S. EPA 1998, 1999). The most common lines of evidence used to demonstrate natural attenuation of dissolved petroleum hydrocarbons in groundwater include the following:

- historical trends
- mass reduction
- microbiological data
- modeling

An alternative to free product skimming for free product removal is absorption using product selective absorbent socks to collect free product within existing monitoring wells. The absorbent socks can be manually removed from the wells, effectively removing the absorbed free product.

There are two methods for the use of absorbent socks. They can be utilized as free product bailers by inserting and promptly removing the materials. They can alternately be used as a long term passive collective system. In this case the socks are left within the well casing between O&M events. The socks are kept in contact with the free product by anchoring them to the well casing. The socks retain their effectiveness so long as a portion of their length is in contact with free product, allowing for approximately 3 foot changes in water level before the height of the sock requires adjusting. Socks would be replaced when they become saturated with free product.

5.3.1.2 Implementability

The *in situ* MNA process is readily implementable because no construction is involved. Ongoing monitoring could verify that these natural processes are occurring. The methods of groundwater sampling and analysis are well proven and their use is ongoing at the site. The plume is accessible for monitoring purposes and the existing network of monitoring wells is available to support MNA and could be easily supplemented as necessary.

Absorbent socks are presently being used and are a readily implementable method which requires limited additional on-site materials, primarily the absorbent socks and rope or twine with which to attach the socks. Presently there is only one well (MW-2) which has recorded free product in it but four others (MW-5, MW-6, MW-7, and MW-17) have a visible sheen. All 5 wells presently have absorbent socks deployed in them. Removal and replacement of the absorbent socks is presently conducted by plant personnel. This can continue indefinitely.

5.3.1.3 Effectiveness

As fuel-related compounds in soil and groundwater are biodegradable, MNA should be effective in reducing concentrations of TPH in soil and groundwater over the long term.

Absorbent socks are a highly effective, low maintenance, method for removing small quantities of free product. A single 2" sock is capable of absorbing approximately 1 quart of free product. The advantage of using absorbent socks is that they function well in situations where the amount of free product is low, including removing residual sheens, such as tend to occur in high water table situations. Necessary maintenance is generally limited to periodic adjustment in material height to keep the sock(s) within range of the top of the water table and in contact with the free product, and periodic replacement. Currently the removal rate of free product from existing wells is on the order of ounces per month. As such the absorptive capacity of socks is more than adequate to efficiently remove free product for intervals of time greater than the current O&M frequency of once every one to two months.

5.3.1.4 Cost

MNA has a low capital cost and moderate O&M costs. The anticipated long-term O&M costs for MNA may be high, depending on the duration required to reach the RAO. The cost of MNA is, therefore, highly variable depending on the effectiveness of the natural processes and the duration of monitoring.

Free product absorption is expected to be a low-cost option for removal of small quantities of free product at the site. Capital costs are primarily related to the installation and maintenance of monitoring wells. Ongoing costs are related to the materials cost for the absorbent socks of approximately $20 per sock, maintenance costs on site, and disposal of the used socks. Maintenance costs may increase slightly compared to the current costs for maintaining free product skimmers, depending on the total number of absorbent socks used and the frequency with which the height in the well is adjusted.

5.3.1.5 Summary

MNA has proven to be effective in reducing diesel range hydrocarbon concentrations at numerous sites. Costs may also be high due to the prolonged timeframe required to degrade free product, however costs would be significantly lower if the time between monitoring events were extended. This alternative is not a preferred option for the site at this time, but should be reserved for future consideration based upon both technical and cost considerations.

5.3.2 Alternative 1 – No Action

5.3.2.1 Description

Evaluation of the No Action alternative is included as a baseline for comparison with other alternatives. The No Action alternative is used to compare the relative benefits of the other alternatives. Because this alternative does not meet the RAO of removal of recoverable free product, it is not discussed further.

5.3.3 Alternative 2 –Groundwater Extraction and Treatment/Disposal

5.3.3.1 Description

Groundwater could be extracted from a series of extraction wells and pumped to a treatment system then discharged to the on-site permitted oil/water management system. Evaluation of the Groundwater Extraction and Treatment option is included for the purpose of discussion however, years of experience at the site with efforts to recover free product show that subsurface conditions are not conducive to successful groundwater extraction. Subsurface materials are characterized by clays and silts with minor sandy stringers. Such low permeability materials mean that groundwater extraction rates are low, and the radius of influence surrounding the extraction wells is limited. Because this alternative does not meet the criteria for implementability within a reasonable time frame it is not evaluated further.

5.3.4 Alternative 3 –Targeted Excavations at Soil Source Areas with the Current Action

5.3.4.1 Description

Subsurface investigations completed in the past indicate that a significant mass of petroleum hydrocarbons still occur within the soil at probable source areas. These areas of soil impact continue to provide additional petroleum hydrocarbons to enter groundwater. Source area remediation is a key factor in improving the overall success of groundwater remediation. The main feature of this alternative is a number of targeted excavations. CKG proposes to complete Targeted Excavations at the areas shown on Plate 7. When the excavations are open CKG will remove 2-3 excavation volumes of impacted groundwater, if possible, from each excavation. The water will be placed in the onsite oil/water separator. The total volume of groundwater removed will be determined by the rate of pumping and site safety considerations due to having excavations open. CKG will then backfill the excavations with one or two feet of a mixture of gravel and chemical oxidation agent (such as Regenesis ORC Advanced). This will provide an oxygen source for the groundwater and a solid platform on which to compact the clean backfill. Following the targeted excavations groundwater monitoring will continue.

5.3.4.2 Implementability

The Targeted Excavations option is implementable, with careful logistical planning because the glass plant is operating. The actual excavation work can be staged or phased as needed to accommodate plant operations. In order to excavate at the western side of the plant CKG will have to coordinate with Owens-Brockway to move some of the structures such as cullet bins. The specific details regarding which excavations are completed first and the exact schedule for that work will be coordinated with Owens-Brockway.

5.3.4.3 Effectiveness

Excavations are an effective way to remediate impacted soils within the targeted area. The addition of chemical oxidant directly to groundwater is also effective at reducing the petroleum hydrocarbon concentrations in groundwater. Because these excavations are targeting the original sources CKG expects that their removal will be very effective at reducing the petroleum hydrocarbon concentrations in groundwater in the vicinity of the excavations. Since groundwater velocity is low CKG does not expect that the excavations will have an immediate impact on downgradient soil and groundwater. Over time however, petroleum hydrocarbon concentrations in groundwater downgradient of the excavations should attenuate more rapidly because the source areas have been removed.

5.3.4.4 Cost

Targeted excavations would be high in capital costs but it is a onetime cost with a strong likelihood of being effective.

5.3.4.5 Summary

Soil excavation and removal is effective at removing petroleum hydrocarbon mass in the excavated area. The addition of chemical oxidant at the water table at the floor of the excavation is also effective at applying a broad distribution of chemical oxidant to the impacted groundwater and is effective at reducing petroleum hydrocarbon concentrations in groundwater in the vicinity of the excavation. Costs are high for soil excavations. As discussed in Section 5.3.1.5 MNA can be effective in reducing diesel range hydrocarbon concentrations. Costs may also be high due to the prolonged timeframe required to degrade free product, however costs may be lowered due to petroleum hydrocarbon source removal at the excavations.

5.3.5 Alternative 4 –In Situ Chemical Oxidation (ISCO) with the Current Action

5.3.5.1 Description

CKG would use In Situ Chemical Oxidation (ISCO) to treat affected groundwater beyond the limits of the excavations. ISCO is applicable to treat petroleum hydrocarbons at the site, and can be used for mass reduction or intercepting dissolved plumes to remove mobile contaminants. The effectiveness of ISCO depends on the effective distribution of the reagent in the treatment zone and the concentration of oxidizing agent used. There is limited potential to accomplish even distribution throughout the plume using existing monitoring wells. The applied reagents also consume natural organic matter (NOM) in the soil, some of which has sorbed contaminants. Within the ISCO treatment zone, changes in oxidation states and/or pH may result in temporary mobilization of metals. Initially ISCO directly oxidizes petroleum hydrocarbons on contact, however as the initial reaction subsides, and the oxidant diffuses through the subsurface, ISCO may promote microbial growth. Following or concurrently with the ISCO injections groundwater monitoring will continue.

The ISCO process involves injection of chemical reagents into the soil and groundwater where contaminants are present; these reagents promote oxidizing agents which oxidize organic chemicals to water and carbon dioxide. Several variations of the process are available, all of which are intended to oxidize organic contaminants in situ. The most commonly used oxidants include:

* Modified Fenton's reagent (hydrogen peroxide [H_2O_2] and ferrous iron [Fe^{+2}]) or catalyzed hydrogen peroxide, occurring with minimal temperature rise and at neutral pH to minimize mobilization of metals

* Activated persulfate ($S_2O_8^{-2}$).

* Permanganate (MnO_4^-),

* Sodium percarbonate (Regenox)

The optimal oxidant loading, including both target and nontarget compounds, is determined before injection. Within the ISCO treatment zone, changes in oxidation states and/or pH may result in mobilization of metals. Advantages of ISCO include its relatively low capital cost and the speed of reaction.

ISCO would be used in conjunction with the current remediation method of free product absorption and monitored natural attenuation as part of a site closure strategy. Descriptions of several ISCO oxidants are provided below.

<u>Modified Fenton's Reagent</u>. Hydrogen peroxide is used at concentrations as high as 14%. The addition of dissolved ferrous iron dramatically increases the oxidative strength of peroxide by creating the hydroxyl radical (OH•) that acts as the active oxidizing agent. The suite of reactions associated with Fenton's chemistry is complex and effective at degrading many organic compounds dissolved in groundwater, sorbed to soil particles, or existing as light non aqueous phase liquids (NAPLs) in subsurface environments. The hydroxyl radical generated by the Fenton's reagent is an effective, nonselective oxidant. The oxidation of an organic compound by modified Fenton's reagent is a controlled, exothermic (heat-producing) reaction that is generally completed within minutes. The end products of oxidation of petroleum hydrocarbons are primarily innocuous carbon dioxide and water. Unconsumed hydrogen peroxide naturally degrades to oxygen and water. Partially degraded petroleum molecules that may remain behind are more readily biodegraded.

Sodium persulfate. Persulfate salts dissociate in water to persulfate anions, which, although strong oxidants, are kinetically slow in destroying many organic contaminants. For ISCO applications, the most common salt used is sodium persulfate. Potassium persulfate generally is not used as an ISCO reagent because it has a lower solubility in water. Activated persulfate produces a sulfate radical (SO4-•), which is a more powerful oxidant than hydrogen peroxide, permanganate, or ozone. Only the hydroxyl free radical is stronger. The addition of heat or a ferrous salt after sodium persulfate injection activates the ISCO process, producing the sulfate radical. Chelated iron effectively increases the iron solubility and longevity of ferrous iron in the groundwater. Oxidation of petroleum hydrocarbons in soil and groundwater with activated persulfate also has the potential to lower the pH. In water, without soil present to buffer the pH, the pH generally drops to the range of 1.5 to 2.5, depending on the amount of persulfate used. This pH change mobilizes metals present in the soil. The persulfate anion interaction with natural organic matter has been observed to be limited and much lower than that for peroxide or permanganate. However, the presence of high concentrations of chloride, carbonate, and bicarbonate ions can reduce persulfate effectiveness. During ISCO treatment using persulfate, sulfate concentrations typically will increase.

Permanganate. Two common forms of permanganate are used, potassium permanganate and sodium permanganate. The potential for higher concentrations in liquid sodium permanganate solutions gives more flexibility in the design of the injection volume, and the dusting hazards associated with dry potassium permanganate solids are eliminated. Permanganate is a stable oxidant and can persist in soil and groundwater for months. Permanganate has been shown to be effective in treating dissolved petroleum hydrocarbons. Because permanganate, like all oxidants, is nonselective, it also can oxidize NOM present in the soil. Since organic contaminants sorb to NOM in the soil matrix, they can be released as the NOM is oxidized by the permanganate. The application rate and the total mass introduced must be balanced with the subsurface oxidizable material. The viability of applying permanganate depends on the extent of contamination, the contaminant oxidant demand, the presence of competing naturally reduced materials, and treatment goals. Poor performance of permanganate is often attributed to injection of an inadequate volume of oxidant to contact the entire target zone; poor uniformity of oxidant delivery caused by low-permeability zones and subsurface heterogeneity, excessive oxidant consumption by natural subsurface materials, or sorbed contaminants. The generation of a manganese dioxide precipitate in soil through permanganate treatment can reduce permeability and limit effectiveness of future injections. Background measurements of manganese concentrations should be collected to establish existing conditions prior to injection of permanganate.

Sodium Percarbonate. A recent development in ISCO technologies is another proprietary mixture utilizing peroxide called RegenOx. According to the manufacturer (Regenesis), RegenOx is an advanced ISCO technology designed to treat organic chemicals, including petroleum hydrocarbon source areas in the saturated and vadose zones. RegenOx maximizes in situ performance using a solid alkaline oxidant that employs a sodium percarbonate complex containing peroxide. Once in the subsurface, the combined product produces an effective oxidation reaction comparable to that of Fenton's reagent without an exothermic reaction. Strategies employing multiple RegenOx injections coupled with accelerated bioremediation can be used to cost-effectively treat contaminated sites to regulatory closure. RegenOx has been rigorously tested in both the laboratory and the field on petroleum hydrocarbons (TPH, BTEX, etc; Regenesis n.d.). CKG has used RegenOx at other petroleum hydrocarbon impacted sites with notable success.

5.3.5.2 Implementability

Handling of reagents requires engineering controls such as a health and safety plan and personal protective equipment. ISCO has been implemented successfully at numerous sites, and would be implementable at this site. The presence of underground utilities and their bedding materials at the site may influence the distribution of the reagents. Some amount of physical displacement of groundwater and migration of contaminants is likely during ISCO reagent injection. The need for hydraulic controls would be evaluated during the remedial design phase. Wells may need to be installed to extract groundwater if hydraulic controls are needed. One of the advantages of ISCO injection is that it can be staged or phased as necessary to avoid the need for hydraulic control. Approval would be needed from the RWQCB to introduce oxidants to the subsurface at the site.

5.3.5.3 Effectiveness

CKG has utilized ISCO at other sites with notable reductions in petroleum hydrocarbon concentrations in groundwater. Multiple applications may be necessary because petroleum hydrocarbon concentrations in groundwater usually show a rebound effect following initial reduction as groundwater concentrations equilibrate with the petroleum hydrocarbons that are sorbed onto adjacent soil particles. ISCO may not be affective in areas with very high petroleum hydrocarbon concentrations, and may react very strongly (potentially with exothermic results) in the presence of free product.

ISCO could result in temporary increases of dissolved metals such as iron and manganese. Poor performance of permanganate is often attributed to the presence of free product or sorbed contaminants that are not released from the aquifer matrix, therefore permanganate would not be effective at the site. Persulfate salts dissociate in water to persulfate anions, which, although strong oxidants, are kinetically slow in destroying many organic contaminants. ISCO using modified Fenton's reagent such as RegenOx has been implemented successfully at numerous sites around the country impacted with petroleum hydrocarbons,

5.3.5.4 Cost

ISCO would be high in capital costs. ISCO has a high probability to be effective in reducing TPH concentrations in the plume area, but large quantities and multiple applications may be necessary, particularly in the source areas.

5.3.5.5 Summary

ISCO is very effective at reducing petroleum hydrocarbon concentrations in the subsurface although there will be difficulties in the source areas. As a result numerous applications are likely required to meet the RAO. Costs for each application of ISCO are high; however ISCO can be applied in a flexible manner over time so that disruptions to plant operations can be minimized.

5.3.6 Alternative 5 –Targeted Excavations at Soil Source Areas and In Situ Chemical Oxidation with the Current Action

5.3.6.1 Description

CKG would employ the Targeted Excavations as described in Section 5.3.4.1 and ISCO as described in Section 5.3.5.1. The advantage of this approach is that the highest concentration source areas are removed from the ISCO treatment program thus removing the difficulty and potential risks associated with applying ISCO in areas with significant free product. Following or concurrently with the targeted excavations and ISCO injections groundwater monitoring will continue.

5.3.6.2 Effectiveness

As stated above soil excavation and removal is completely effective at removing petroleum hydrocarbon mass in the excavated area, and CKG has successfully used chemical oxidants in the past within excavations and as ISCO to reduce petroleum hydrocarbon concentrations in soil and groundwater over large areas. The combination of targeted excavations and ISCO is most likely to provide the greatest mass reduction of contaminants over the largest areas within a reasonable time frame and meet the RAO. Costs are high for the excavations and ISCO. Although multiple applications of ISCO may be necessary the total number is likely to be much less than without the targeted excavations because the source areas would be particularly difficult to treat and would continue to act as a source area of contaminant migration to the groundwater.

5.3.6.3 Cost

Costs for excavations and ISCO are high.

5.3.6.4 Summary

The combination of targeted excavations and ISCO is most likely to provide the greatest mass reduction of contaminants over the largest areas within a reasonable time frame and meet the RAO. Costs are high for the excavations and ISCO. Although multiple applications of ISCO may be necessary the total number is likely to be much less than without the targeted excavations because the source areas will be particularly difficult to treat and will continue to act as a source area of contaminant migration to the groundwater.

5.4 RECOMMENDED REMEDIAL ACTION STRATEGY

For this FS, an evaluation of the treatment technologies has been summarized in a Decision Matrix presented on Table 3. The decision matrix further breaks down the three evaluation criteria of effectiveness, implementability and cost. Effectiveness is further evaluated by; the likelihood of reaching the RAO, the need for long-term operations and maintenance, and short and long term impacts to the environment. Implementability is further evaluated by; health and safety concerns, impact to plant operations, and expected reliability of the option. Cost is evaluated by total cost and the uncertainty of that cost. Each remedial option was ranked on a scale of 1-5 relative to the other options. Then each of the evaluation criteria was assigned a weighting factor in an effort to indicate the importance of those criteria. The score for each criteria is the ranking multiplied by the weighting factor. After all the scores were tallied the higher scoring alternatives were further considered.

The current actions and alternatives were ranked and scored based on their effectiveness, implementability and cost. Total scores ranged from 65, which represents the least preferred option, to 124, which represents the most preferred option. Alternative 5, Targeted Excavations at Soil Source Areas and In Situ Chemical Oxidation with the Current Action received a score of 124 which is the highest score of all the alternatives reviewed.

Alternative 5 is a viable option based on technical efficacy of excavations and ISCO. It is also the only alternative reviewed that is likely to meet the RAO in the planning period. Costs are comparatively high but they can be spread out over time depending on the specific schedule implemented for each excavation and round of ISCO injections.

5.5 CONCLUSION AND PROJECTED TIME FRAME FOR REMEDIAL ACTIONS

CKG plans to implement the interim remediation within 12 months of submitting this feasibility study. The logistics involved with the excavations at an operating plant are very difficult which may increase the time required. While that work is being performed CKG will prepare the Remedial Action Work Plan for the selected alternative and refine the implementation specifics. ISCO injections can be completed during any season and can be phased depending on plant operations. For example it may be appropriate to focus ISCO injection efforts on offsite areas initially while preparations are being made for the excavations. CKG will coordinate with Owens-Brockway, with input and concurrence by ACDEH, to prepare a remediation schedule.

6.0 REFERENCES

Bedient, Philip B, Hanadi S. Rifai, and Charles J. Newell. *Ground Water Contamination*. New Jersey: Prentice Hall, 1999.

California Regional Water Quality Control Board – San Francisco Bay Region, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, May 2008.

CKG Environmental, Inc. 2010 Data Gap Investigation Report, Owens-Brockway Glass Container Facility, Oakland, California February 3, 2010.

CKG Environmental, Inc. 2009 Groundwater Monitoring Report, Owens-Brockway Glass Container Facility, Oakland, California January 15, 2010.

CKG Environmental, Inc. 2009 Addendum to Work Plan to Complete a Detailed Utility Survey and Sampling, and Soil and Groundwater Investigation to Address Data Gaps, Owens-Brockway Glass Container Facility, Oakland, California, August 27, 2009.

CKG Environmental, Inc. 2009 Work Plan to Complete a Detailed Utility Survey and Sampling, and Soil and Groundwater Investigation to Address Data Gaps, Owens-Brockway Glass Container Facility, Oakland, California July 7, 2009.

CKG Environmental, Inc. 2009 Site Conceptual Model, Owens-Brockway Glass Container Facility, 3600 Alameda Avenue, Oakland, California April 3, 2009.

CKG Environmental, Inc. 2008 Groundwater Monitoring Report, Owens-Brockway Glass Container Facility, Oakland, California December 22, 2008.

CKG Environmental, Inc. 2007 Groundwater Monitoring Report, Owens-Brockway Glass Container Facility, Oakland, California December 17, 2007.

CKG Environmental, Inc. 2006 Groundwater Monitoring Report, Owens-Brockway Glass Container Facility, Oakland, California January 12, 2007.

CKG Environmental, Inc. 2005 Groundwater Monitoring Report, Owens-Brockway Glass Container Facility, Oakland, California November 29, 2005.

CKG Environmental, Inc. 2005, Work Plan to Prepare a Site Conceptual Model, Owens-Brockway Glass Container Facility, Oakland, California. April 6, 2005.

CKG Environmental, Inc. 2004 Groundwater Monitoring Report, Owens-Brockway Glass Container Facility, Oakland, California April 29, 2004.

CKG Environmental, Inc. Summary of Remediation History and Groundwater Impact by Petroleum Hydrocarbons, Owens-Brockway Glass Container Facility, 3600 Alameda Avenue, Oakland, California. April 4, 2003.

CKG Environmental, Inc. Work Plan to Install One Monitoring Well and Assess the Distribution of Petroleum Hydrocarbons, Owens-Brockway Glass Container Facility, Oakland, California, April 22, 2003.

CKG Environmental, Inc. Data Compilation and Closure Report Underground Fuel Storage Tank Locations, Owens-Brockway Glass Container Facility, Oakland, California, November 4, 2003.

Exeltech, Soil and Groundwater Contamination Investigation for Owens-Illinois Glass Container Division, 3600 Alameda Avenue, Oakland, California, December 1986.

Exeltech, Soil and Groundwater Contamination Investigation for Owens-Illinois Glass Container Division, 3600 Alameda Avenue, Oakland, California, February 1987.

Kennedy/Jenks, Consultants. Groundwater investigation Report, Owens-Brockway Glass Containers, February 16, 1999.

Kennedy/Jenks, Consultants. Annual Groundwater Monitoring Report, Owens-Brockway Glass Containers, January 21, 2003.

Wiedemeier, T.H., M.A. Swanson, D.E. Moutoux, E.K. Gordon, J.T. Wilson, B.H. Wilson, D.H. Kampbell, P.E. Haas, R.N. Miller, J.E. Hansen, and F.H. Chapelle. 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. EPA/600/R-98/128. United States Environmental Protection Agency Office of Research and Development, Washington, DC.

TABLES

Table 1. Soil Sample Analytical Results
Oakland, California

Sample ID	Sample Date	Depth ft bgs	TPHd	TPHmo	TPHg	BTEX				MTBE	SVOCs[11]	VOCs[12]
						Benzene	Toluene	Ethylbenzene	Xylenes			
CKG - B1 3.5-4[3]	8/31/2009	3.5-4	ND	ND	1.8	ND	ND	ND	ND	-	-	-
CKG - B1 8-8.5[3,4]	8/31/2009	1 8-8.5	**510**[5]	**180**[5]	**340**	ND<0.050	ND<0.050	0.057	0.55	-	ND<3.3 - ND<16[1]	0.053-0.54[1]
CKG - B2 5-5.5[3]	8/31/2009	5-5.5	**710**[5]	**190**[5]	66	ND	ND	ND	0.039	-	-	-
CKG - B2 12-12.5[3]	8/31/2009	12-12.5	150[6,8]	98[6,8]	50	ND<0.010	ND<0.010	ND<0.10	ND<0.10	-	-	-
CKG - B3 12.5-13	8/31/2009	12.5-13	ND	ND	ND	ND	ND	ND	ND	-	-	-
CKG - B4 9-9.5	8/31/2009	9-9.5	19[6,8]	59[6,8]	ND	ND	ND	ND	ND	-	-	-
CKG - B5 11.5-12[3,4]	8/31/2009	11.5-12	63[5]	18[5]	24	ND	0.013	0.07	0.064	-	-	-
CKG - B6 5-5.5	8/31/2009	5-5.5	ND	ND	ND	ND	ND	ND	ND	-	-	-
CKG - B6 7.5-8	8/31/2009	7.5-8	ND	ND	ND	ND	ND	ND	ND	-	-	-
CKG - B7 7.5-8	8/31/2009	7.5-8	9.9[7]	ND	ND	ND	ND	ND	ND	-	-	-
CKG - B7 12-12.5[3]	8/31/2009	12-12.5	ND	ND	6.3	ND	ND	ND	ND	-	-	-
CKG - B8 7.5-8[3,4]	9/1/2009	7.5-8	**1,800**[5,8]	**390**[5,8]	**2,000**	ND<0.25	0.51	2.4	10	-	-	-
CKG - B8 13-13.5[3,4]	9/1/2009	13-13.5	**580**[5,8]	170[5,8]	**840**	ND<0.25	ND<0.25	**4.3**	2.9	-	-	-
CKG - B9 4-4.5[3,4]	9/1/2009	4-4.5	140[6,8,9]	**200**[6,8,9]	140	ND<0.050	ND<0.050	0.26	0.18	-	-	-
CKG - B9 14-14.5[2,3]	9/1/2009	14-14.5	**760**[5,8]	**190**[5,8]	870	ND<1.0	ND<1.0	ND<1.0	ND<1.0	-	-	-
CKG - B11 11-11.5	9/1/2009	11-11.5	ND	ND	ND	ND	ND	ND	ND	-	-	-
CKG - B11 13.5-14[3]	9/1/2009	13.5-14	**800**[5,8]	**360**[5,8]	**280**	ND<0.25	ND<0.25	ND<0.25	ND<0.25	-	-	-
CKG - B12 3.5-4[3,4]	9/1/2009	3.5-4	**7,500**	**3,600**	**2,400**	ND<1.0	ND<1.0	**4.9**	**11**	-	-	-
CKG - B12 13.5-14[3,4]	9/1/2009	13.5-14	**220**[5,8]	87[5,8]	**490**	ND<0.25	ND<0.25	0.5	1.2	-	ND<0.66-0.8	ND<0.008 - ND<0.2[1]
CKG - B13 10-10.5	9/1/2009	10-10.5	8.5[6,8]	14[6,8]	ND	ND	ND	ND	ND	-	-	-
CKG - B14 10-10.5[3,4]	9/1/2009	10-10.5	**3,100**[6,8,9]	**3,200**[6,8,9]	**890**	ND<0.25	1.1	2.5	5.5	-	-	-
CKG - B14 15-15.5[3,4]	9/1/2009	15-15.5	**290**[6,8]	**260**[6,8]	**420**	ND<0.010	0.25	0.62	1.1	-	-	-
CKG - B15 4-4.5	9/1/2009	4-4.5	2.8[6,9]	ND	ND	ND	ND	ND	ND	-	-	-
CKG - B15 9-9.5[3,4]	9/1/2009	9-9.5	**430**[5,8]	140[5,8]	**400**	ND<0.10	ND<0.10	0.51	1.5	-	-	-
CKG - B16 4-4.5[3,4]	9/1/2009	4-4.5	4.8[6,8,9]	7.7[6,8,9]	-	ND	ND	0.013	0.074	-	-	-
CKG - B16 9.5-10[3,4]	9/1/2009	9.5-10	**7,900**	**5,300**	-	ND<1.0	7.5	**11**	**36**	-	-	-
CKG - B17 4-4.5[3]	9/1/2009	4-4.5	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B17 9.5-10[3]	9/1/2009	9.5-10	**1,000**[5,8]	**270**[5,8]	-	ND<0.10	ND<0.10	2	4.4	-	-	-
CKG - B19 4-4.5[3]	9/2/2009	4-4.5	20[6,8]	92[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B19 10-10.5[3]	9/2/2009	10-10.5	**680**[5,8]	**320**[5,8]	-	ND<0.10	ND<0.10	0.14	0.17	-	-	-
CKG - B20 3.5-4	9/2/2009	3.5-4	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B20 13-13.5[3,4]	9/2/2009	13-13.5	38[6,8]	31[6,8]	-	ND	ND	0.02	ND	-	-	-
CKG - B21 5.5-6	9/2/2009	5.5-6	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B21 12.5-13	9/2/2009	12.5-13	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B22 7.5-8	9/2/2009	7.5-8	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B22 12-12.5	9/2/2009	12-12.5	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B23 8-8.5[3]	9/2/2009	8-8.5	**940**[6,8]	**970**[6,8]	-	ND<0.050	ND<0.050	ND<0.050	ND<0.050	-	-	-
CKG - B23 12.5-13[3]	9/2/2009	12.5-13	23[6,8]	33[6,8]	-	ND	ND	ND	ND	-	-	ND<0.005-0.082
CKG - B24 4-4.5[3,4]	9/2/2009	4-4.5	**420**[6,8]	**860**[6,8]	-	0.012	ND	0.096	0.18	-	-	-
CKG - B24 11.5-12[3]	9/2/2009	11.5-12	15[6,8]	28[6,8]	-	ND	ND	ND	ND	-	ND<0.33-ND<1.6	-
CKG - B25 3.5-4	9/2/2009	3.5-4	130[6,8]	**340**[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B25 7.5-8[3]	9/2/2009	7.5-8	**1,700**[6,8]	**1,800**[6,8]	-	**0.36**	ND<0.25	ND<0.25	ND<0.25	-	-	-
CKG - B26 7.5-8[3]	9/2/2009	7.5-8	8.9[6,8]	28[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B26 14.5-15[3]	9/2/2009	14.5-15	**1,200**[6,8]	**1,200**[6,8]	-	ND<0.10	ND<0.10	0.34	0.98	-	-	0.021-0.054
CKG - B27 5.5-6	9/3/2009	5.5-6	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B27 8.5-9	9/3/2009	8.5-9	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B28 8.5-9	9/3/2009	8.5-9	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B28 12.5-13	9/3/2009	12.5-13	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B29 4-4.5	9/3/2009	4-4.5	2.5[6,8,10]	9.7[6,8,10]	-	ND	ND	ND	ND	-	-	-
CKG - B29 12-12.5	9/3/2009	12-12.5	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B30 8-8.5	9/3/2009	8-8.5	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B30 14-14.5	9/3/2009	14-14.5	1.5[6]	ND	-	ND	ND	ND	ND	-	-	-
CKG - B31 8-8.5	9/3/2009	8-8.5	14[6,8]	**100**[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B31 13-13.5	9/3/2009	13-13.5	4.6[6,8]	9.9[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B32 7-7.5	9/3/2009	7-7.5	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B32 14-14.5[3]	9/3/2009	14-14.5	**230**[5,8]	67[5,8]	-	ND<0.50	ND<0.50	ND<0.50	ND<0.50	-	-	ND<0.016-ND<0.4[1]
CKG - B33 5-5.5[3]	9/3/2009	5-5.5	**2,300**[5,8]	**890**[5,8]	-	ND<1.0	ND<1.0	**2.3**	7	-	-	-
CKG - B33 10-10.5[3,4]	9/3/2009	10-10.5	**980**[5,8]	**380**[5,8]	-	ND<1.0	1.7	1.2	2.8	-	-	-
CKG - B34 5.5-6[3]	9/3/2009	5.5-6	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B34 12-12.5	9/3/2009	12-12.5	2.1[6,8]	10[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B35 4-4.5	9/3/2009	4-4.5	9.1[6,8]	85[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B35 9.5-10	9/3/2009	9.5-10	1.2[6]	ND	-	ND	ND	ND	ND	-	-	-
CKG - B36 4-4.5	9/4/2009	4-4.5	ND	ND	-	ND	ND	ND	ND	-	-	-
CKG - B36 9-9.5	9/4/2009	9-9.5	72[6,8]	**210**[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B37 4-4.5[3]	9/4/2009	4-4.5	7.7[6,8]	36[6,8]	-	ND	ND	0.0081	0.029	-	-	-
CKG - B37 16.5-17[3,4]	9/4/2009	16.5-17	**4,100**[6,8,10]	**3,100**[6,8,10]	-	ND<1.0	ND<1.0	**5.7**	6.7	-	-	-
CKG - B38 7.5-8[3]	9/4/2009	7.5-8	**590**[5,8]	**240**[5,8]	-	ND<0.050	ND<0.050	ND<0.0050	0.56	-	-	-
CKG - B38 15-15.5[3]	9/4/2009	15-15.5	66[5,8]	26[5,8]	-	ND	ND	0.0094	0.12	-	-	-
CKG - B39 8-8.5[3]	9/4/2009	8-8.5	14[6,8]	39[6,8]	-	ND	ND	ND	ND	-	-	-
CKG - B39 15.5-16[3]	9/4/2009	15.5-16	**480**[5,8]	90[5,8]	-	ND<0.10	ND<0.10	ND<0.10	0.63	-	-	-
CKG - B40 9-9.5[3,4]	9/4/2009	9-9.5	**3,800**[5,8]	**1,100**[5,8]	-	ND<0.25	ND<0.25	ND<0.25	10	-	-	-
CKG - B40 15.5-16[3]	9/4/2009	15.5-16	**190**[5,8]	76[5,8]	-	ND<0.050	ND<0.050	0.073	4.6	-	-	-
CKG - B41 8-8.5[3]	9/4/2009	8-8.5	12[6,8,9]	28[6,8,9]	-	ND	ND	ND	ND	-	-	-
CKG - B41 16.517[3,4]	9/4/2009	16.5-17	24[5,8]	11[5,8]	-	ND	ND	0.035	0.072	-	-	-
ESL Standard B-2			**180**	**180**	**180**	**0.27**	**9.3**	**4.7**	**11**	**8.4**	-	-

Notes: All results in mg/kg
ESL Standard B-2 - Shallow Soil Screening Levels, Commercial/Industrial Land Use (groundwater is not a current or potential drinking water resource).

1 Sample diluted due to high organic content
2 Estimated value due to low surrogate recovery, caused by matrix interface
3 Strongly aged gasoline or diesel range compounds are significant in the TPH(g) chromatogram
4 No recognizable pattern
5 Unmodified or weakly modified diesel is significant; and/or kerosene/kerosene range/jet fuel range
6 Diesel range compounds are significant; no recognizable pattern
7 Aged diesel is significant
8 Oil range compounds are significant
9 Stoddard solvent/mineral spirit (?)
10 Gasoline range compounds are significant
11 See table 1A below
12 See table 1B below

Table 1A. Soil Sample Analytical Results - SVOCs
Oakland, California

Sample ID:	CKG - B1 8-8.5[1]	CKG - B12 13.5-14	CKG - B24 11.5-12	ESL Standard B-2
SVOCs				
2-Methylnapthalene	ND<3.3	**0.8**	ND	**0.25**
All Other SVOCs	ND<3.3 - ND<16	ND<0.66-ND<3.2	ND<0.33-ND<1.6	-

Note: All results in mg/kg
Standard B-2 - Shallow Soil Screening Levels, Commercial/Industrial Land Use (groundwater is not a current or potential drinking water resource).

1 Sample diluted due to high organic content

Table 1B. Soil Sample Analytical Results - VOCs
Oakland, California

Sample ID:	CKG - B1 8-8.5[1]	CKG - B12 13.5-14[1]	CKG - B23 12.5-13	CKG - B26 14.5-15	CKG - B32 14-14.5[1]	ESL Standard B-2
VOCs						
Acetone	ND<0.2	ND<0.1	0.082	ND<0.2	ND<0.2	**0.50**
n-Butyl benzene	0.54	ND<0.01	ND	0.038	ND<0.02	-
1,2,4 - Trimethylbenzene	ND<0.02	ND<0.01	ND	0.052	ND<0.02	-
sec Butyl Benzene	0.20	ND<0.01	ND	0.054	ND<0.02	-
Ethylbenzene	ND<0.02	ND<0.01	ND	0.021	ND<0.02	**4.7**
Isopropylbenzene	0.068	ND<0.01	ND	0.035	ND<0.02	-
n-Propyl benzene	0.053	ND<0.01	ND	0.032	ND<0.02	-
1,2,3 - Trichloropropane	ND<0.02	ND<0.01	ND	0.024	ND<0.02	-
1,3,5 - Trimethylbenzene	ND<0.02	- ND<0.01	ND	0.052	ND<0.02	-
All Other VOCs	ND<0.016 - ND<0.2	ND<0.008 - ND<0.2	ND<0.005-ND<0.1	ND<0.016-ND<0.4	ND<0.016 - ND<0.4	-

Note: All results in mg/kg
ESL Standard B-2 - Shallow Soil Screening Levels, Commercial/Industrial Land Use (groundwater is not a current or potential drinking water resource).

1 Sample diluted due to high organic content

Table 2. Groundwater Sample Analytical Results
Oakland, California

Sample ID	Sample Date	TPHd	TPHmo	TPHg	BTEX				MTBE	SVOCs[14]	VOCs[15]
					Benzene	Toluene	Ethylbenzene	Xylenes			
CKG - B1[2,3,3]	8/31/2009	**220,000**[2,3,7,8,10]	**53,000**[2,3,7,8,10]	**17,000**	**720**	ND<25	**400**	**340**	-	-	22-710[2,3]
CKG - B2[2,3,5]	8/31/2009	**720,000**[2,3,4,9]	**630,000**[2,3,6,9]	**15,000**	ND<10	ND<10	ND<10	ND<10	-	-	-
CKG - B3[2]	8/31/2009	**270**[2,6,9]	**310**[2,6,9]	ND	ND	ND	ND	ND	-	-	-
CKG - B4[2]	8/31/2009	**410**[2,6,9]	**520**[2,6,9]	ND	ND	ND	ND	ND	-	-	-
CKG - B5[2,6]	8/31/2009	**1,200**[2,6,9]	**850**[2,6,9]	240	ND	1.6	ND	ND	-	-	-
CKG - B6[2]	8/31/2009	**3,900**[2,6,9]	**3,400**[2,6,9]	ND	ND	ND	ND	ND	-	-	-
CKG - B8[2,3,5,6]	9/1/2009	**170,000**[2,3,7,9]	**62,000**[2,3,7,9]	-	ND<10	ND<10	17	ND<10	-	-	-
CKG - B9[2,3,5,6]	9/1/2009	**330,000**[2,3,4,7,9]	**120,000**[2,3,4,7,9]	**23,000**	ND<10	ND<10	**46**	**200**	-	-	-
CKG - B11[2,5]	9/1/2009	**3,100**[2,6,9]	**6,300**[2,6,9]	-	ND	ND	ND	ND	-	-	-
CKG - B12[2,3,5]	9/1/2009	**150,000**[2,3,4,7,9]	**100,000**[2,3,4,7,9]	-	ND<2.5	ND<2.5	3.8	10	-	-	1.4-13[2,3]
CKG - B13[2]	9/1/2009	**3,200**[2,6,9]	**10,000**[2,6,9]	-	ND	ND	ND	ND	-	-	-
CKG - B14[2,3,6,7]	9/1/2009	**82,000**[2,6,9]	**81,000**[2,6,9]	**1,400**	ND<1.0	2.2	14	4.6	-	-	-
CKG - B15[2,3,5]	9/1/2009	**34,000**[2,3,4,9]	**19,000**[2,3,4,9]	-	ND<2.5	ND<5.0	ND<5.0	ND<5.0	-	-	-
CKG - B16[2,3,6,7]	9/1/2009	**680,000**[2,6,9,11]	**490,000**[2,6,9,11]	**11,000**	ND<1.0	10	26	63	-	-	-
CKG - B17[2,3,6,7]	9/1/2009	**19,000**[2,3,4/7,9]	**9,300**[2,3,4/7,9]	**1,400**	ND<1.7	ND<1.7	ND<1.7	ND<1.7	-	-	-
CKG - B19[2,3,6,7]	9/2/2009	**1,300,000**[2,6,9,11]	**860,000**[2,6,9,11]	**19,000**	ND<10	12	39	14	-	-	-
CKG - B20[2,3,7]	9/2/2009	**1,100,000**[2,6,9]	**900,000**[2,6,9]	**4,300**	ND<10	ND<10	ND<10	ND<10	-	-	4.3-27[1,2,3]
CKG - B21[2]	9/2/2009	**310**[2,6,9]	**330**[2,6,9]	ND	ND	ND	ND	ND	-	-	-
CKG - B22[2,3,7]	9/2/2009	**70,000**[2,3,6,9]	**60,000**[2,3,6,9]	110	ND	ND	ND	ND	-	-	-
CKG - B23[2,3,6,7]	9/2/2009	**140,000**[2,6,9,11]	**590,000**[2,6,9,11]	**7,500**	ND	2.6	5.1	39	-	-	-
CKG - B24[2]	9/2/2009	**3,900**[2,8,9]	**4,300**[2,8,9]	ND	ND	ND	ND	ND	-	-	-
CKG - B25[2,3,7]	9/2/2009	**34,000**[2,6,9]	**57,000**[2,8,9]	**270**	ND	ND	N D	2.5	-	-	-
CKG - B26[2,3,6,7]	9/2/2009	**4,700,000**[2,3,6,9]	**4,700,000**[2,3,6,9]	**5,500**	ND<2.05	2.6	4.7	42	-	-	6.1-70[1,2,3]
CKG - B27[2,3,7]	9/3/2009	**3,200**[2,4/7,9]	**1,500**[2,4/7,9]	**250**	ND	ND	ND	2.3	-	-	-
CKG - B28[2,3,6,7]	9/3/2009	**770,000**[2,4/7,9]	**230,000**[2,4/7,9]	**8,000**	ND<1.7	ND<1.7	9.5	35	-	-	-
CKG - B29[2,3,7]	9/3/2009	**120,000**[2,4/7,9]	**55,000**[2,4/7,9]	**1,700**	ND<5.0	ND<5.0	ND<5.0	ND<5.0	-	-	-
CKG - B30[2,3,7]	9/3/2009	**29,000**[2,6,9]	**36,000**[2,6,9]	120	ND	1.1	ND	0.8	-	-	-
CKG - B31[2,3,7]	9/3/2009	**260,000**[2,4/7,9]	**150,000**[2,4/7,9]	**2,100**	ND<5.0	ND<5.0	ND<5.0	ND<5.0	-	-	2.8-72[1,2]
CKG - B32[2,3,7]	9/3/2009	**1,700,000**[2,4/7,9]	**820,000**[2,4/7,9]	**18,000**	ND<1.7	ND<1.7	13	78	-	-	-
CKG - B33[2,3,5,6]	9/3/2009	**1,500,000**[2,3,4/7,9]	**1,100,000**[2,3,4/7,9]	-	ND<1.7	8	19	50	-	-	-
CKG - B34[5,6]	9/3/2009	**1,000**[2,6,9]	**2,800**[2,6,9]	-	ND	ND	ND	ND	-	-	-
CKG - B35[2]	9/3/2009	**450**[2,6,9]	**1,200**[2,6,9]	-	ND	ND	ND	ND	-	-	-
CKG - B36[2,3,5,6]	9/4/2009	**310,000**[2,3,6,9,11]	**250,000**[2,3,6,9,11]	-	ND	1.9	2.7	16	-	-	-
CKG - B37[2,3,5,6]	9/4/2009	**460,000**[2,3,6,9,11]	**550,000**[2,3,6,9,11]	-	ND	2.6	6.5	34	-	-	-
CKG - B38[2,3,5,6]	9/4/2009	**620,000**[2,3,4/7,9]	**300,000**[2,3,4/7,9]	-	ND	3.4	4.7	20	-	-	-
CKG - B39[2,3,5]	9/4/2009	**180,000**[2,3,4/7,9]	**64,000**[2,3,4/7,9]	-	ND	ND	5.1	ND	-	ND<1,000-ND<5,000[1,2]	-
CKG - B40[2,3,5,6]	9/4/2009	**350,000**[2,3,4/7,9]	**150,000**[2,3,4/7,9]	-	ND<2.5	2.6	**47**	**200**	-	-	-
CKG - B41[2,3,5,6]	9/4/2009	**150,000**[2,3,4/7,9]	**87,000**[2,3,4/7,9]	-	ND<10	ND<10	ND<10	ND<10	-	-	-
MW-1[2, 9, 12]	10/16/2009	**310**	**310**	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-5[2, 3, 2, 9, 12]	10/16/2009	**160,000**	**140,000**	180	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-6[3, 2, 12, 13]	10/16/2009	**98,000**	**89,000**	**490**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-7[3, 34, 5, 9]	10/16/2009	**60,000**	**35,000**	**2,200**	ND<5.0	ND<5.0	ND<5.0	ND<5.0	-	-	-
MW-8[2, 6, 11, 12]	10/16/2009	**340**	ND<250	**280**	ND<0.5	ND<0.5	ND<0.5	1.4	-	-	-
MW-10[2 5, 9, 12]	10/16/2009	**4,700**	**4,600**	110	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-13[2]	10/16/2009	ND<50	ND<250	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-15[2, 12]	10/16/2009	55	ND<250	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-16[9, 12, 13]	10/16/2009	**780**	**910**	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-17[2, 3, 4, 5, 6]	10/16/2009	**900,000**	**350,000**	**2,400**	ND<1.0	2.9	ND<1.0	ND<1.0	-	-	-
MW-19[5, 11, 12]	10/16/2009	**440**	ND<250	**390**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	-
MW-20	10/16/2009	ND<50	ND<250	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	-	-	
ESL Standard F-1b		**210**	**210**	**210**	**46**	**130**	**43**	**100**	**1,800**	-	-

Note: All results in µg/l
ESL Standard F-1b - Groundwater Screening Levels (groundwater is not a current or potential drinking water resource).

1 Sample diluted due to high organic content
2 Aqueous sample that contains greater than ~1 vol. % sediment
3 Lighter than water immiscible sheen/product is present
4 Weakly modified or unmodified gasoline is significant
5 Strongly aged gasoline or diesel range compounds are significant in the TPH(g) chromatogram
6 No recognizable pattern
7 Kerosene/kerosene range/jet fuel range
8 Aged diesel is significant
9 Oil range compounds are significant
10 Stoddard solvent/mineral spirit (?)
11 Gasoline range compounds are significant
12 Diesel range compounds are significant; no recognizable pattern
13 One to few isolated peaks present in the TPH (d/mo) chromatogram
14 See table 2A below
15 See table 2B below

Table 2A. Groundwater Sample Analytical Results - SVOCs
Oakland, California

Sample ID:	CKG - B39[1,2]
SVOCs	
All Other SVOCs	ND<1,000-ND<5,0000

Note: All results in µg/l

[1] Sample diluted due to high organic content
[2] Aqueous sample that contains greater than ~1 vol. % sediment

Table 2B. Groundwater Sample Analytical Results - VOCs
Oakland, California

Sample ID:	CKG - B1[2, 3]	CKG - B12[2,3]	CKG - B20[1,2,3]	CKG - B26[1,2,3]	CKG - B32[1,2]	ESL Standard F-1b
VOCs						
Acetone	ND<330	13	27	70	72	**1,500**
Benzene	**710**	ND	ND<1.0	ND<1.0	ND<2.5	**46**
2-Butanone(MEK)	ND<67	ND	4.3	15	17	**14,000**
n-Butyl benzene	100	6.1	ND<1.0	11	10	-
tert-Butyl benzene	ND<17	1.4	ND<1.0	ND<1.0	ND<2.5	-
Chloroethane	ND<17	ND	ND<1.0	ND<1.0	2.8	**12**
4-Isopropyl toluene	ND<17	3.9	ND<1.0	9	ND<2.5	-
Naphthalene	**190**	ND	ND<1.0	ND<1.0	ND<2.5	**24**
1,2,4 - Trimethylbenzene	92	ND	ND<1.0	14	ND<2.5	-
t-Butyl alcohol (TBA)	ND<67	ND	5.3	44	ND<10	**18,000**
sec Butyl Benzene	22	8.7	ND<1.0	6.1	15	-
Ethylbenzene	**360**	ND	ND<1.0	ND<1.0	ND<2.5	**43**
Isopropylbenzene	91	2.3	ND<1.0	15	ND<2.5	-
Methyl-t-butyl ether (MTBE)	320	ND	ND<1.0	ND<1.0	ND<2.5	**1,800**
n-Propyl benzene	220	ND	ND<1.0	16	ND<2.5	-
1,2,3 - Trichloropropane	ND<17	ND	ND<1.0	ND<1.0	ND<2.5	-
1,3,5 - Trimethylbenzene	190	ND	ND<1.0	6.3	ND<2.5	-
Xylenes	**320**	ND	ND<1.0	24	ND<2.5	**100**
All Other VOCs	ND<17-ND<330	ND<0.2-ND<10	ND<0.4-ND<20	ND<0.4-ND<20	ND<1.0-ND<50	-

Note: All results in µg/l
ESL Standard F-1b - Groundwater Screening Levels (groundwater is not a current or potential drinking water resource).

[1] Sample diluted due to high organic content
[2] Aqueous sample that contains greater than ~1 vol. % sediment
[3] Lighter than water immiscible sheen/product is present

NOTES (Tables 1-2):

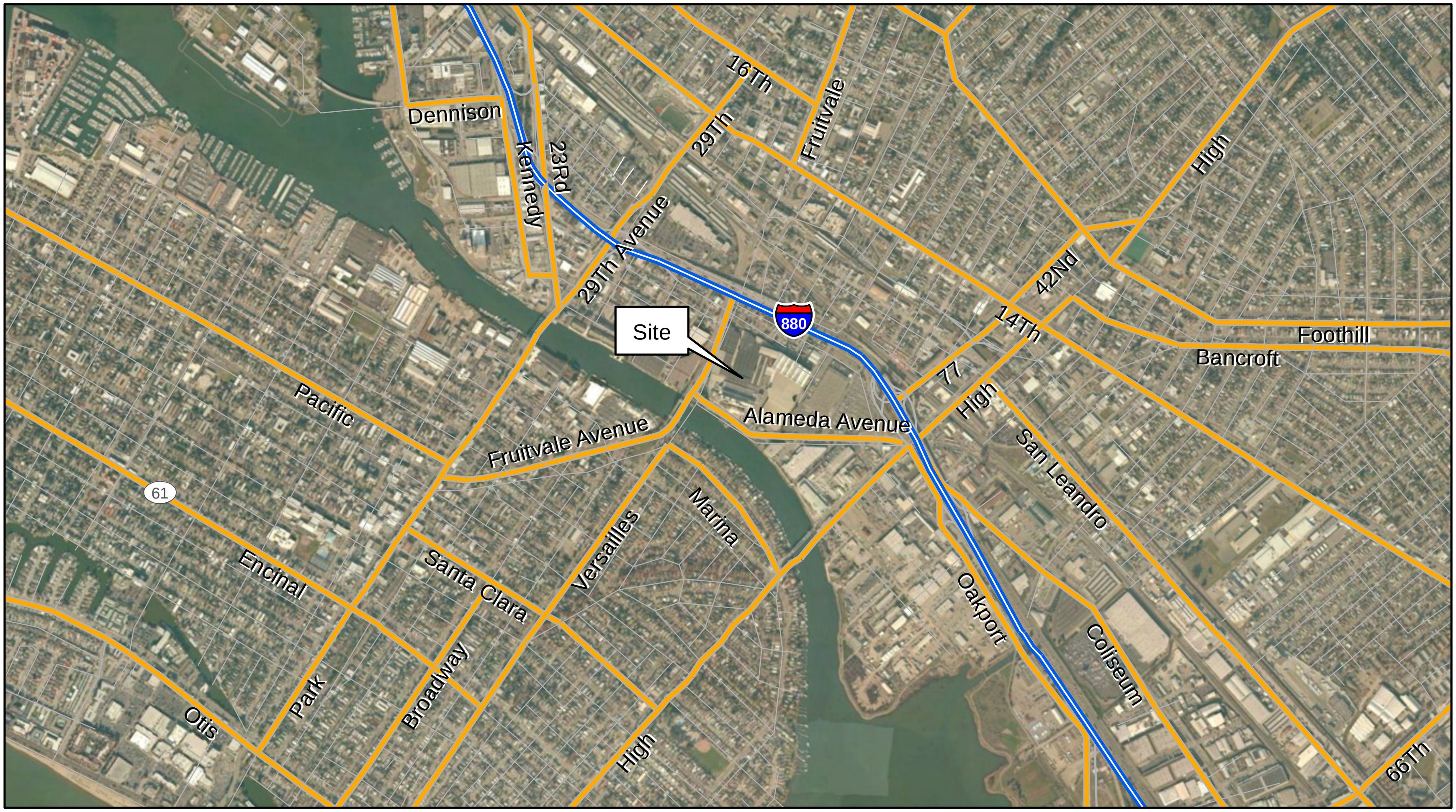
TPHg: Total petroleum hydrocarbons as gasoline; analyzed by Method SW8021B/8015Bm
TPHd: Total petroleum hydrocarbons as diesel w/silica gel cleanup; analyzed by Method SW8015B
TPHmo: Total petroleum hydrocarbons as motor oil w/silica gel cleanup; analyzed by Method SW8015B
SVOCs: Semi-Volatile Organic Compounds; analyzed by Method SW8720C
VOCs: Volatile Organic Compounds; analyzed by Method SW8260B
MTBE: Methyl-t-butyl-ether; analyzed by Method SW8021B/8015Bm
mg/kg: Milligrams per kilogram
µg/l: Micrograms per liter
ND: Not detected above the respective reporting limit
- : Not Analyzed

TABLE 3
TREATMENT TECHNOLOGY DECISION MATRIX
OWENS-BROCKWAY GLASS CONTAINER MANUFACTURING FACILITY
3600 ALAMEDA AVENUE,
OAKLAND, CALIFORNIA

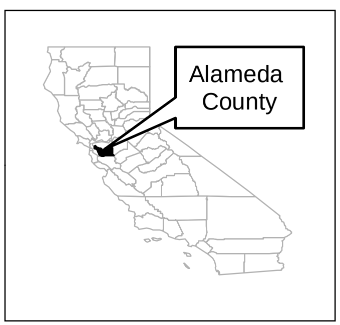
Remedial Actions		Effectiveness						Implementability						Cost				TOTAL (6)
		Likelihood of Reaching Remediation Objective In Planning Period (1)		Need for Long-Term O & M (2)		Short & Long Term Impacts to Environment (2)		Health & Safety (3)		Impact to Plant Operations (4)		Expected Reliability of the Option (5)		Total Cost (2)		Cost Uncertainty & Contingency (2)		
		Weighting Factor	7	Weighting Factor	2	Weighting Factor	5	Weighting Factor	3	Weighting Factor	2	Weighting Factor	3	Weighting Factor	6	Weighting Factor	4	
		Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	
Current Action 1	MNA with Absorbent Socks	1	7	4	8	1	5	5	15	5	10	4	12	5	30	5	20	107
Alternative 1	No Action	1	7	5	10	1	5	5	15	5	10	5	15	5	30	5	20	112
Alternative 2	Groundwater Treatment and Disposal	1	7	1	2	1	5	4	12	3	6	1	3	3	18	3	12	65
Alternative 3	Targeted Excavations with Current Action	3	21	4	8	3	15	2	6	1	2	5	15	5	30	2	8	105
Alternative 4	ISCO with Current Action	2	14	4	8	3	15	3	9	2	4	4	12	4	24	2	8	94
Alternative 5	Targeted Excavtions and ISCO with Current Action	5	35	4	8	4	20	2	6	1	2	5	15	5	30	2	8	**124**

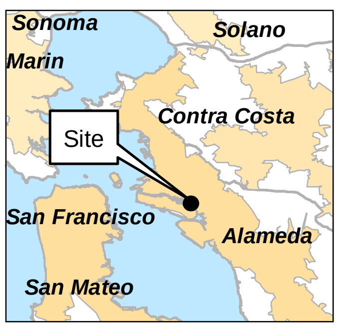
Notes:
Score = Rank x Weighting Factor
(1) Rank of; 1 = Unlikely and 5 = Likely
(2) Rank of; 1 = High and 5 = Low
(3) Rank of; 1 = High Risk and 5 = Low Risk
(4) Rank of; 1 = Difficult and 5 = Easy
(5) Rank of; 1 = Low and 5 = High
(6) Highest Score is Most Preferred

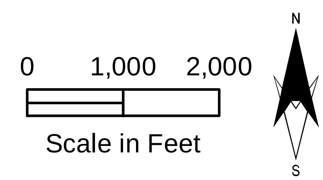
PLATES



Drawn by A. Llewellyn. May 2010. Base layers are unmodified Alameda County Digital Data Sets.



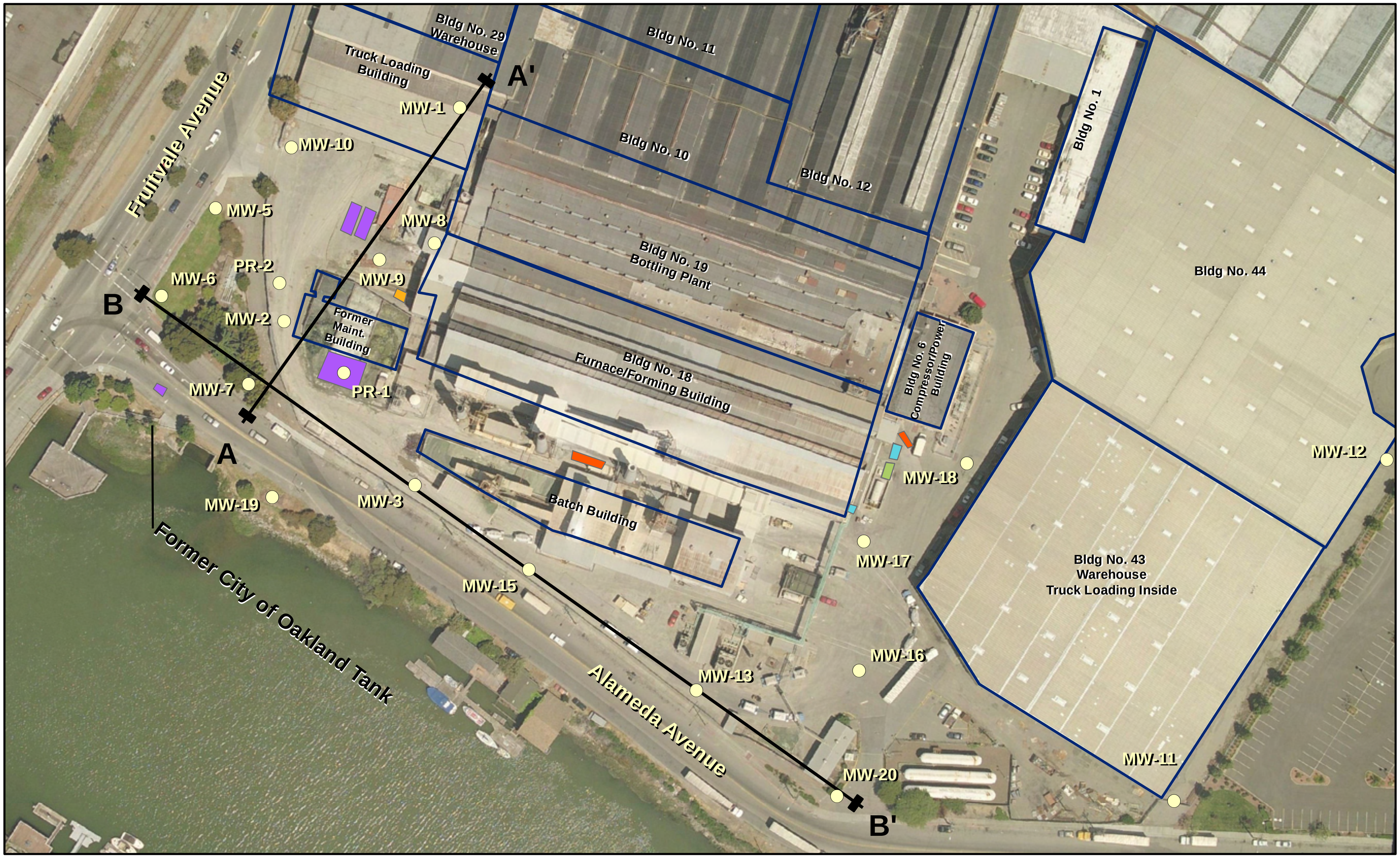




CKG Environmental, Inc.

Site Location Map
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland, California

PLATE
1



Drawn by A. Llewellyn. May 2010. Base layers are unmodified Pictometry Digital Data Sets.

EXPLANATION

Monitoring Wells

Cross Section Lines

Buildings

Former Underground Fuel Storage Tanks

Diesel

Fuel Oil

Gasoline

Lube Oil

Waste Oil

0 75 150

Scale in Feet

N

S

CKG Environmental, Inc.

Site Features Map

Owens-Brockway Glass Container Facility

3600 Alameda Avenue, Oakland California

PLATE

2

Drawn by A. Llewellyn. July 2010. Base layers are unmodified Pictometry Digital Data Sets.

0 62.5 125

Scale in Feet

N

S

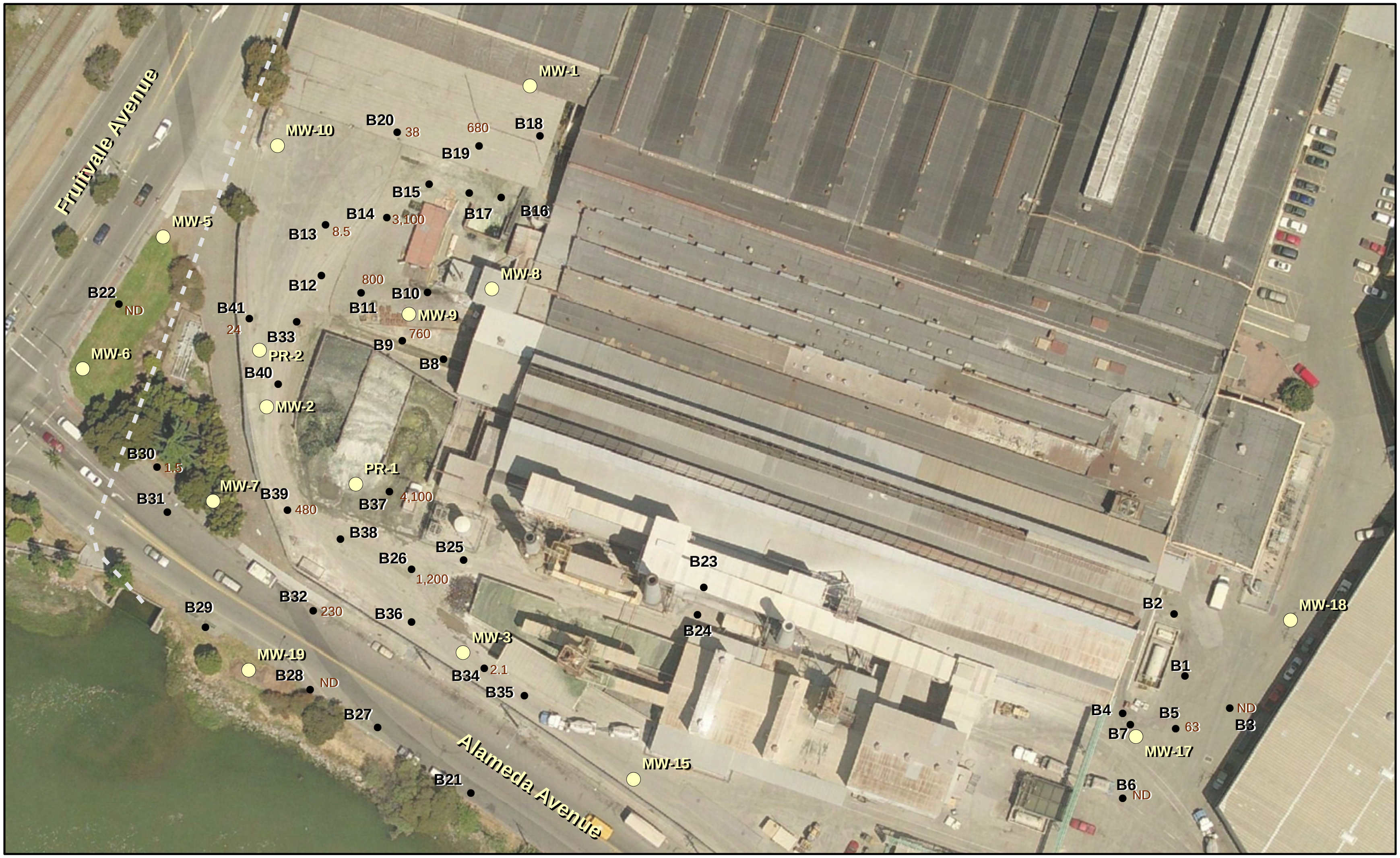
EXPLANATION

- 1986 Grab Sample Locations (Exceltach)
- 1986 Auger Locations (Exceltech)
- 1999 Geoprobe Locations (Kennedy/Jenks)
- 2003 CPT Locations (CKG Environmental)
- 2009 Geoprobe Locations (CKG Environmental)
- Monitoring Wells

CKG Environmental, Inc.

Soil Boring and Well Location Map
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE 3



Drawn by A. Llewellyn. May 2010. Base layers are unmodified Pictometry Digital Data Sets.

0 50 100

Scale in Feet

N

S

EXPLANATION

710 TPHd Concentration from Geoprobe in mg/kg

Geoprobe Locations

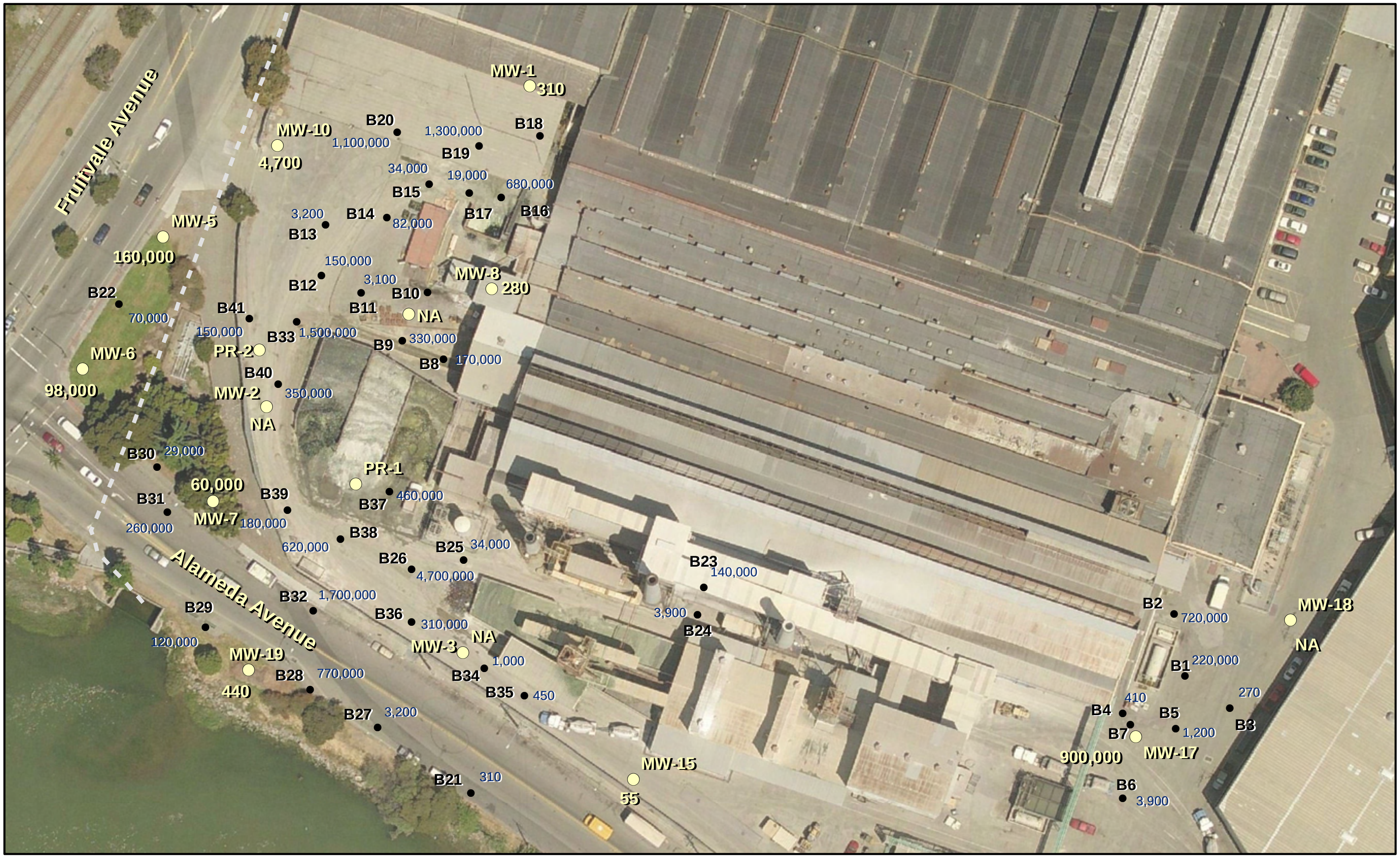
Monitoring Wells

Sausal Creek Storm Sewer

CKG Environmental, Inc.

TPHd in Soil Distribution Map
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE
4



Drawn by A. Llewellyn. May 2010. Base layers are unmodified Pictometry Digital Data Sets.

0 50 100

Scale in Feet

N S

EXPLANATION

310 TPHd Concentration from Geoprobe Sample in µg/l

• Geoprobe Locations

310 TPHd Concentration from Monitoring Well Sample in µg/l

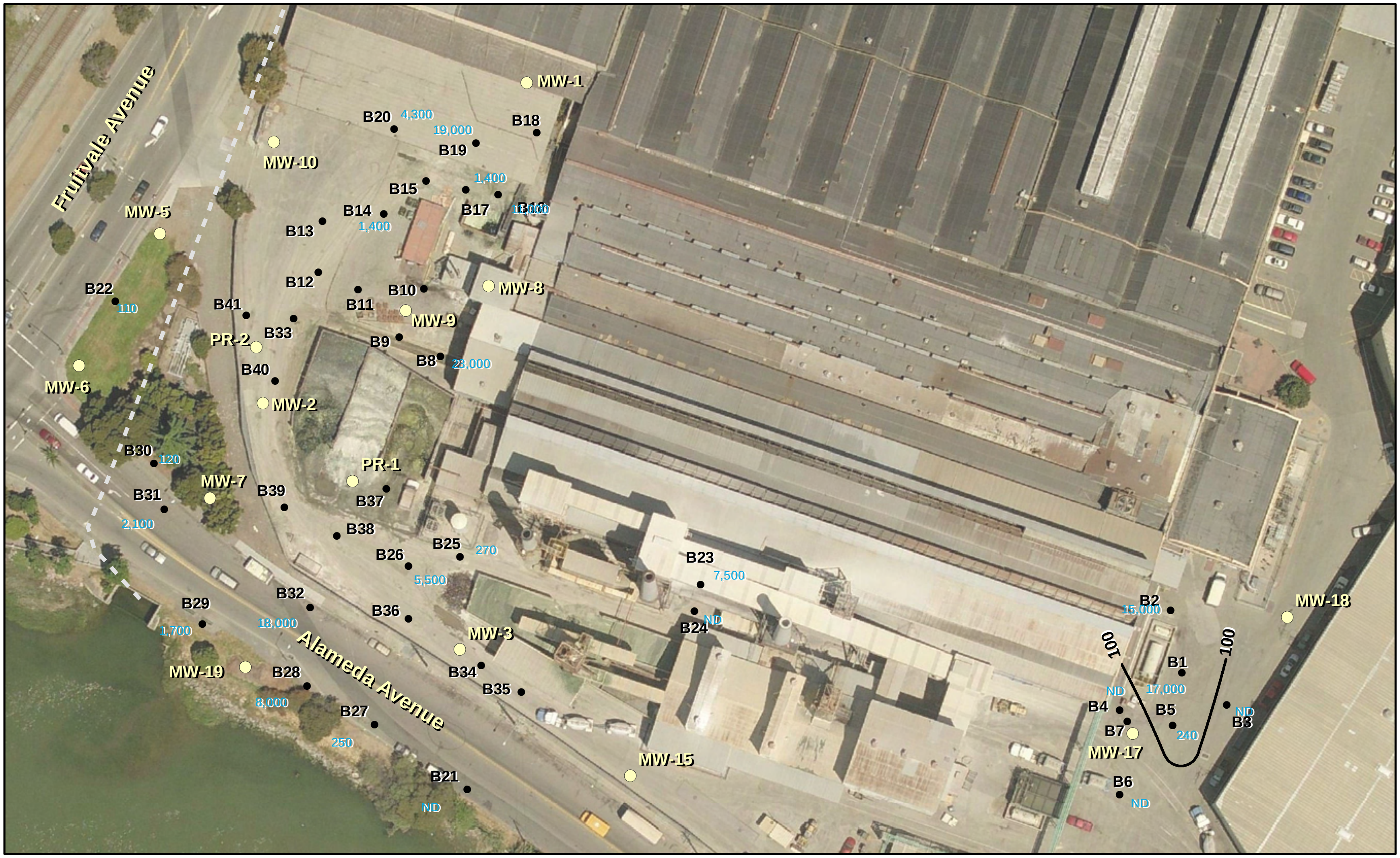
○ Monitoring Wells

- - - Sausal Creek Storm Sewer

CKG Environmental, Inc.

TPHd in Groundwater Distribution Map
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE
5



Drawn by A. Llewellyn. May 2010. Base layers are unmodified Pictometry Digital Data Sets.

EXPLANATION

- 710 TPHg Concentration from Geoprobe Sample in µg/l
- ● Geoprobe Locations
- ○ Monitoring Wells
- Line of Equal TPHg Concentration
- Sausal Creek Storm Sewer

0 50 100

Scale in Feet

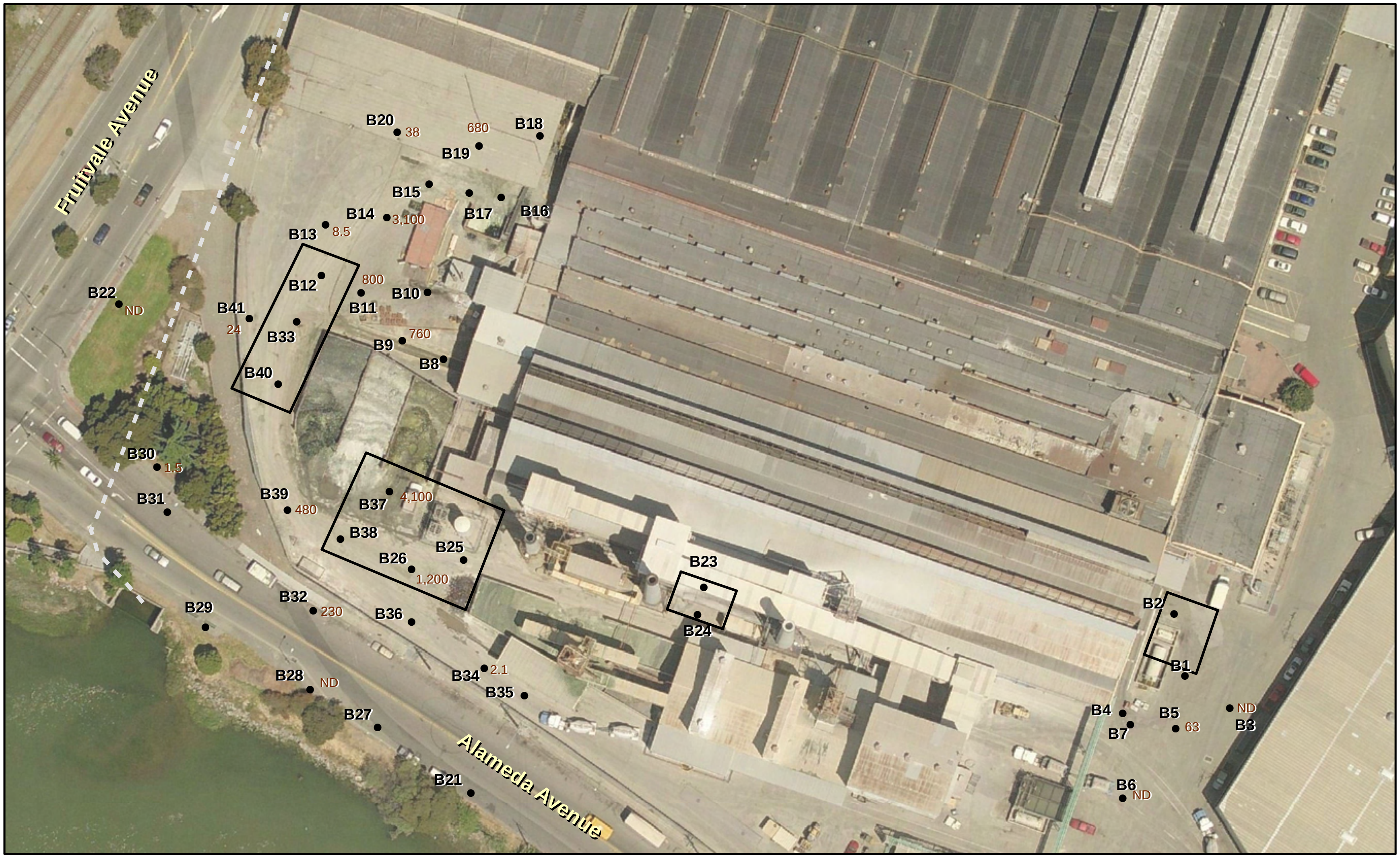
N

S

CKG Environmental, Inc.

TPHg in Groundwater Distribution Map
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE
6



Drawn by A. Llewellyn. May 2010. Base layers are unmodified Pictometry Digital Data Sets.

EXPLANATION

230 TPHd Concentration from Geoprobe in mg/kg

• Geoprobe Locations

Soil Source Areas

Sausal Creek Storm Sewer

0 50 100

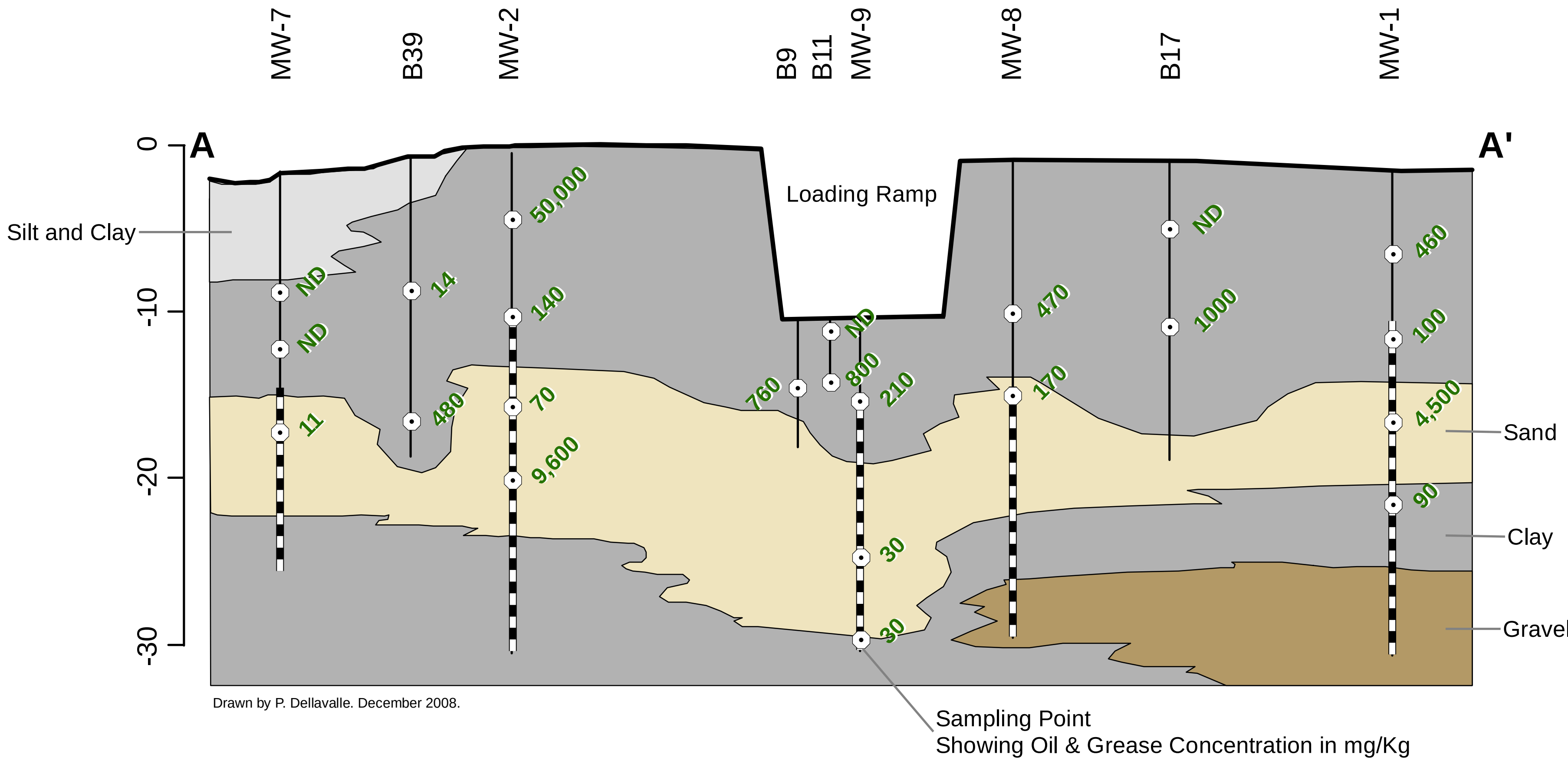
Scale in Feet

CKG Environmental, Inc.

Proposed Soil Excavation Areas
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE 7

APPENDIX A



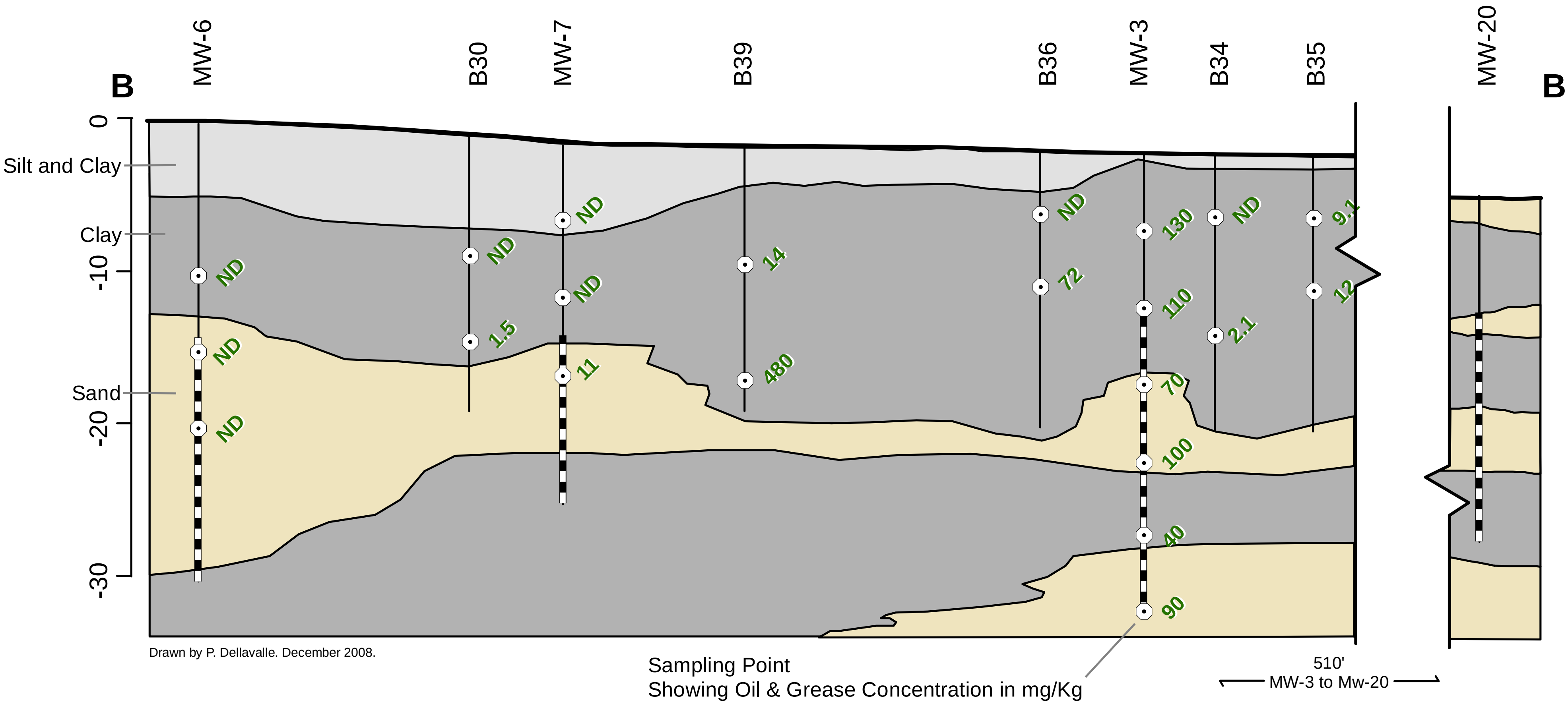
0 25 50

Horizontal Scale in Feet
5X Vertical Exaggeration

Geologic Cross Section A - A'
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE
A-1

CKG Environmental, Inc.



0 25 50

Horizontal Scale in Feet

5X Vertical Exaggeration

Geologic Cross Section B - B'
Owens-Brockway Glass Container Facility
3600 Alameda Avenue, Oakland California

PLATE
A-2

CKG Environmental, Inc.

Table 2A. Groundwater Sample Analytical Results - SVOCs
Oakland, California

Sample ID:	CKG - B39[1,2]
SVOCs	
All Other SVOCs	ND<1,000-ND<5,0000

Note: All results in µg/l

[1] Sample diluted due to high organic content
[2] Aqueous sample that contains greater than ~1 vol. % sediment

Table 2B. Groundwater Sample Analytical Results - VOCs
Oakland, California

Sample ID:	CKG - B1[2, 3]	CKG - B12[2,3]	CKG - B20[1,2,3]	CKG - B26[1,2,3]	CKG - B32[1,2]	ESL Standard F-1b
VOCs						
Acetone	ND<330	13	27	70	72	**1,500**
Benzene	**710**	ND	ND<1.0	ND<1.0	ND<2.5	**46**
2-Butanone(MEK)	ND<67	ND	4.3	15	17	**14,000**
n-Butyl benzene	100	6.1	ND<1.0	11	10	-
tert-Butyl benzene	ND<17	1.4	ND<1.0	ND<1.0	ND<2.5	-
Chloroethane	ND<17	ND	ND<1.0	ND<1.0	2.8	**12**
4-Isopropyl toluene	ND<17	3.9	ND<1.0	9	ND<2.5	-
Naphthalene	**190**	ND	ND<1.0	ND<1.0	ND<2.5	**24**
1,2,4 - Trimethylbenzene	92	ND	ND<1.0	14	ND<2.5	-
t-Butyl alcohol (TBA)	ND<67	ND	5.3	44	ND<10	**18,000**
sec Butyl Benzene	22	8.7	ND<1.0	6.1	15	-
Ethylbenzene	**360**	ND	ND<1.0	ND<1.0	ND<2.5	**43**
Isopropylbenzene	91	2.3	ND<1.0	15	ND<2.5	-
Methyl-t-butyl ether (MTBE)	320	ND	ND<1.0	ND<1.0	ND<2.5	**1,800**
n-Propyl benzene	220	ND	ND<1.0	16	ND<2.5	-
1,2,3 - Trichloropropane	ND<17	ND	ND<1.0	ND<1.0	ND<2.5	-
1,3,5 - Trimethylbenzene	190	ND	ND<1.0	6.3	ND<2.5	-
Xylenes	**320**	ND	ND<1.0	24	ND<2.5	**100**
All Other VOCs	ND<17-ND<330	ND<0.2-ND<10	ND<0.4-ND<20	ND<0.4-ND<20	ND<1.0-ND<50	-

Note: All results in µg/l
ESL Standard F-1b - Groundwater Screening Levels (groundwater is not a current or potential drinking water resource).

[1] Sample diluted due to high organic content
[2] Aqueous sample that contains greater than ~1 vol. % sediment
[3] Lighter than water immiscible sheen/product is present

NOTES (Tables 1-2):

TPHg: Total petroleum hydrocarbons as gasoline; analyzed by Method SW8021B/8015Bm
TPHd: Total petroleum hydrocarbons as diesel w/silica gel cleanup; analyzed by Method SW8015B
TPHmo: Total petroleum hydrocarbons as motor oil w/silica gel cleanup; analyzed by Method SW8015B
SVOCs: Semi-Volatile Organic Compounds; analyzed by Method SW8720C
VOCs: Volatile Organic Compounds; analyzed by Method SW8260B
MTBE: Methyl-t-butyl-ether; analyzed by Method SW8021B/8015Bm
mg/kg: Milligrams per kilogram
µg/l: Micrograms per liter
ND: Not detected above the respective reporting limit
- : Not Analyzed

TABLE 1
Soil Data Summary
Owens-Brockway Glass Container Facility, Oakland California

Boring Hole Data

	Sample Depth (ft/bgs)	Date Sampled	Sampled By	Volatile Hydrocarbons mg/kg	Oil and Grease mg/kg	Benzene mg/kg	Tolunene mg/kg	Xylene mg/kg
BH-1	3.5 to 4.5	7/15/1986	Exceltech	830	470	2.2	0.85	2.7
	6 to 7	7/15/1986	Exceltech	20	40	2.2	14	30
	10.5 to 11.5	7/15/1986	Exceltech	380	20	5.3	4.4	1.1
BH-2	5 to 6	7/15/1986	Exceltech	1,500	3,600	3.4	6.1	11
	10 to 11	7/15/1986	Exceltech	1,700	30	1.7	2.8	2.1
	15 to 16	7/15/1986	Exceltech	160	ND	2.6	6.9	1.6
BH-3	2 to 3.5	7/10/1986	Exceltech	1,800	1,100	30	57	15
	4 to 5.5	7/10/1986	Exceltech	1,600	440	5.7	21	62
	9 to 10.5	7/10/1986	Exceltech	18,000	8,700	NA	NA	NA
	14 to 15.5	7/10/1986	Exceltech	1,300	1,100	NA	NA	NA
BH-4	4 to 5.5	7/23/1986	Exceltech	640	210	NA	NA	NA
	14.5 to 15.5	7/23/1986	Exceltech	2.8	30	0.042	0.53	1.4
	19 to 20.5	7/23/1986	Exceltech	21	30	0.41	0.84	3.5
BH-5	2 to 3.5	7/23/1986	Exceltech	1,400	990	48	72	120
	4 to 5.5	7/23/1986	Exceltech	1,200	1,800	6.7	83	200
	9 to 10.5	7/23/1986	Exceltech	930	210	X	30	100
BH-6	2 to 3.5	8/14/1986	Exceltech	12	15,000	NA	NA	NA
	10 to 11.5	8/14/1986	Exceltech	49	1,400	NA	NA	NA
	20 to 21.5	8/14/1986	Exceltech	180	710	NA	NA	NA
BH-7	5 to 6.5	8/14/1986	Exceltech	18	100	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	20,000	18,000	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	39	90	NA	NA	NA

TABLE 1
Soil Data Summary
Owens-Brockway Glass Container Facility, Oakland California

BH-8	5 to 6.5	8/14/1986	Exceltech	690	1,400	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	540	1,800	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	3,900	5,800	NA	NA	NA
BH-9	2 to 3.5	8/14/1986	Exceltech	1,600	2,300	NA	NA	NA
	9 to 10.5	8/14/1986	Exceltech	400	380	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	310	770	NA	NA	NA
BH-10	10 to 11.5	8/14/1986	Exceltech	110	570	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	3.2	60	NA	NA	NA
BH-11	10 to 11.5	8/14/1986	Exceltech	1,700	250	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	67	350	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	8.3	30	NA	NA	NA
BH-12	5 to 6.5	8/14/1986	Exceltech	130	360	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	130	310	NA	NA	NA
	20 to 21.5	8/14/1986	Exceltech	0.23	90	NA	NA	NA
BH-13	10 to 11.5	8/14/1986	Exceltech	580	2,100	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	47	210	NA	NA	NA
BH-14	5 to 6.5	8/14/1986	Exceltech	180	200	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	110	20	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	63	320	NA	NA	NA
BH-15	2 to 3.5	8/14/1986	Exceltech	51	390	NA	NA	NA
	10 to 11.5	8/14/1986	Exceltech	2,300	13,000	NA	NA	NA
	15 to 16.5	8/14/1986	Exceltech	250	1,300	NA	NA	NA
	20 to 21.5	8/14/1986	Exceltech	4,200	11,000	NA	NA	NA
	25 to 26.5	8/14/1986	Exceltech	40	90	NA	NA	NA

X: Not Calcuable

NA: Not Requested

*Results indicated in parentheses are transcribed from 1986 boring logs and results not in parentheses are transcrbied from 1986 report tables; due to lack of original laboratory analytical results.

TABLE 1
Soil Data Summary
Owens-Brockway Glass Container Facility, Oakland California

Monitoring Well Data

	Sample Depth (ft/bgs)	Date Sampled	Sampled By	Volatile Hydrocarbons mg/kg	Extractable Hydrocarbons mg/kg	Oil and Grease mg/kg	Benzene mg/kg	Toluene mgkg	Xylenes mg/kg
MW-1	5 to 6.5	9/12/1986	Exceltech	3.6	NA	460	ND	ND	ND
	10 to 11.5	9/12/1986	Exceltech	4.3	NA	100	ND	ND	ND
	15 to 16.5	9/12/1986	Exceltech	2,000	NA	4,500	ND	12	60
	20 to 21.5	9/12/1986	Exceltech	18	NA	90	ND	ND	ND
	25 to 26.5	9/12/1986	Exceltech	8.1	NA	130	ND	ND	ND
	28.5 to 30	9/12/1986	Exceltech	5.1	NA	100	ND	ND	ND
MW-2	5 to 6.5	9/12/1986	Exceltech	7.3	NA	50,000	ND	ND	ND
	10 to 11.5	9/12/1986	Exceltech	33	NA	140	ND	0.12	0.8
	15 to 16.5	9/12/1986	Exceltech	41	NA	70	ND	1	0.51
	20 to 21.5	9/12/1986	Exceltech	110	NA	9,600	ND	ND	1.4
	25 to 26.5	9/12/1986	Exceltech	31	NA	90	ND	ND	ND
	28.5 to 30	9/12/1986	Exceltech	66	NA	80	ND	ND	ND
MW-3	5 to 6.5	9/12/1986	Exceltech	18	NA	130	ND	ND	ND
	10 to 11.5	9/12/1986	Exceltech	10	NA	110	ND	ND	ND
	15 to 16.5	9/12/1986	Exceltech	24	NA	70	ND	ND	ND
	20 to 21.5	9/12/1986	Exceltech	19	NA	100	ND	ND	ND
	25 to 26.5	9/12/1986	Exceltech	9.3	NA	40	ND	ND	ND
	28.5 to 30	9/12/1986	Exceltech	17	NA	90	ND	ND	ND
MW-4	3.5 to 5	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
	8.5 to 10	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
	13.5 to 15	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
MW-5	8.5 to 10	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
	13.5 to 15	9/29/1986	Exceltech	110	NA	ND	ND	ND	ND
	18.5 to 20	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND

TABLE 1
Soil Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-6	8.5 to 10	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
	13.5 to 15	9/29/1986	Exceltech	ND	NA	5.2	ND	ND	ND
	18.5 to 20	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
MW-7	3.5 to 5	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
	8.5 to 10	9/29/1986	Exceltech	ND	NA	ND	ND	ND	ND
	13.5 to 15	9/29/1986	Exceltech	120	NA	11	ND	ND	0.45
MW-8	10	10/21/1986	Exceltech	530	NA	470	ND	0.21	1.7
	15	10/21/1986	Exceltech	130	NA	170	0.059	0.59	4.8
MW-9	5	7/23/1986	Exceltech	640	NA	210	NA	NA	NA
	15	7/23/1986	Exceltech	8.8	NA	30	NA	NA	NA
MW-10	5	10/21/1986	Exceltech	<3	NA	90	ND	ND	ND
	10	10/21/1986	Exceltech	260	NA	1400	ND	0.12	0.84
MW-14	10	1986	Exceltech	NA	ND	300	NA	NA	NA
MW-15	5	1986	Exceltech	NA	ND	ND	NA	NA	NA
	10	1986	Exceltech	NA	1.9	20	NA	NA	NA
MW-16	5	1986	Exceltech	NA	1.7	270	NA	NA	NA
	10	1986	Exceltech	NA	ND	65	NA	NA	NA
MW-17	5	1986	Exceltech	NA	ND	ND	NA	NA	NA
	10	1986	Exceltech	NA	8.1	25	NA	NA	NA
MW-18	5	1986	Exceltech	NA	ND	20	NA	NA	NA
	10	1986	Exceltech	NA	ND	90	NA	NA	NA

ND: Not Dectected

NA: Not Analyzed

Note: MW-9 is BH-4

TABLE 1
Soil Data Summary
Owens-Brockway Glass Container Facility, Oakland California

Product Recovery 1 Well Data

Sample Depth (ft/bgs)	Date Sampled	Sampled By	Volatile Hydrocarbons mg/kg	Oil and Grease mg/kg	Benzene mg/kg	Toluene mg/kg	Xylenes mg/kg
4	8/4/1986	Exceltech	22,000	20,000	310	1,000	1,500
8	8/4/1986	Exceltech	1,300	3,000	5.3	28	110
12	8/4/1986	Exceltech	2,000	840	1.4	27	67
16	8/4/1986	Exceltech	510	20,000	5.2	120	70
20	8/4/1986	Exceltech	2,800	56,000	71	X	310

X: Not Calculable

NA: Not Analyzed

TABLE 2
Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

Monitoring Well Data

	Date Sampled	Sampled By	TPHd µg/l	TPHg µg/l	TOG/ TPHmo µg/l	Benzene µg/l	Toluene µg/l	Ethyl benzene µg/l	Xylenes µg/l	TCE µg/l	TCA µg/l	TRANS 1,2-DCE µg/l	1,1-DCE µg/l	1,1-DCA µg/l	Oil and Grease µg/l
MW-1	8/14/1986*	Exceltech	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	25,000
	4/9/1987	Exceltech	ND	NA		ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech					NOT SAMPLED COVERED BY GLASS								
	12/1/1987	Exceltech					NOT SAMPLEDCOVERED BY GLASS								
	3/7/1988	Exceltech					NOT SAMPLED COVERED BY GLASS								
	6/8/1988	Ensco					NOT SAMPLED COVERED BY GLASS								
	9/14/1988	Ensco					NOT SAMPLED COVERED BY GLASS								
	12/29/1988	Ensco					NOT SAMPLED COVERED BY GLASS								
	9/16/1997	Kennedy/Jenks	190[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks	160[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/11/2001	Kennedy/Jenks					NOT ACCESSIBLE								
	12/6/2002	Kennedy/Jenks	69[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental					NOT ACCESSIBLE								
	6/30/2005	CKG Environmental					NOT ACCESSIBLE								
	10/19/2006	CKG Environmental	5,400	120	3,300	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental					NOT ACCESSIBLE								
	10/21/2008	CKG Environmental	2,000	69	1,300	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/16/2009	CKG Environmental	310	<50	310	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-2	8/14/1986*	Exceltech	NA	FP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND
	4/9/1987	Exceltech					NOT SAMPLED								
	9/16/1987	Exceltech					NOT SAMPLED								
	12/1/1987	Exceltech					NOT SAMPLED								
	3/7/1988	Exceltech					NOT SAMPLED COVERED BY DUMPSTER								
	6/8/1988	Ensco					NOT SAMPLED COVERED BY DUMPSTER								
	9/14/1988	Ensco					NOT SAMPLED COVERED BY TRAILER								
	12/29/1988	Ensco					NOT SAMPLED								
	9/16/1997	Kennedy/Jenks					FP								
	11/2/1998	Kennedy/Jenks					FP								
	12/11/2001	Kennedy/Jenks					FP								
	12/6/2002	Kennedy/Jenks					FP								
	3/15/2004	CKG Environmental					FP								
	6/30/2005	CKG Environmental	1,600,000	2,900	1,200,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	830,000	13,000[b]	530,000	ND	4.4	19	60	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental					FP (1.25 FEET)								
	10/21/2008	CKG Environmental					FP								
	10/16/2009	CKG Environmental					FP								

TABLE 2
Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-3	8/14/1986*	Exceltech	NA	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	18,000
	4/9/1987	Exceltech	NA	370	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech					NOT SAMPLED								
	12/1/1987	Exceltech					NOT SAMPLED								
	3/7/1988	Exceltech	190,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	16,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco					NOT SAMPLED								
	12/29/1988	Ensco					NOT SAMPLED								
MW-4	8/14/1986*	Exceltech	NA	20	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	7,200
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	66	1.3	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	100	ND	NA	ND	ND	NA	8.9	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	100	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
MW-5	8/14/1986*	Exceltech	NA	1400	NA	ND	ND	NA	6.6	NA	NA	NA	NA	NA	24,000
	4/9/1987	Exceltech	NA	54	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	96,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	12,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	63,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	5,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks	11,600	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks					FP								
	12/6/2000	Kennedy/Jenks	11700[(a)]	1,000	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/12/2001	Kennedy/Jenks	10000[(a)]	360[(b)]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2002	Kennedy/Jenks	5200[(a)]	150[(b)]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	46000[(a)]	180[(b)]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	34,000	100	26,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	45,000	300[(b)]	33,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	34,000	120	31,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	13,000	150	11,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/16/2009	CKG Environmental	160,000	180	140,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA

TABLE 2
Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-6	8/14/1986*	Exceltech	NA	NA		NA	NA		NA	NA	NA	NA	NA	NA	NA
	4/9/1987	Exceltech					NOT SAMPLED								
	9/16/1987	Exceltech	400,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	30,000	NA	NA	NA	NA	N	NA	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	9,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	63,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	140,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	42,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks					FP								
	11/2/1998	Kennedy/Jenks					FP								
	12/11/2001	Kennedy/Jenks					FP								
	12/6/2002	Kennedy/Jenks					FP								
	3/15/2004	CKG Environmental					FP								
	6/30/2005	CKG Environmental	270,000	300	200,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	100,000	700[a]	77,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	290,000	3,400	190,000	ND	ND	ND	11	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	38,000	330	28,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/16/2009	CKG Environmental	98,000	490	89,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-7	8/14/1986*	Exceltech	NA	260		ND	ND		ND	NA	NA	NA	NA	NA	8,000
	4/9/1987	Exceltech					NOT SAMPLED								
	9/16/1987	Exceltech	790,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	5,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	12,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	97,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	6,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks	37,000	850	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks					FP								
	12/6/2000	Kennedy/Jenks	3580[a]	540	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/12/2001	Kennedy/Jenks	12600[a]	1200[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2002	Kennedy/Jenks	27600[a]	480[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	170000[a]	890[b]	NA	ND	ND	0.57	1.1	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	290,000	3,000	150,000	ND	ND	3.1	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	310,000	6600[b]	150,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	330,000	1,900	190,000	ND	ND	ND	2.7	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	82,000	1,100	43,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/16/2009	CKG Environmental	60,000	2,200	35,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA

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Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-8	8/14/1986*	Exceltech	NA	1300	NA	ND	ND	NA	1	NA	NA	NA	NA	NA	14,000
	4/9/1987	Exceltech	NA	73	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech					NOT SAMPLED								
	12/1/1987	Exceltech	630	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	2,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	1,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8/12/1997	Kennedy/Jenks					FP								
	9/16/1997	Kennedy/Jenks	290[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks	1,300[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2000	Kennedy/Jenks	160(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/12/2001	Kennedy/Jenks	ND	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/5/2002	Kennedy/Jenks	170[a]	55[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	3,000[a]	320[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	4,600	1,100	1,400	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	1,800	1,200	760	ND	ND	ND	2.1	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	1,300	390	2,100	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	380	74	470	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/16/2009	CKG Environmental	340	280	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-9	8/14/1986*	Exceltech	NA	FP		NA	NA		NA	NA	NA	NA	NA	NA	NA
	4/9/1987	Exceltech					NOT SAMPLED								
	9/16/1987	Exceltech	1,300	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	18,000	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	47,000	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco					NOT SAMPLED ACCESS RESTRICTED								
	9/14/1988	Ensco	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco					NOT SAMPLED								
	9/16/1997	Kennedy/Jenks	28,000[a]	6,000	NA	ND	ND	ND	18	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks					FP								
	12/6/2000	Kennedy/Jenks	102,000[a]	790	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/12/2001	Kennedy/Jenks					INACCESSIBILE								
	12/5/2002	Kennedy/Jenks					INACCESSIBILE								
	3/15/2004	CKG Environmental					INACCESSIBILE								
	6/30/2005	CKG Environmental					INACCESSIBILE								
	9/11/2006	CKG Environmental					INNACCESSIBLE								
	10/17/2007	CKG Environmental					INNACCESSIBLE								
	10/21/2008	CKG Environmental					INNACCESSIBLE								
	10/16/2009	CKG Environmental					INNACCESSIBLE								

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Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-10	8/14/1986*	Exceltech	NA	380	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	7,200
	4/9/1987	Exceltech	NA	300	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	3,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	590	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	3,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	570	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks	1,300[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks	1,400[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2000	Kennedy/Jenks	730[a]	150	NA	ND	ND	ND	0.7	NA	NA	NA	NA	NA	NA
	12/12/2001	Kennedy/Jenks	630[a]	210[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/5/2002	Kennedy/Jenks	840[a]	210[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	2,500[a]	160[b]	NA	ND	ND	ND	0.8	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	2,900	140	2,300	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	3,400	270	2,600	ND	ND	ND	0.81	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	1,700	140	1,500	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	2,300	240	1,500	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/16/2009	CKG Environmental	4,700	110	4,600	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-11	8/14/1986*	Exceltech	NA	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	1,200
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	NA	ND	NA	0.8	ND	NA	10	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	100	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
MW-12	8/14/1986*	Exceltech	NA	100	NA	0.49	1	NA	1.3	ND	ND	ND	ND	ND	2,500
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	NA	ND	NA	ND	ND	NA	13	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	120	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA

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Groundwater Data Summary
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	8/14/1986*	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	57,000
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	NA	ND	NA	1.6	ND	NA	12	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	7.7	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	130	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks	120(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-13	11/2/1998	Kennedy/Jenks	120(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2000	Kennedy/Jenks	200(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/11/2001	Kennedy/Jenks	91(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/5/2002	Kennedy/Jenks	190(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	ND	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	56	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/19/2009	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	8/14/1986*	Exceltech	NA	ND		ND	ND		ND	ND	19	ND	ND	ND	3,200
	4/9/1987	Exceltech	NA	ND		ND	ND		ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	56	1.7		ND	ND		ND	NA	NA	NA	NA	NA	NA
MW-14	12/1/1987	Exceltech	66	ND		1.2	4		10	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	20		ND	ND		ND	NA	NA	NA	NA	NA	NA
	6/8 & 9/14 1988	Ensco					NOT SAMPLED WELL INACCESSIBLE								
	12/29/1988	Ensco	ND	ND		ND	ND		ND	NA	NA	NA	NA	NA	NA

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Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-15	8/14/1986*	Exceltech	NA	120	NA	ND	ND	NA	0.92	NA	NA	NA	NA	NA	1,200
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	ND	8.4	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	NA	ND	NA	3.3	0.84	NA	14	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	90	NA	0.8	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	53	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks	127[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks	340[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2000	Kennedy/Jenks	400[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/11/2001	Kennedy/Jenks	290[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/5/2002	Kennedy/Jenks	440[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	ND	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	240	ND	360	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	56	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/19/2009	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-16	8/14/1986*	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	1,200
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	64	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	150	120	NA	1	0.37	NA	9.1	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	10	NA	0.5	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	190	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks					FP								
	12/6/2000	Kennedy/Jenks	97[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/11/2001	Kennedy/Jenks	ND	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/5/2002	Kennedy/Jenks	51[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	63	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	66	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	140	ND	550	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	92	ND	290	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	76	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/19/2009	CKG Environmental	780	ND	910	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA

TABLE 2
Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-17	8/14/1986*	Exceltech	NA	240	NA	5	1.2	NA	14	NA	NA	NA	NA	NA	2,400
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	680	44	NA	ND	ND	NA	0.55	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	1,300	540	NA	7.8	2.4	NA	28	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	3,800	4,300	NA	83	ND	NA	46	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco				NOT SAMPLED COVERED BY DUMPSTER									
	9/14/1988	Ensco	64,000	54,000	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	4,700	1,100	NA	150	ND	NA	140	NA	NA	NA	NA	NA	NA
	9/16/1997	Kennedy/Jenks	119,600[a]	1,900	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	11/2/1998	Kennedy/Jenks	16,000[a]	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/6/2000	Kennedy/Jenks	47,800[a]	340	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/11/2001	Kennedy/Jenks	101,000[a]	5,300[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/5/2002	Kennedy/Jenks	71,000[a]	700[b]	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	660,000[a]	1,400[b]	NA	2.1	0.71	ND	1.5	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	1,600,000	1,700	NA	ND	2.4	ND	1.1	NA	NA	NA	NA	NA	NA
	9/11(10/19)/2006[c]	CKG Environmental	2,300,000 (1,100,000)	26,000 (1,600)	81,0000 (480,000)	ND (6)	36 (ND)	9.5 (ND)	79 (3.7)	NA (NA)	NA (NA)	NA (NA)	NA (NA)	NA (NA)	NA (NA)
	10/17/2007	CKG Environmental	710,000	4,400	270,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	330,000	3,300	130,000	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/19/2009	CKG Environmental	900,000	2,400	350,000	ND	2.9	ND	ND	NA	NA	NA	NA	NA	NA
MW-18	8/14/1986*	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	1,600
	4/9/1987	Exceltech	NA	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/16/1987	Exceltech	480	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/1/1987	Exceltech	18	ND	NA	ND	ND	NA	6.6	NA	NA	NA	NA	NA	NA
	3/7/1988	Exceltech	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	6/8/1988	Ensco	ND	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	9/14/1988	Ensco	190	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA
	12/29/1988	Ensco	170	ND	NA	ND	ND	NA	ND	NA	NA	NA	NA	NA	NA

TABLE 2
Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

MW-19	6/23/2004	CKG Environmental	1,100	480	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	1,100(a)	330(b)	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	1,700	840	350	ND	ND	1.5	4.5	NA	NA	NA	NA	NA	NA
	9/18/2006	CKG Environmental	890	280	280	ND	ND	ND	0.83	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	1,200	880	ND	ND	ND	ND	0.61	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	300	340	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/19/2009	CKG Environmental	440	390	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
MW-20	12/11/2000	Kennedy/Jenks	110(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	4/6/2001	Kennedy/Jenks	57(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	7/6/2001	Kennedy/Jenks	120(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/19/2001	Kennedy/Jenks	160(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	12/11/2001	Kennedy/Jenks	82(a)	86(b)	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	2/6/2002	Kennedy/Jenks	85(a)	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	3/15/2004	CKG Environmental	ND	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	6/30/2005	CKG Environmental	ND	ND	NA	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	9/11/2006	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/17/2007	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/21/2008	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
	10/19/2009	CKG Environmental	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA

ND: Not Detected

NA: Not Analyzed

FP: Floating Product

*: Results converted to µg/l for consistency of table

(a): Quantified as diesel but chromatogram did match diesel pattern

(b): Quantified as gasoline but chromatogram did not match gasoline pattern

(c): Re-stest was performed on 10/19, results indicated in parenthesis

TOG/TPHmo: Total Oil and Grease and Total Petroleum Hydrocarbons as Motor Oil (TPHmo used after 2004).

Note: MW's 3, 11, 14, and 18 have been destroyed.

TABLE 2
Groundwater Data Summary
Owens-Brockway Glass Container Facility, Oakland California

Grab Groundwater Data

	Date Sampled	Sampled By	Total Volatile Hydrocarbons µg/l	Oil and Grease µg/l	Benzene µg/l	Tolunene µg/l	Xylene µg/	TCE µg/l	TCA µg/l	TRANS 1,2-DCE µg/l	1,1-DCE µg/l	1,1-DCA µg/l
BH-1	7/15/1986	Exceltech	75,000	60,000	1,800	2,000	5,600	NA	NA	NA	NA	NA
BH-2	7/15/1986	Exceltech	11,000	90,000	1,300	760	320	NA	NA	NA	NA	NA
BH-3	7/15/1986	Exceltech	14,000	150,000	640	0.5	1,000	NA	NA	NA	NA	NA
BH-4	7/15/1986	Exceltech	26,000	14,000	0.5	79	1,300	NA	NA	NA	NA	NA
BH-6	8/14/1986	Exceltech	73,000	7,200,000	ND	ND	ND	ND	ND	ND	ND	ND
BH-7	8/14/1986	Exceltech	1,700	2,700,000	ND	ND	ND	ND	ND	ND	ND	ND
BH-8	8/14/1986	Exceltech	9,800	320,000	ND	ND	ND	30	ND	12	ND	ND
BH-9	8/14/1986	Exceltech	26,000	35,000	ND	ND	ND	ND	ND	ND	ND	ND
BH-10	8/14/1986	Exceltech	150,000	40,000	ND	ND	ND	ND	ND	ND	ND	ND
BH-11	8/14/1986	Exceltech	86,000	46,000	ND	ND	ND	14	ND	2	ND	ND
BH-12	8/14/1986	Exceltech	9,100	130,000	ND	ND	ND	ND	ND	ND	ND	ND
BH-13	8/14/1986	Exceltech	28,000	100,000	ND	ND	ND	ND	ND	ND	ND	ND
BH-14	8/14/1986	Exceltech	520	25,000	ND	ND	ND	10	21	2	ND	ND
BH-15	8/14/1986	Exceltech	13,000,000	400,000,000	ND	ND	ND	500	13	ND	13	2.,200

ND: Not Detected

NA: Not Analyzed

All results converted from mg/l to µg/l

Georpobe Investigation - Groundwater Sample Data

	Date Sampled	Sampled By	TPPH µg/l	TEPH µg/l	TEPH (w/ silica gel) µg/l	Benzene µg/l	Tolunene µg/l	Ethylbenzene µg/l	Xylene µg/l
KB-1	1/27/1999	Kennedy/Jenks	ND	ND	NA	ND	ND	ND	ND
KB-2	1/27/1999	Kennedy/Jenks	ND	ND	NA	ND	ND	ND	ND
KB-3	1/27/1999	Kennedy/Jenks	110 (160)*	420 (490)*	ND(NA)*	1.4 (1.5)*	ND(1.1)*	ND(ND)*	3.3(2.9)*
KB-4	1/27/1999	Kennedy/Jenks	590	360	ND	ND	ND	ND	ND
KB-5	1/27/1999	Kennedy/Jenks	1,500	1,400	730	ND	ND	ND	0.88

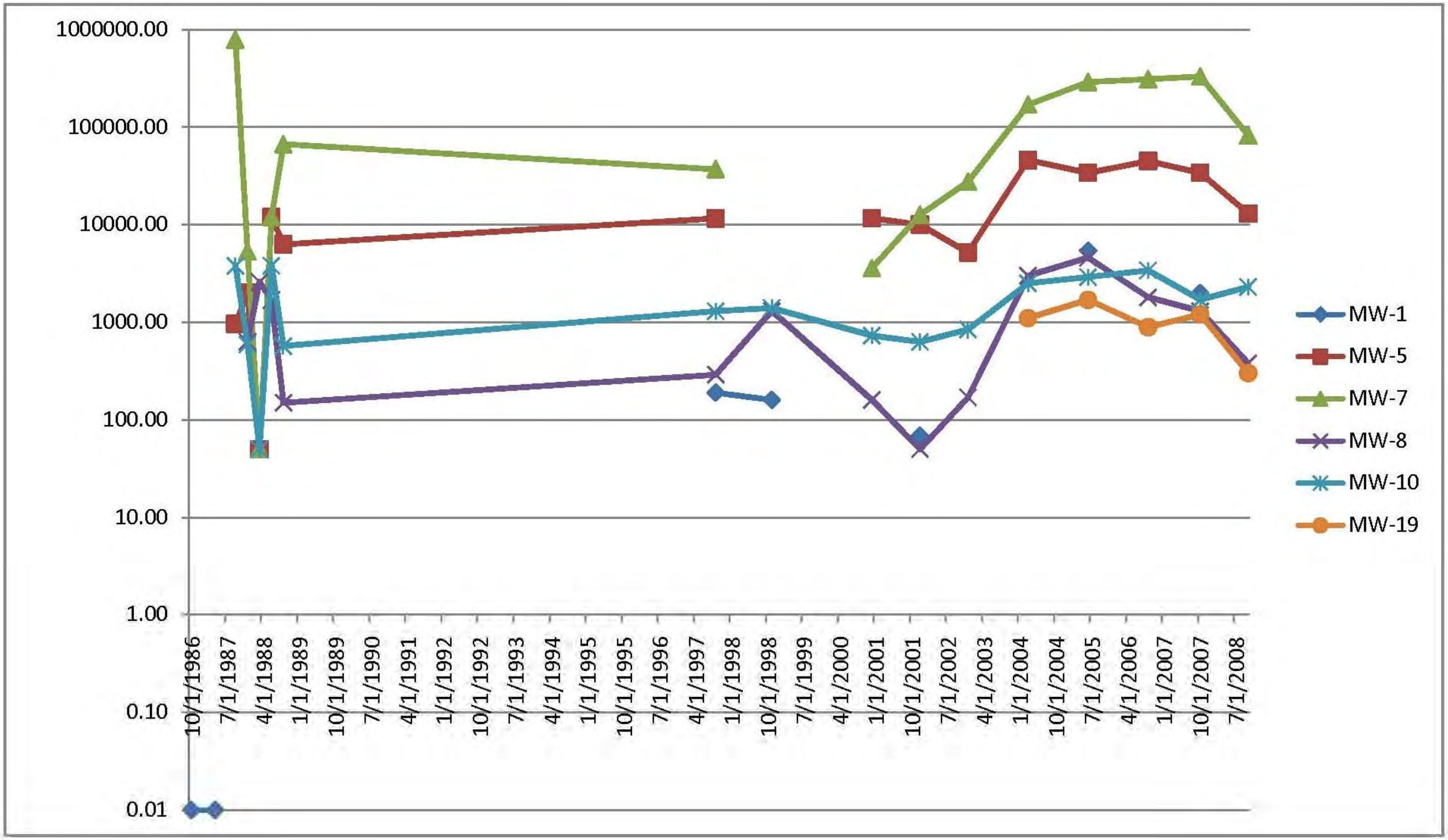
ND: Not Detected

NA: Not Analyzed

*: Duplicate sample indicated in parentheses

TPPH: total purgeable petroleum hydrocarbons

TEPH: total extractable petroluem hydrocarbons



CKG Environmental, Inc.

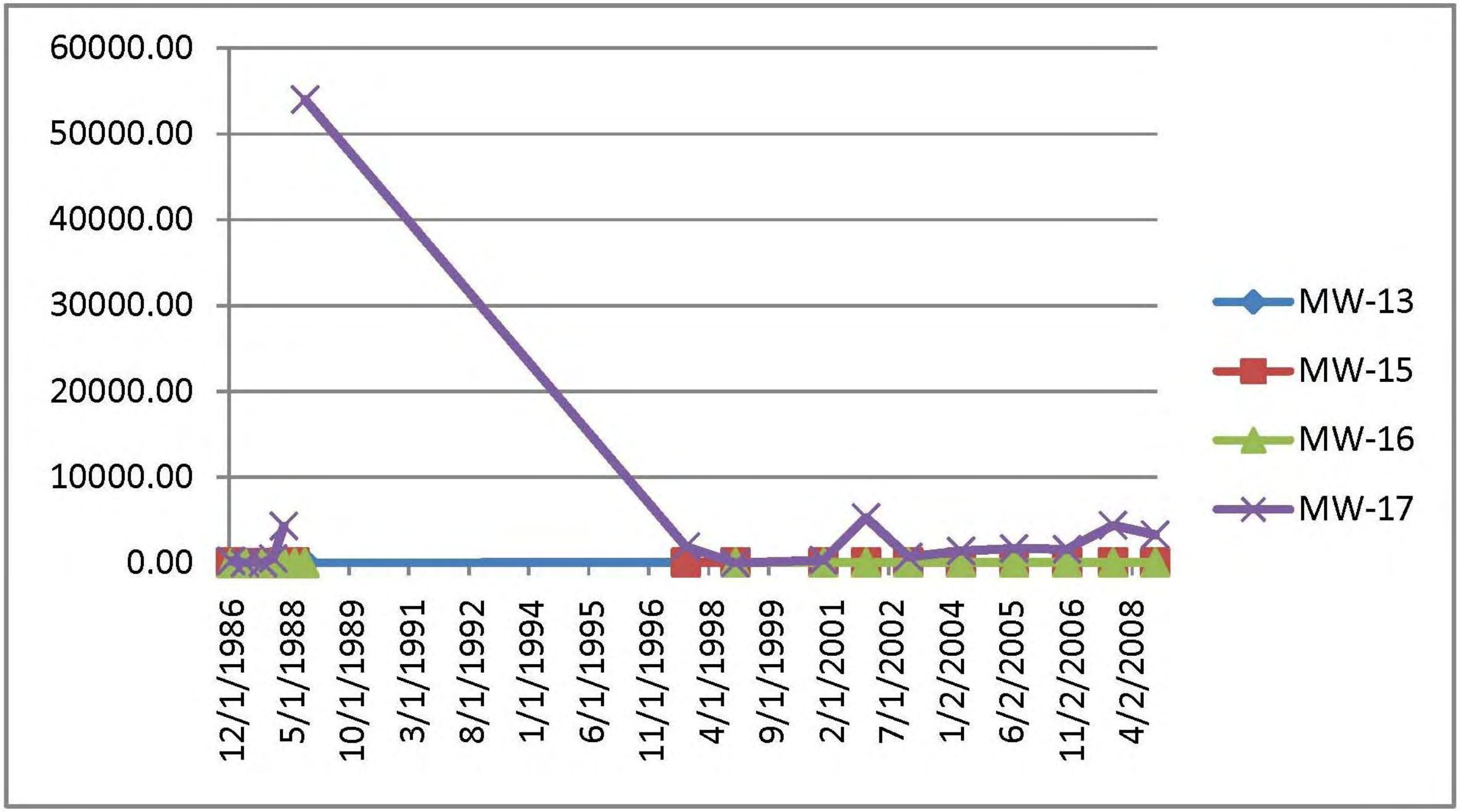
Project No: Date: 4/2/09

TPHd Concentration vs Time
Western Fuel Storage Area

Owens-Brockway Glass Container, Inc
Oakland, California

PLATE

A-3



CKG Environmental, Inc.

Project No:

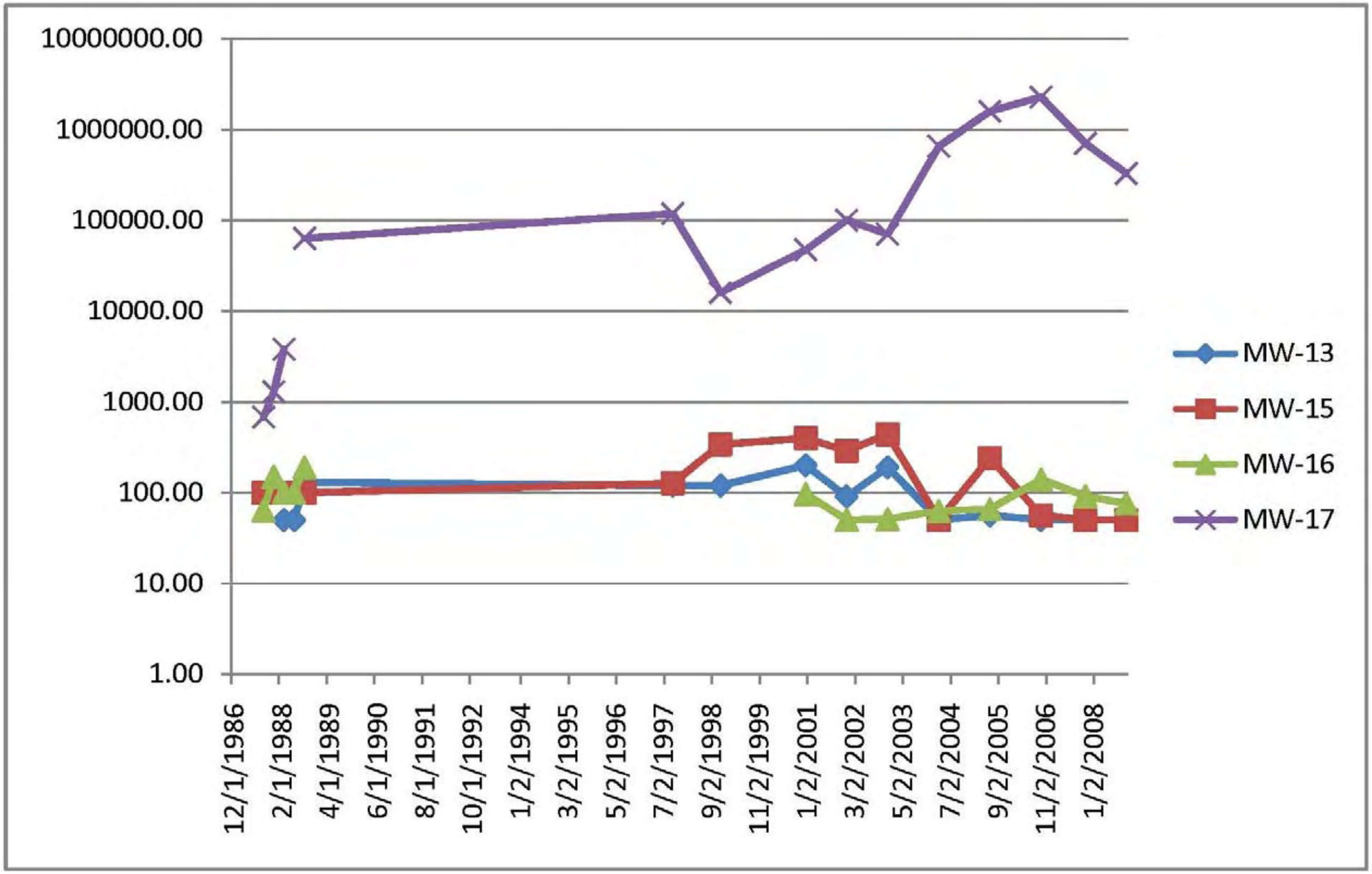
Date: 3/19/09

TPHg Concentration vs Time
Central Fuel Storage Area

Owens-Brockway Glass Container, Inc
Oakland, California

PLATE

A-4



CKG Environmental, Inc.

Project No: Date: 4/2/09

TPHd Concentration vs Time
Central Fuel Storage Area

Owens-Brockway Glass Container, Inc
Oakland, California

PLATE

A-5

APPENDIX B

BORING NO.: MW-1

PROJECT NAME: Owens-Illinois

DATE DRILLED: 9/12/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs
0			Pavement Section		
			Sandy/Silty CLAYS, Black, slightly moist	CL	
5	1-1		Sandy CLAYS, Brown, slightly moist, very stiff, 20-25% Sand and Silt Content		24
10	1-2	▼	Sandy CLAYS, Blue, moist, Stiff, 30-40% Sand and Silt Homogeneous increase in Sand Content		11
			Clayey/Silty SANDS, Blue, Very Moist, Slight petroleum odor.	SC/SM	
15	1-3		Gravelly Coarse SANDS to Coarse Sandy GRAVELS, Black, Wet, Dense, very strong product odor, saturated	SP/GM	41
20	1-4		Sandy CLAYS, Brown, Very Moist to Wet, Stiff, Slight Fuel Odor, Strong odor in water	CL	14
25	1-5		Brown Sandy GRAVELS grading to Silty gravelly SANDS at 26½', Wet, Dense, No odor increase sands with depth	GM/SP	40
30	1-6				39
			Bottom of Boring = 30 feet		
35					

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

BORING / WELL NO. MW-1

PROJECT NAME Owens-Illinois

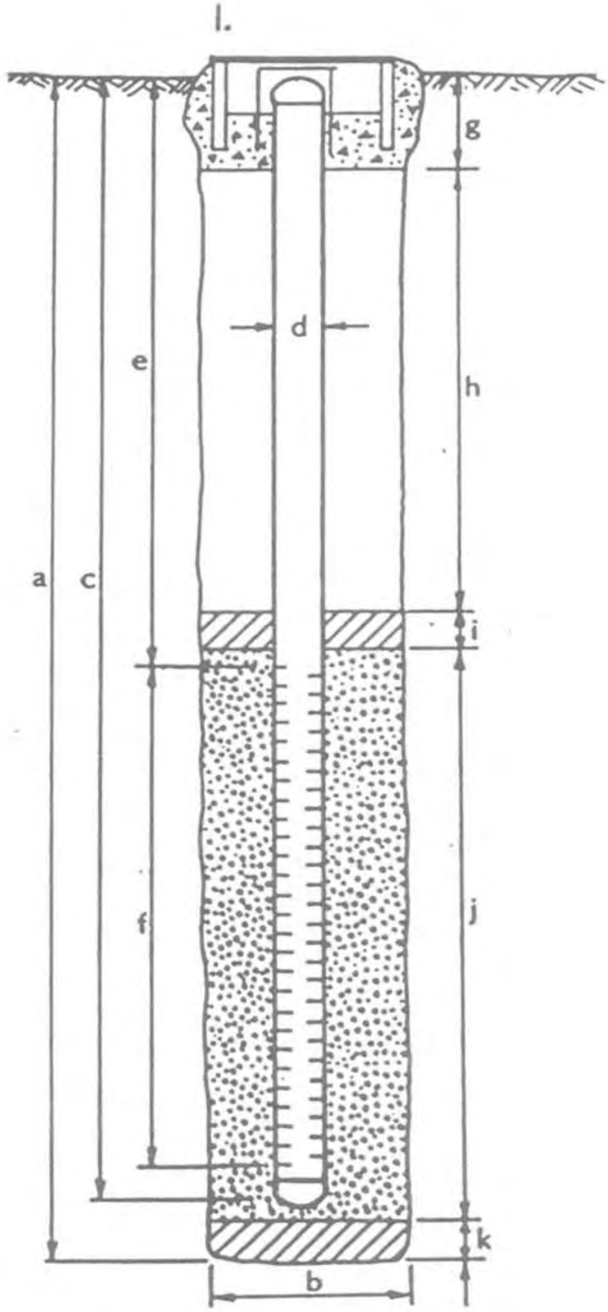
TOP OF CASING ELEV. 16.02

COUNTY Alameda

GROUND SURFACE ELEV. ______

WELL PERMIT NO. ______

DATUM US Coast Geodetic



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 29 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 8 ft.

f. Perforated length 21 ft.

Perforated interval from 29 to 8 ft.

Perforation type Machine

Perforation size 0.010 inches

g. Surface seal 1.5 ft.

Seal material Cement/Christy Box

h. Backfill 3.5 ft.

Backfill material Cement

i. Seal 2 ft.

Seal material Bentonite

j. Gravel pack 22 ft.

Pack material #4 Sand

k. Bottom seal ______ ft.

Seal material None

l. Steel Locking Casing Inside Christy Box

BORING NO.: MW-2

PROJECT NAME: Owens-Illinois

DATE DRILLED: 9/12/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			Pavement Section						
			Sandy/Silty CLAYS, Black, Moist, Stiff	CL	13				
5	2-1								
10	2-2		Sandy CLAYS, Blue, Moist, Stiff, 20-30% Sand Content, Slight Fuel Odor		12				
15	2-3	▼ ▽	Silty SANDS, Blue, Moist, Very firm, slight fuel odor	SM	25				
20	2-4		Blue Gravelly, Med-grained SANDS, wet very strong fuel odor with visible oil droplets in soil	SP	12				
25	2-5		Sandy CLAY to Clayey Fine to Med-grained SANDS, Brown, very stiff to medium dense	CL SC	21				
30	2-6				20				
			Bottom of Boring = 30 feet						
35									
40									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

BORING / WELL NO. MW-2

PROJECT NAME Owens-Illinois

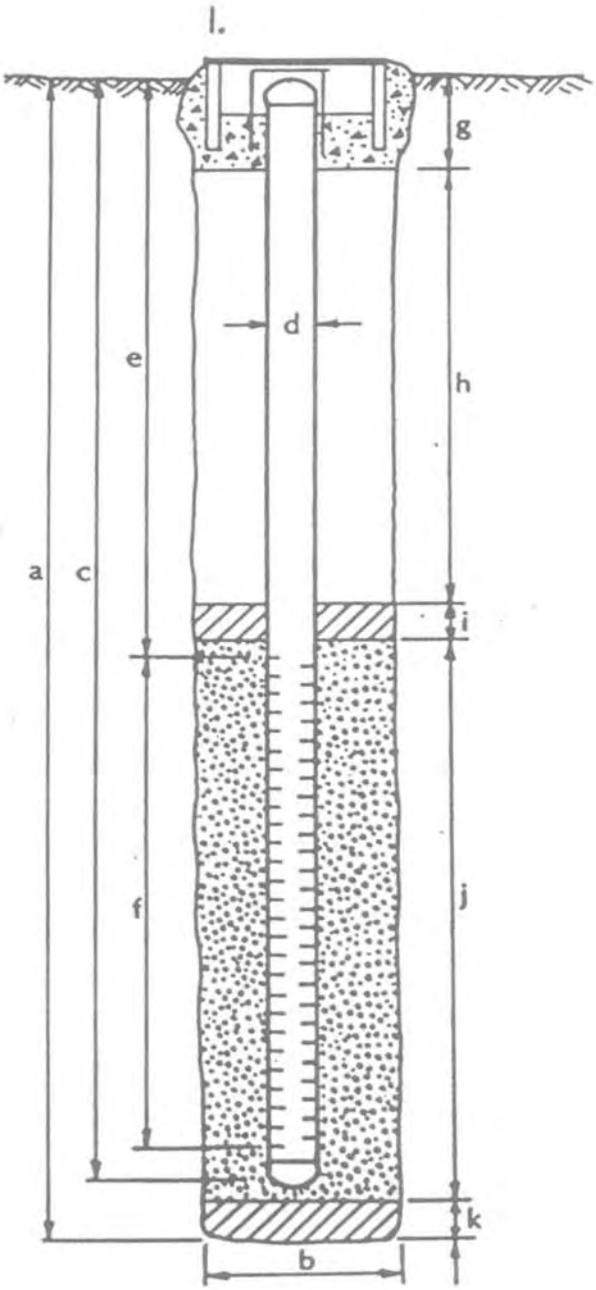
TOP OF CASING ELEV. 17.11

COUNTY Alameda

GROUND SURFACE ELEV. ______

WELL PERMIT NO. ______

DATUM US Cost Geodetic



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 30 ft.

Material Hollowstem Auger

d. Diameter 2 in.

e. Depth to top perforations 10 ft.

f. Perforated length 20 ft.

Perforated interval from 30 to 10 ft.

Perforation type Machine

Perforation size 0.010

g. Surface seal 1.5 ft.

Seal material Cement/Christy box

h. Backfill 5.5 ft.

Backfill material Cement

i. Seal 1.0 ft.

Seal material Bentonite

j. Gravel pack 22 ft.

Pack material #4 Sand

k. Bottom seal ____ ft.

Seal material None

l. Steel locking casing inside Christy box

BORING NO.: MW-3

PROJECT NAME: Owens-Illinois

DATE DRILLED: 9/12/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			4" Asphalt 8" Base Silty Sand & Gravel fill with wood frag.						
			Clayey Fine Sand, Black, wet, petroleum odor, loose fill	SC					
5			Silty CLAYS, Gray/Blue, moist, stiff	CL	17				
10		▽			21				
15			Silty SAND to Clayey Fine to Med-grained SANDS, Tan/Gray, wet, very firm	SM/SC	29				
20					23				
			Sandy CLAY, Brown, Moist, Stiff	CL					
25					20				
			Silty SANDS to Gravelly SANDS, Brown fine to coarse grained	SM/GP					
30					27				
			Bottom of Boring = 31 feet						
35									
40									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

PROJECT NAME Owens-Illinois

COUNTY ~~Alameda~~

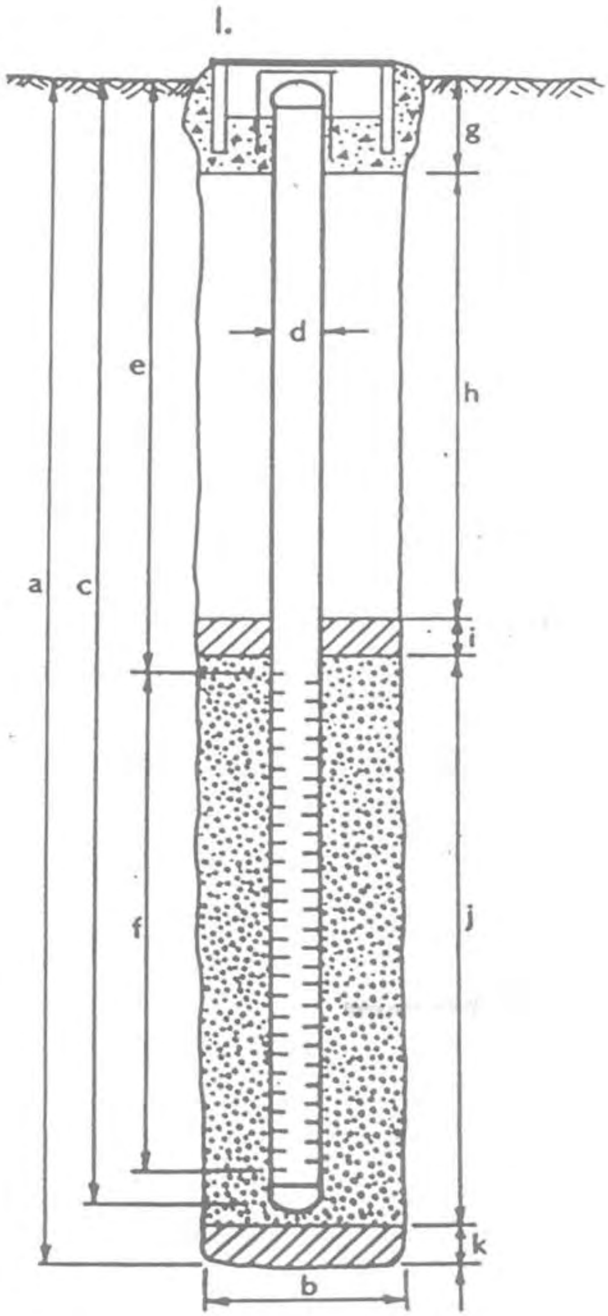
WELL PERMIT NO.

BORING / WELL NO. MW-3

TOP OF CASING ELEV. 15.46

GROUND SURFACE ELEV.

DATUM US Coast Geodetic



EXPLORATORY BORING

a. Total depth 31 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 30 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 10 ft.

f. Perforated length 20 ft.

Perforated interval from 30 to 10 ft.

Perforation type Machine

Perforation size 0.010

g. Surface seal 1.5 ft.

Seal material Cement/Christy box

h. Backfill 5.5 ft.

Backfill material Cement

i. Seal 1.0 ft.

Seal material Bentonite

j. Gravel pack 23 ft.

Pack material #4 Sand

k. Bottom seal ft.

Seal material None

l. Steel locking casing inside christy box

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO. : MW-4

DATE DRILLED: 9/29/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			Pavement Section						
			GRAVELLY SANDY SILT, yellow brown, 20% gravel, 30% sand 50% Silt may contain fill	ML					
5			GRAVELLY SANDY CLAY, yellow brown, 15% gravel, 30% sand, 55% clay, moderately plastic, hard	CL	35				
10		▼	-interbed of highly plastic clay -decreasing gravel and sand		3				
		▽	-increasing gravel						
15			CLAYEY SANDY GRAVEL, yellow brown, 10% clay, 40% sand, 50% gravel, saturated very dense	GC	69				
20			GRAVELLY CLAY, brown, 10% sand, 15% gravel rootholes or barrows open and wet, moderately plastic, hard	CL	29				
25			SANDY CLAYEY GRAVEL, Brown 10% sand, 15% clay, 75% gravel, wet, dense	GC	42				
			SANDY CLAY, yellow brown, 10% sand, moderate plasticity, damp, hard						
30			-becomes gravelly		34				
			Bottom of Boring = 30 feet						
35									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

PROJECT NAME Owens-Illinois

COUNTY Alameda

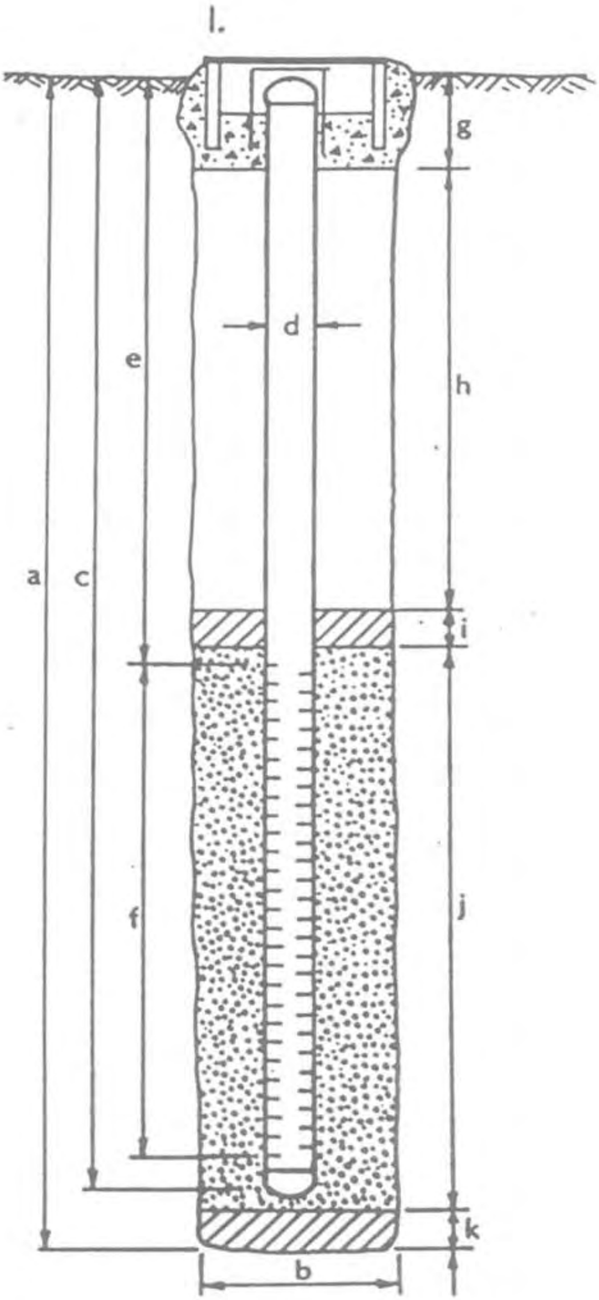
WELL PERMIT NO. 86265

BORING / WELL NO. MW-4

TOP OF CASING ELEV. 16.02

GROUND SURFACE ELEV. ______

DATUM US Coast and Geodetic



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 28.5 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 8.5 ft.

f. Perforated length 20 ft.

Perforated interval from 28.5 to 8.5 ft.

Perforation type Machine

Perforation size 0.020 inch

g. Surface seal 1.5 ft.

Seal material Cement/Christy box

h. Backfill 5.0 ft.

Backfill material Cement

i. Seal 1.0 ft.

Seal material Bentonite

j. Gravel pack 21 ft.

Pack material #4 Sand

k. Bottom seal ____ ft.

Seal material None

l. Steel locking case inside Christy box

BORING NO.: MW-5

PROJECT NAME: Owens-Illinois

DATE DRILLED: 9/29/86

PROJECT NUMBER: 1467G

LOGGED BY: CMP

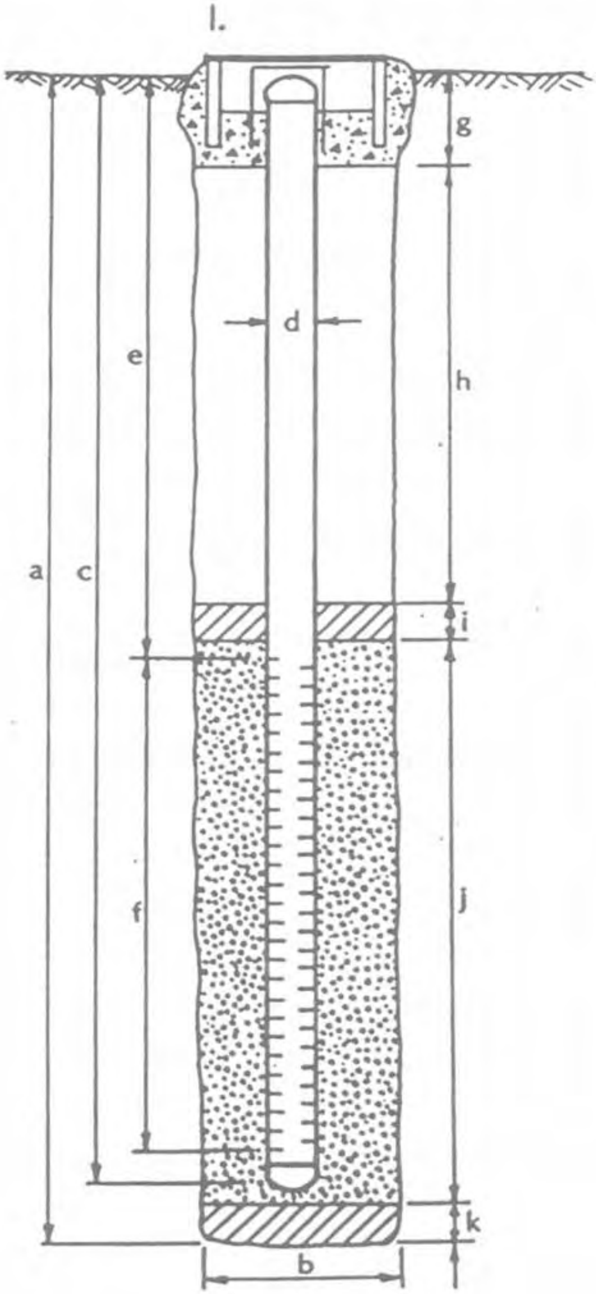
EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			SILTY CLAY, black moderate to high plasticity, damp, may contain fill	CL-CH					
5			SAND, gray, fine-grained, <50% fines, loose -minor gravel	SP	6				
10			SANDY CLAY, gray, 40% sand, high plasticity, very moist, firm	CL	6 5				
15		▼	CLAYEY SAND, stained gray green, clay 40% odor and free product in soil, medium dense, rootholes and burrows	SC	23				
20		▽	-becomes wet at 18.5 feet, free product -less clay		25				
25			CLAYEY SANDY GRAVEL, Stained gray, 15% clay, 20% sand 65% gravel, sand and clay beds, increasing clay content with depth free product, very dense	GC/GW	55				
30			CLAYEY SAND and SANDY CLAY INTERBEDDED, yellow brown, clayey sand, interbeds 0.5 to 1.0 inch thick, sandy clay beds 4.0" to 1 foot thick, rootholes or burrows, stiff, damp	GC/CL	13				
			Bottom of Boring = 30 feet						
35									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G
BORING / WELL NO. MW-5
PROJECT NAME Owens-Illinois
TOP OF CASING ELEV. 16.19
COUNTY Alameda
GROUND SURFACE ELEV. ______
WELL PERMIT NO. 86265
DATUM US Coast Geodetic



EXPLORATORY BORING

a. Total depth 30 ft.
b. Diameter 8 in.
Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 28.5 ft.
Material Sch 40 PVC
d. Diameter 2 in.
e. Depth to top perforations 8.5 ft.
f. Perforated length 20 ft.
Perforated interval from 28.5 to 8.5 ft.
Perforation type Machine
Perforation size 0.020
g. Surface seal 1.0 ft.
Seal material Cement/Christy box
h. Backfill 4.5 ft.
Backfill material Cement
i. Seal 2.0 ft.
Seal material Bentonite
j. Gravel pack 21 ft.
Pack material #4 Sand
k. Bottom seal ____ ft.
Seal material None
l. Steel locking casing inside christy box

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: MW-6

DATE DRILLED: 9/29/86

LOGGED BY: CMP

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			SANDY SILT FILL, contains rocks, concrete refuse, damp	ML					
5			SILTY CLAY, Black, moderate to high plasticity, damp	CL-CH	22				
10			SANDY SILTY CLAY, yellow brown, 10-15% fine sand, rootholes and burrows, faint bedding, moderate plasticity, stiff	CL	11				
15		▼	CLAYEY SAND to SANDY CLAY, stained brown, free product, 40-60% sand, rootholes in filled with plant matter	SC/CL	19				
20		▽	-becomes interbedded at 18.5, becomes wet at 19, product decreases with depth, becomes very sandy at 20		72/11				
25			-clay interbed from 23.5 to 24, much free product		27				
30			GRAVELLY CLAY, brown, 20-40% fine to medium gravel, bedded, nearly saturated to damp		31				
			Bottom of Boring = 30'						
35									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

PROJECT NAME Owens-Illinois

COUNTY Alameda

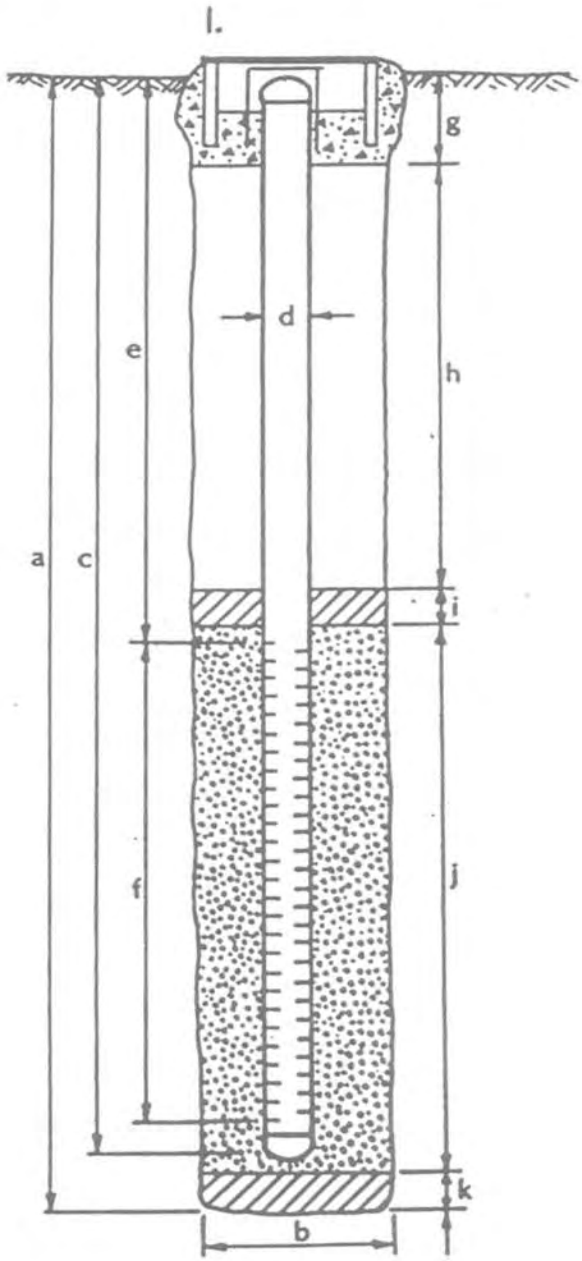
WELL PERMIT NO. 86265

BORING / WELL NO. MW-6

TOP OF CASING ELEV. 17.48

GROUND SURFACE ELEV. ______

DATUM US Coast & Geodetic



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 28.5 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 12.5 ft.

f. Perforated length 16 ft.

Perforated interval from 28.5 to 12.5 ft.

Perforation type Machine

Perforation size 0.020

g. Surface seal 1.5 ft.

Seal material Cement/Christy box

h. Backfill 9.5 ft.

Backfill material Cement

i. Seal 2 ft.

Seal material Bentonite

j. Gravel pack 17.5 ft.

Pack material #4 Sand

k. Bottom seal ______ ft.

Seal material None

l. Steel locking casing inside Christy box.

BORING NO.: MW-7

PROJECT NAME: Owens-Illinois

DATE DRILLED: 9/30/86

PROJECT NUMBER: 1467G

LOGGED BY: CMP

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			CLAYEY SILT, dark yellowish brown, moderated plastic, hard, contains fill	ML					
5					36				
			SILTY CLAY, very dark brown to brown, 15% sand disseminated, moderately expansive contains rootholes, stiff	CL					
10					12				
		▼							
			SAND and SILTY SAND, discolored to gray and blue gray, petroleum odor, 2-5% silt, rare gravel, dense, free product at 15'	SP-SM					
15					47				
		▽	-becomes silty, weak petroleum odor gradational contact, becomes red brown wet						
20			SILTY CLAY, brown 10% fine sand disseminated moderate plasticity, very stiff	CL	13				
25					17				
			Bottom of Boring = 25 feet						
30									
35									

EXCELTECH

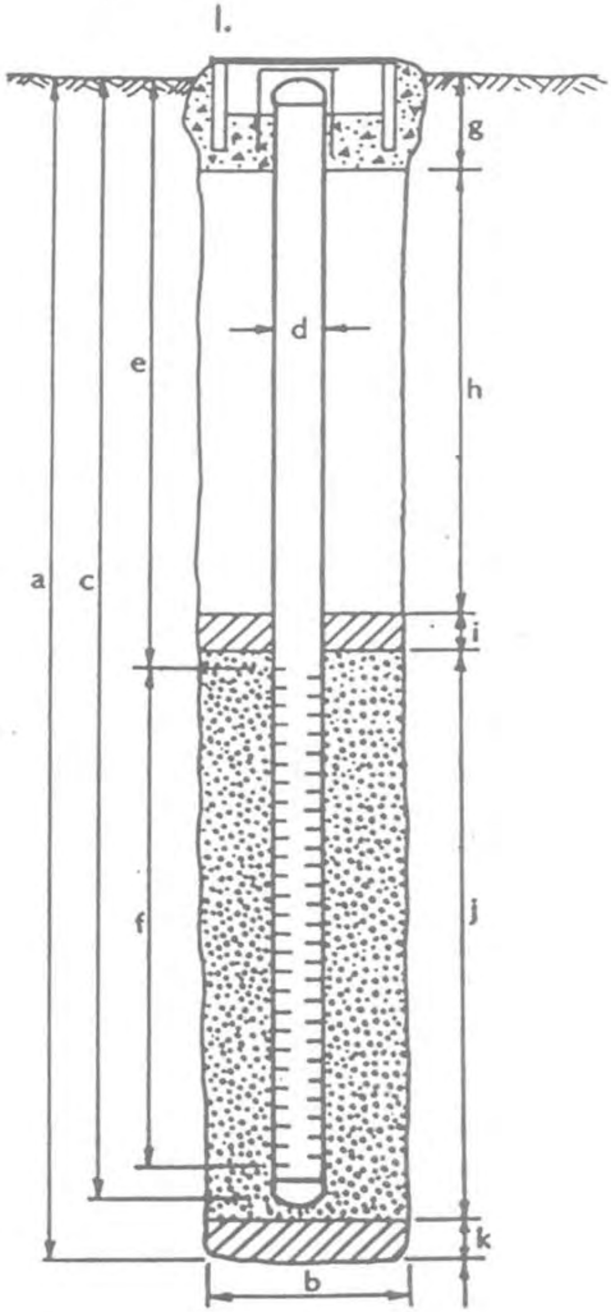
Monitoring Well Detail

PROJECT NUMBER 1467G — BORING / WELL NO. MW-7

PROJECT NAME Owens-Illinois — TOP OF CASING ELEV. 16.11

COUNTY Alameda — GROUND SURFACE ELEV. ______

WELL PERMIT NO. 86265 — DATUM US Coast & Geodetic



EXPLORATORY BORING

a. Total depth 25 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 23.5 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 12.5 ft.

f. Perforated length 11 ft.

Perforated interval from 23.5 to 12.5 ft.

Perforation type Machine

Perforation size 0.020

g. Surface seal 1.5 ft.

Seal material Cement/Christy Box

h. Backfill 7 ft.

Backfill material Cement

i. Seal 2.5 ft.

Seal material Bentonite

j. Gravel pack 13 ft.

Pack material #4 Sand

k. Bottom seal ____ ft.

Seal material None

l. Steel locking casing inside Christy box.

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: MW-8

DATE DRILLED: 10/22/86

LOGGED BY: CMP

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			PAVEMENT SECTION						
			SILTY CLAY, black, moderate to high plasticity, weak product odor, may contain fill, moist	CL					
			strong product odor, fine sand 10%						
5	8-1		SILTY CLAY, gray, moderate to high plasticity, product odor, plant infilled root holes, very stiff, moist	CL	12				
10	8-2	▼			31				
			CLAYEY SAND, gray, sand 70%, clay 30% as matrix, massive, burrows and root holes, strong product odor, very moist, dense	SC					
15	8-3				34				
		▽							
			SAND to CLAYEY SAND, gray product stain to depth of 21', yellow brown below 21', sand 70% to 95%, clay disseminated, massive, medium dense, wet	SP-SC					
20	8-4				16				
			SILTY CLAY, yellow brown, fine to coarse sand 5% moderate to high plasticity massive, stiff, damp	CL					
25	8-5		SANDY GRAVEL, yellow brown, fine to coarse sand 25%, gravel 65%, clay matrix 10% very dense, wet	GW	80				
30	8-6		SILTY CLAY, yellow brown, fine sand 5% gravel 5%, moderate plasticity, massive very stiff, damp	CL	18				
35									
40									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

PROJECT NAME Owens-Illinois

COUNTY Alameda

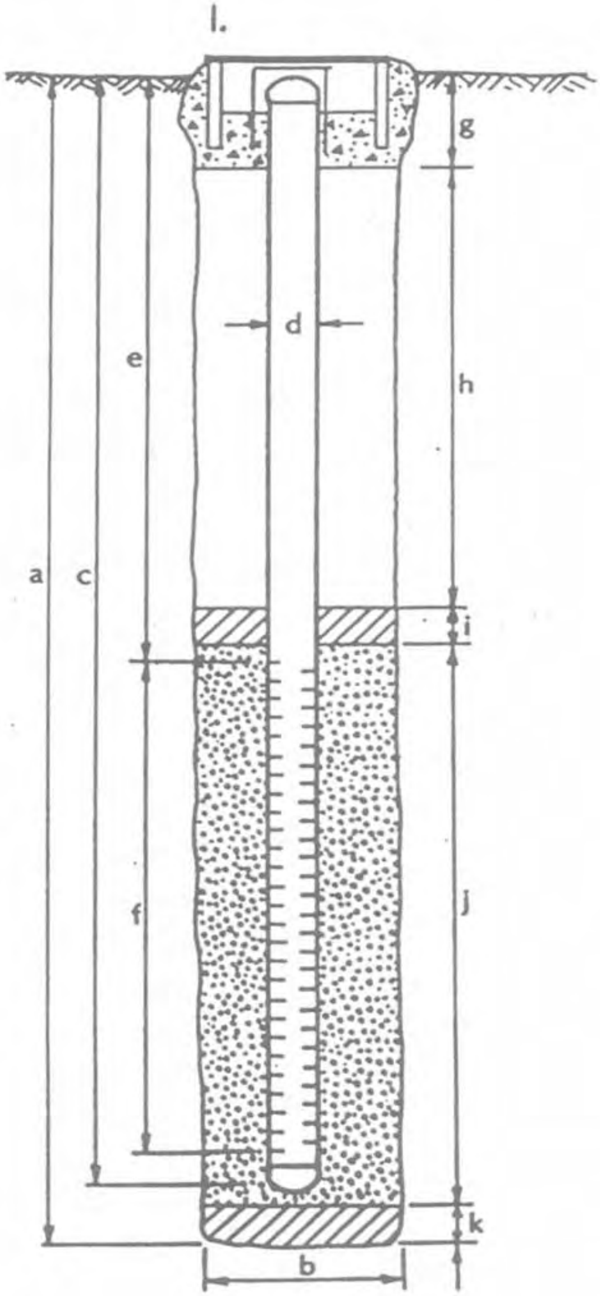
WELL PERMIT NO. 86279

BORING / WELL NO. MW-8

TOP OF CASING ELEV. 16.57'

GROUND SURFACE ELEV. ______

DATUM US Coast Geodetic



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 28.5 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 9 ft.

f. Perforated length 13.5 ft.

Perforated interval from 28.5 to 15 ft.

Perforation type Machine

Perforation size 0.020

g. Surface seal 1 ft.

Seal material Christy box/cement

h. Backfill 8.0 ft.

Backfill material Cement

i. Seal 3 ft.

Seal material Bentonite

j. Gravel pack 16 ft.

Pack material #4 Sand

k. Bottom seal ____ ft.

Seal material None

l. Steel locking casing in Christy box

MW-9
BORING NO.: (B-4)

PROJECT NAME: Owens-Illinois

DATE DRILLED: 7/23/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	TVH mg/kg	Oil & Grease mg/kg		Comments
0			SILTY SANDY CLAY, blue-gray, 25-30% sand very strong fuel odor, stiff	CL					Well MW-9 installed in Boring B-4
	4-1				14				
5	4-2				12	640	210		
10	4-3		SILTY SAND, blue gray, medium grained strong product odor, medium dense, moist	SM	23				
15	4-4				11	8.8	30		
20	4-5		SANDY CLAY, brown, 20-25% sand, strong fuel odor, very stiff, wet	CL	21				
25	4-6				20				
			Bottom of Boring = 25.5 feet						
30									
35									
40									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

BORING / WELL NO. MW-9

PROJECT NAME Owens-Illinois

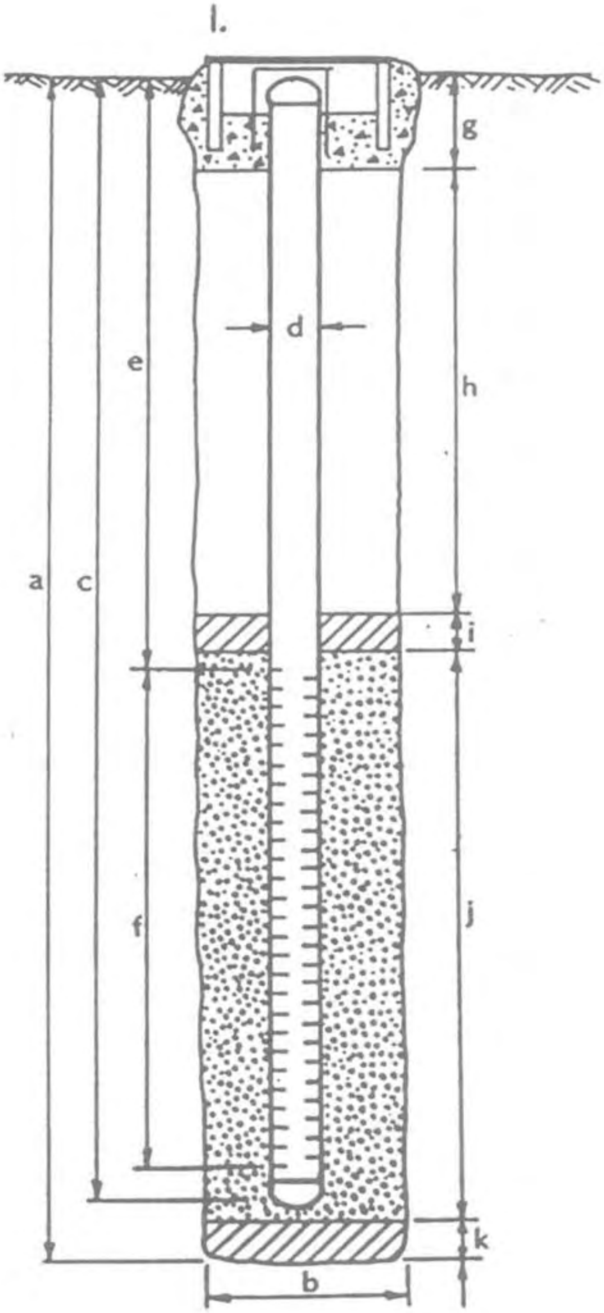
TOP OF CASING ELEV. ______

COUNTY Alameda

GROUND SURFACE ELEV. 7.33

WELL PERMIT NO. 86279

DATUM U.S. Coast & Geodetic



EXPLORATORY BORING

a. Total depth 16 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 20 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations ____ ft.

f. Perforated length ____ ft.

Perforated interval from 15 to 5 ft.

Perforation type Machine

Perforation size 0.020

g. Surface seal ____ ft.

Seal material None - Ramp to be built

h. Backfill ____ ft.

Backfill material Cement

i. Seal 2.0 ft.

Seal material Bentonite

j. Gravel pack 11.5 ft.

Pack material #4 Sand

k. Bottom seal – ft.

Seal material None

l. Sluff to 15' deep

Note leave 3' PVC standing out of hole.

Well installed in borehole B-4

EMCON TECH

BORING NO.: MW-10

PROJECT NAME: Owens-Illinois

DATE DRILLED: 10/22/86

PROJECT NUMBER: 1467G

LOGGED BY: CMP

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
0			PAVEMENT SECTION						
			SILTY CLAY, black, gravel 5% disseminated, moderate to high plasticity, may contain fill, very stiff, damp	CL					
	10-1				19				
5			SILTY CLAY, greenish gray, very fine sand 5% massive, weak product odor, very stiff	CL					
	10-2		-fine sand 15%, burrows		7				
10		▼							
			-nearly saturated						
	10-3	▽	CLAYEY SAND, yellow brown with green gray stains, fine-medium sand 70%, clay 30% as matrix & contains thin clay lenses, vertical burrows, weak product odor, medium dense, yields water slowly	SC	15				
15									
	10-4		-less clay from 16' to 18.5' -increasing clay 19' to 20'		10				
20			SILTY CLAY, yellow brown with gray mottles, fine sand 10% disseminated, root holes in-filled with plant fragments, moderate plasticity, stiff, locally wet root holes, over-all damp	CL					
	10-5				11				
25			Bottom of Boring = 25 feet						
30									
35									
40									

EXCELTECH

Monitoring Well Detail

PROJECT NUMBER 1467G

PROJECT NAME Owens-Illinois

COUNTY Alameda

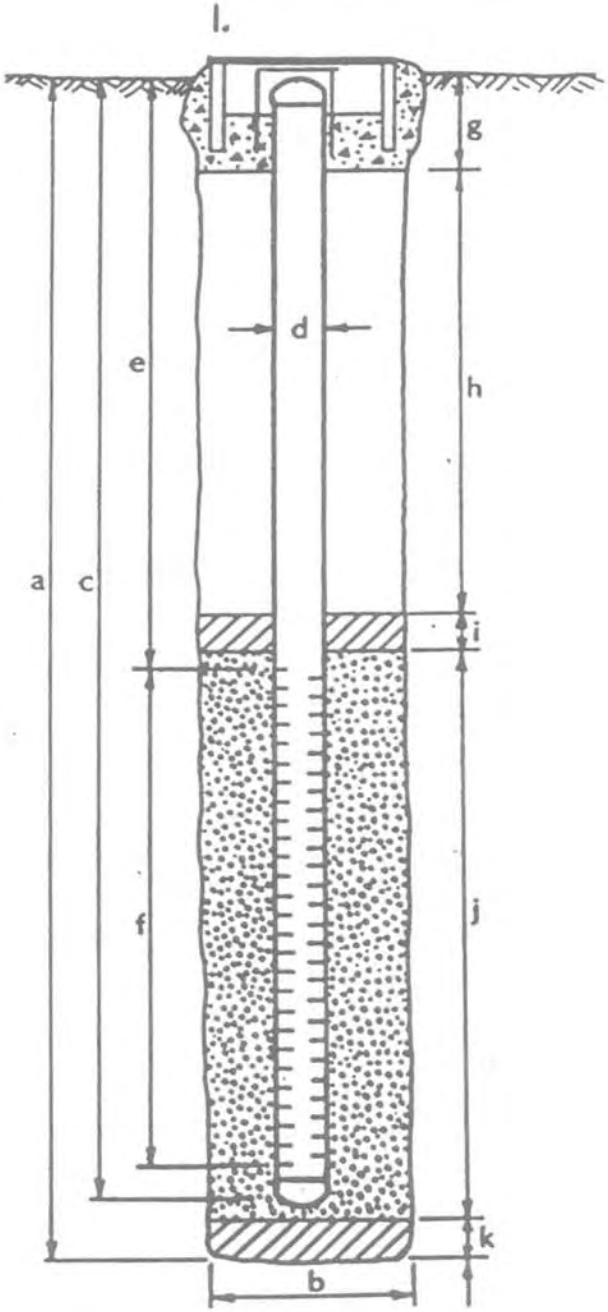
WELL PERMIT NO. 86279

BORING / WELL NO. MW-10

TOP OF CASING ELEV. 15.96'

GROUND SURFACE ELEV. ______

DATUM US Coast and Geodetic



EXPLORATORY BORING

a. Total depth 25 ft.

b. Diameter 8 in.

Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 25 ft.

Material Sch 40 PVC

d. Diameter 2 in.

e. Depth to top perforations 10 ft.

f. Perforated length 15 ft.

Perforated interval from 25 to 10 ft.

Perforation type Machine

Perforation size 0.020"

g. Surface seal 1.0 ft.

Seal material Christy box in cement

h. Backfill 5.5 ft.

Backfill material Cement

i. Seal 1.5 ft.

Seal material Bentonite

j. Gravel pack 17 ft.

Pack material #4 Sand

k. Bottom seal ____ ft.

Seal material None

l. Christy box with steel locking interior casing

EXCELTECH

BORING NO.: MW-14

PROJECT NAME: Owens-Illinois

DATE DRILLED: 11/25/86

PROJECT NUMBER: 1467G

LOGGED BY: RM

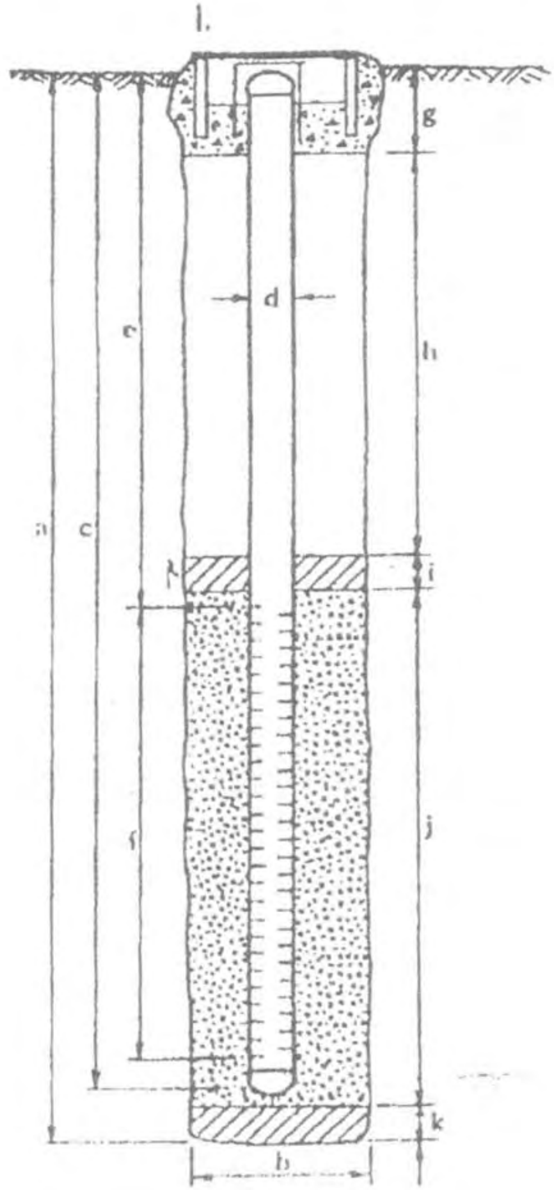
EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Unified Soil Classification	Blows/foot 350 ft-lbs	SOIL DESCRIPTION				
				PAVEMENT SECTION				
		CL		SANDY CLAY, black, 20-25% fine sand, low to medium, plasticity, very stiff, moist.				
5	14-1		18	-25-30% silt disseminated, rare gravel, root holes, decrease sand content				
		▼						
10	14-2		28	-15% gravel, 30% fine sand, low plasticity				
		▽						
15		GW-GM	32	SANDY GRAVEL, brown, 30% medium sand, 70% gravel, 0-25% silt with silt content increase with depth, dense, wet.				
		CL	22	-less gravel at 16.5 feet.				
20				SANDY CLAY, olive brown, 20% fine sand, medium to high plasticity, rare root holes sand occurs disseminated and as laminae very stiff, very moist.				
25			23	-10-15% gravel, clay low plasticity, very moist.				
				BOTTOM OF BORING- 26.5 feet				

Monitoring Well Detail

PROJECT NUMBER 1476G
PROJECT NAME Owens-Illinois
COUNTY Alameda
WELL PERMIT NO. 86279

BORING / WELL NO. MW-14
TOP OF CASING ELEV. 14.78
GROUND SURFACE ELEV. 15.53
DATUM US Coast Geodetic



EXPLORATORY BORING

a. Total depth 26.5 ft.
b. Diameter 8 in.
Drilling method Hollowstem Auger

WELL CONSTRUCTION

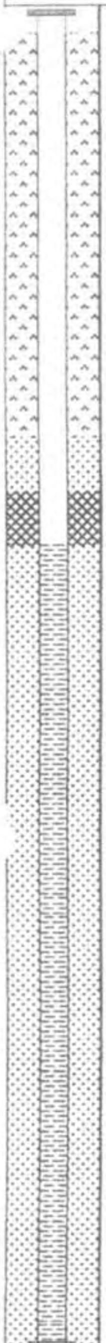
c. Casing length 25 ft.
Material PVC Sch 40
d. Diameter 2 in.
e. Depth to top perforations 10 ft.
f. Perforated length 15 ft.
Perforated interval from 25 to 10 ft.
Perforation type Machine
Perforation size 0.020
g. Surface seal 1 ft.
Seal material Cement/Christy box
h. Backfill 6 ft.
Backfill material cement grout
i. Seal 1 ft.
Seal material bentonite
j. Gravel pack 17 ft.
Pack material #4 sand
k. Bottom seal ____ ft.
Seal material None
l. Steel locking casing inside Christy box

MONITORING WELL CONSTRUCTION DETAILS

TOC El. = ft.**

PID (ppm)	Blows/Ft.	SAMPLE	Depth (feet)

Equipment: Hollow Auger | Elevation:
Logged By: CLK | Start Date:
Drilled By: | Finish Date:



Depth (feet)	PID (ppm)	Blows/Ft.	Description
0			BROWN SANDY SILTS with 2: rocks (or smaller) mostly in backfill to 5'
5	5	17	BROWNISH ORANGE SANDY SILT WITH SOME CLAYS at 6', 2" rock present along with old clay brick (red) - possibly and old pipe?
		17	BROWNISH YELLOW SANDY SILTS - no odor, slightly moist and densely packed, low plasticity
10	10		strong petroleum hydrocarbon odor, silty sands with some lean clay
		35	SILTY SANDS (coarse sand, strong petroleum odor-not as much as above, very moist and greenish gray, groundwater possibly at 13-14', not ML but maybe SC, low plasticity - high permeability
15	15		gasoline odor
		70	SILTY SANDS (more coarse sands) with small gravel, slight petroleum odor, moist and greenish-gray, SC classification, low plasticity - high permeability
20	20		
		27	Brown Clay begins at 23', very distinct layer LIGHT TAN-BROWN LAYER with no odor - high plasticity, slight moist and very dense, low permeability silty clays with some fine sands
25	25		

BOTTOM OF BORING MW-19 @ 25'4"
Hole Converted to Monitoring Well

CKG Environmental Inc.

Job No: 123.04
Appr:
Drwn: LPDD
Date: AUG 2003

Log of Boring MW-19 and Well Details
Owens-Brockway Glass Container, Inc.
Oakland, California

PLATE 3

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Downgradient of Former USTs		Boring/Well Name	MW-20
DRILLING COMPANY: West Hazmat Drilling Corp.	DRILLER: D. Marrochi	Project Name	Owens-Brockway Glass Cont.
DRILLING METHOD(S): Hollow Stem Auger - CME 55	DRILL BIT(S) SIZE: 8-inches	Project Number	950007.30
ISOLATION CASING: None	FROM n/a TO n/a FT	ELEVATION AND DATUM: TOC:	TOTAL DEPTH: 25.0 ft. bgs
BLANK CASING: 2-inch SCH 40 PVC	FROM 0.3 TO 6.9 FT	DATE STARTED: 12/1/00	DATE COMPLETED: 12/1/00
SLOTTED CASING: 2-inch SCH 40 PVC - 0.010-inch slotted	FROM 6.9 TO 21.9 FT	STATIC WATER ELEVATION: 9.1 ft. bgs (12/11/00)	
SIZE AND TYPE OF FILTER PACK: Lonestar #2/16	FROM 6.0 TO 22.3 FT	LOGGED BY: M. McLeod	
SEAL: Kwik Plug Medium Bentonite Chips	FROM 5.1, 22.3 TO 6.0, 25.0 FT	SAMPLING METHODS: CME Continuous	WELL COMPLETION: X SURFACE HOUSING / STAND PIPE ___ FT
GROUT: Neat Cement	FROM 1.0 TO 5.1 FT		

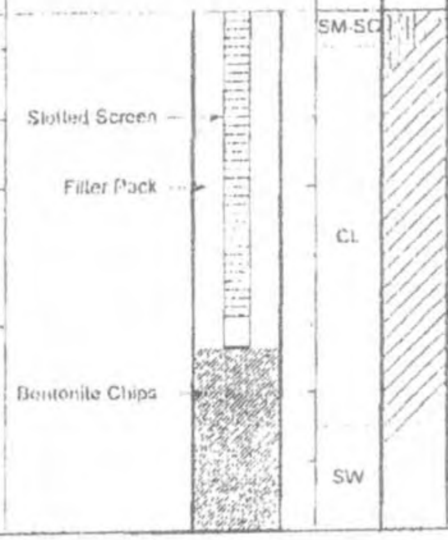
Depth (feet)	Samples (Recovery ft)	Well Construction	USCS Log	Color	Sample Description and Drilling Remarks
					ASPHALT AND BASE ROCK
		Blank Casing; Grout Seal	SW	10YR 5/4; 5GY 5/1	WELL GRADED SAND (SW) YELLOWISH BROWN OVERALL, ~20% GRAVEL TO ½-INCH, ~10-15% COARSE-GRAINED SAND, ~60% MEDIUM-GRAINED SAND, MOIST TO DRY, NO ODOR. 1 FT. COLOR CHANGES TO GREENISH GRAY, POSSIBLE SLIGHT HYDROCARBON ODOR
5		Bentonite Seal	CL	2.5Y N2/0; 5Y N4/0; 5Y N2/0; 5GY 5/1; 5GY 5/1; 10YR 6/2	CLAY (CL) BLACK, MEDIUM STIFF (PP~2.5 TSF), MEDIUM PLASTICITY, DRY, NO ODOR, ONE BRICK FRAGMENT. 3 FT. COLOR GRADES TO DARK GRAY AND BLACK, WITH SCATTERED GREENISH GRAY SPECKS, ABUNDANT ROOTS. 4 FT. COLOR GRADES TO GREENISH GRAY, WITH SCATTERED WHITE AND BLACK
	3.8	Slotted Screen	SM	2.5Y N2/0; 5GY 4/1; 10YR 8/2; 10YR 4/6	SILTY SAND (SM) DARK GREENISH GRAY WITH SPECKS OF WHITE AND DARK YELLOWISH BROWN, ~80% FINE-GRAINED SAND, ~20% SILT, DRY TO MOIST, NO ODOR
10			CL	5Y 7/1; 2.5Y 6/2; 2.5Y 5/4; 10YR 3/2	CLAY (CL) LIGHT GRAY OVERALL, MEDIUM STIFF (PP~2 TSF), MEDIUM PLASTICITY, MOIST TO DRY, NO ODOR. 10 FT. WATER IN CRACKS IN CLAY. 12 FT. COLOR CHANGES TO LIGHT BROWNISH GRAY, LIGHT OLIVE BROWN, WITH SCATTERED VERY DARK GRAYISH BROWN. STIFFNESS INCREASES TO PP~3 TSF
	3.9	Filter Pack	SP	10YR 4/2	POORLY GRADED SAND (SP) DARK GRAYISH BROWN, ~90% FINE-GRAINED SAND, ~10% SILT, WET, NO ODOR. ONE CLAY LAYER IS BROWNISH YELLOW, STIFF, MEDIUM PLASTICITY
15			SM SC	10YR 7/2; 10YR 3/4	SILTY SAND TO CLAYEY SAND (SM-SC) LIGHT GRAY OVERALL WITH DARK YELLOWISH BROWN SPECKS, ~50-60% FINE-GRAINED SAND, ~50-40% SILT OR CLAY, LOW DENSITY, WET, NO ODOR

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name: Owens-Brockway Glass Containers Project Number: 950007.30 Boring/Well Name: MW-20

Samples: Type & No.	Samples: Recovery (Feet)	Samples: Penetr. Resist. (Blows/ft)	Drill Depth (Feet)	Well Construction	USCS Log	Lithology	Color	Sample Description and Drilling Remarks
	4.0				SM-SC			
				Slotted Screen	CL		10YR 8/3	CLAY (CL), PALE BROWN, LIGHT GRAY, YELLOWISH BROWN STREAKS, MEDIUM STIFF (PP~2.5 TSF), MEDIUM PLASTICITY, MOIST
			20	Filter Pack			10YR 7/1	
							10YR 5/2	
	5.0			Bentonite Chips				
			25		SW		10YR 5/2	WELL GRADED SAND (SW), GRAYISH BROWN OVERALL, ~10% GRAVEL TO ½-INCH, ~25% COARSE-GRAINED SAND, ~10-20% MEDIUM-GRAINED SAND, ~50% FINE-GRAINED SAND, WET



NOTES
1. ALL CONTACTS ARE APPROXIMATE
2. VERTICAL SCALE IS 1-INCH = 2.5 FEET
3. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93
4. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
5. BGS: BELOW GROUND SURFACE
6. TOC = TOP OF CASING
7. AMSL = ABOVE MEAN SEA LEVEL

BORING NO.: B-1

PROJECT NAME: Owens-Illinois

DATE DRILLED: 7/10/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	TVH ppm	Oil & Grease ppm		COMMENTS
0			SILTY SAND mottled brown, medium grained strong product odor, free product, very moist	SM					Angle drilled Samples pushed
5	1-1					830	470		
	1-2		CLAYEY SAND, gray, fine grained, free product, wet	SC		20	40		
10	1-3		SANDY CLAY, mottled brown, 25% sand, free product	CL		380	20		
			Bottom of Boring = 11.5 feet						
15									
20									
25									
30									
35									

EXCELTECH

BORING NO.: B-2

PROJECT NAME: Owens-Illinois

DATE DRILLED: 7/10/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	TVH mg/kg	Oil & Grease mg/kg		
0			SILTY SANDY CLAY, blue gray, stiff, moist product odor	CL	10				
5	2-1		SILTY SAND, Brown to gray, fine grained strong odor, free product, medium dense	SM	29	1500	3600		
10	2-2		SANDY CLAY, mottled brown, 30% sand, strong odor, free product, very moist	CL	19	1700	30		
15	2-3				20	160	40		
			Bottom of Boring = 16 feet						
20									
25									
30									
35									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-3

DATE DRILLED: 7/10/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	TVH mg/kg	Oil & Grease mg/kg		
0			SILTY SANDY CLAY, blue gray, 30-40% sand, strong product odor, moist	CL					
	3-1				17	1800	1100		
5	3-2				10	1600	440		
		▽							
10	3-3		SILTY SAND, black, medium grained, dense very strong product odor, wet	SM	36	18000	8700		
15	3-4				23	1300	1100		
20	3-5		SAND and SILTY GRAVEL, brown, coarse, weak product odor, very dense	SM/GM	46				
25	3-6		SILTY SANDY CLAY, brown, 10-15% sand, slight product odor, moist	CL	20				
			Bottom of Boring = 25.5 feet						
30									
35									

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-4

DATE DRILLED: 7/23/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	TVH mg/kg	Oil & Grease mg/kg		Comments
0			SILTY SANDY CLAY, blue-gray, 25-30% sand very strong fuel odor, stiff	CL					Well MW-9 installed in Boring B-4
	4-1				14				
5	4-2				12	640	210		
10	4-3		SILTY SAND, blue gray, medium grained strong product odor, medium dense, moist	SM	23				
15	4-4				11	8.8	30		
20	4-5		SANDY CLAY, brown, 20-25% sand, strong fuel odor, very stiff, wet	CL	21				
25	4-6				20				
			Bottom of Boring = 25.5 feet						
30									
35									
40									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-5

DATE DRILLED: 7/23/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease		
0			SANDY CLAY, black to gray, 20-30% sand strong product odor, very stiff, moist	CL					
	5-1				14	1400	990		
5	5-2				18	1200	1800		
10	5-3		CLAYEY SAND, blue gray, 20% clay, strong product odor, loose, moist	SC	7	930	210		
			Bottom of Boring = 10.5 feet						
15									
20									
25									
30									
35									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-6

DATE DRILLED: 7/23/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			CONCRETE						
	6-1		GRAVELLY SAND, dark brown, fill	SP		12	1500		
5	6-2		SANDY CLAY, gray to black, 30% sand stiff to very stiff, strong product odor, free product	CL	25	49	1400		
10	6-3				13				
		∇							
15	6-4				27				
			CLAYEY SILTY SAND to SILTY CLAYEY SAND, loose, strong product odor, wet	SM/SC					
20	6-5				7	180	710		
25	6-6		GRAVELLY SAND to SANDY GRAVEL, brown, very dense, strong product odor, wet	SP/GM	50				
			Bottom of Boring = 26.5 feet						
30									
35									
40									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-7

DATE DRILLED: 7/23/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0	7-1		SANDY GRAVEL, Brown, damp, fill	GM					
5	7-2		SANDY CLAY, Gray black, 15% sand, very stiff, slight product odor, moist	CL	18	18	1000		
10	7-3				17				
15	7-4		SAND, blue, medium grained, dense, free product -becomes wet	SP	48	20000	18000		
20	7-5		CLAYEY SILTY SAND, brown, medium dense, strong product odor	SM	12				
25	7-6		-contains silt interbeds, strong product odor		17	38	90		
30			Bottom of Boring = 26.5 feet						
35									
40									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-8

DATE DRILLED: 7/24/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			SANDY GRAVEL, green, fill	GW					
	8-1		SANDY CLAY, gray to black, 20% sand, moderate to strong product odor, stiff to very stiff, very moist	CL	10				
5	8-2				18	690	1400		
10	8-3		-free product		19				
		▽							
15	8-4		GRAVELLY SAND, blue gray, medium grained free product, dense, moist		49	540	180		
20	8-5				16				
			SILTY SAND, blue gray, fine grained, rare gravel, strong product odor, medium dense						
25	8-6				17	3900	5800		
			Bottom of Boring = 26.5 feet						
30									
35									

EXCELTECH

BORING NO.: B-9

PROJECT NAME: Owens-Illinois

DATE DRILLED: 7/24/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			PAVEMENT SECTION						
	9-1		GRAVELLY SAND, black, medium grained, weak product odor, dense, moist, contains fill	SW	49	1000	2300		
5	9-2		SANDY CLAY, black, 20% sand, strong product odor, very stiff	CL	17				
10	9-3				34	400	380		
15	9-4		SILTY SAND, blue gray, strong product odor, dense, moist	SM/SP	41	310	720		
20	9-5		SANDY CLAY, brown, 10-20% sand, product odor, very stiff, moist	CL	34				
25	9-6				21				
			Bottom of Boring = 26.5 feet						
30									
35									
40									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-10

DATE DRILLED: 7/24/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			PAVEMENT SECTION						
	10-1		SANDY GRAVEL to GRAVELLY SAND, black contains fill	GW/SW	24				
5	10-2		SANDY SILTY CLAY, black to gray, 10-20% sand, slight product odor, very stiff to stiff, moist	CL	24				
10	10-3				8	3.2	520		
15	10-4	▽	GRAVELLY SAND, blue to gray, free product dense, very moist	SW	42				
20	10-5		SANDY CLAY, brown gray, 10-20% sand, strong product odor, stiff, moist to wet	CL	11				
25	10-6		SANDY GRAVEL, brown, 30% sand, product odor, moist	GW	30				
30			Bottom of Boring = 26.5 feet						
35									
40									

EXCELTECH

BORING NO.: B-12

PROJECT NAME: Owens-Illinois

DATE DRILLED: 7/23/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			PAVEMENT SECTION						
	12-1		SILTY SAND, dark brown, contains minor gravel, weak product odor, medium dense	SM	21				
5	12-2		SANDY CLAY, gray to glack, 30% sand, strong product odor, very stiff, moist	CL	21	130	360		
10	12-3	▽			17				
15	12-4		SILTY SAND, blue, strong product odor medium dense	SM	24	130	310		
20	12-5		SILTY CLAY, brown gray, weak product odor stiff, moist	CL	11	0.23	90		
25	12-6		SANDY GRAVEL, brown, 20-30% sand, very dense, wet	GW	37				
			Bottom of Boring = 26.5 feet						
30									
35									
40									

EXCELTECH

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-13

DATE DRILLED: 7/23/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			PAVEMENT SECTION						
	13-1		SILTY SAND, black, rare gravel, weak product odor, loose, moist, contains fill	SM	12				
5	13-2		SANDY CLAY, gray to black, 20% sand, stiff to very stiff moist	CL	24				
10	13-3				10	580	2100		
		▽							
15	13-4		SILTY SAND, blue gray, rare gravel, free product, dense, wet	SM	43				
20	13-5		GRAVELLY SANDY CLAY, brown, 3% gravel weak product odor, very stiff, very moist	CL	26				
25	13-6				20	47	200		
			Bottom of Boring = 26.5 feet						
30									
35									
40									

EXCELTECH

BORING NO.: B-14

PROJECT NAME: Owens-Illinois

DATE DRILLED: 7/24/86

PROJECT NUMBER: 1467G

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0			PAVEMENT SECTION						
	14-1		GRAVELLY SAND, green, contains fill	SP					
			SANDY CLAY, black, 30% sand, weak product odor, very stiff, moist	CL	14				
5	14-2				24	180	200		
			SANDY CLAY, gray, 20% sand, weak product odor, very stiff, moist	CL					
10	14-3				17				
15	14-4		SILTY SAND, blue gray 15-20% sand, weak product odor, very stiff, moist	SM	21	110	20		
20	14-5		SANDY CLAY, brown, 15-20% sand, weak product odor, very stiff, moist	CL	24				
25	14-6		GRAVELLY SAND to SANDY GRAVEL, brown very dense, wet	SW/GW	75	63	320		
			Bottom of Boring = 26.5 feet						
30									
35									
40									

PROJECT NAME: Owens-Illinois

PROJECT NUMBER: 1467G

BORING NO.: B-15

DATE DRILLED: 7/25/86

LOGGED BY: BM

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	VH mg/kg	Oil & Grease mg/kg		
0	15-1		SAND AND GRAVEL FILL	SP/GW	13	51	390		
5	15-2		SANDY CLAY, gray, 20-40% sand, product odor, firm to hard	CL	7				
10	15-3		-free product		7	2300	13000		
15	15-4				40	250	1300		
20	15-5		CLAYEY SAND, black, strong product odor, saturated with product, medium dense	SC	11	4200	11000		
25	15-6		CLAYEY SANDY GRAVEL, brown, free product wet	GC	35	40	90		
			Bottom of Boring = 26.5 feet						
30									
35									
40									

EXCELTECH

BORING NO.: B-16

PROJECT NAME: Owens-Illinois

DATE DRILLED: 10/22/86

PROJECT NUMBER: 1467G

LOGGED BY: CMP

EXPLORATORY BORING LOG

Depth, ft.	Sample No.	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs				
			PAVEMENT SECTION						
0			SILTY CLAY, black, moderate to high plasticity, strong product odor, may contain fill, stiff, damp	CL					
5	16-1		-disseminated gravel <5%		10				
			-color change to blue, strong product odor						
10	16-2		SILTY CLAY, blue gray, sand <5%, moderate to high plasticity, rootholes, burrows, stiff, damp	CL	14				
		∇	nearly saturated						
15	16-3		CLAYEY SAND to SANDY CLAY, gray, sand 45-55%, clay 45-55% as matrix, disseminated plant framents, rare gravel, strong product odor, medium dense to very stiff, wet	SC/CL	25				
			Bottom of Boring = 15 feet						

EXCELTECH

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: **Fruitvale Avenue, Oakland, CA**		Boring/Well Name	**KB-1**
DRILLING COMPANY: **Precision Sampling, Inc.**	DRILLER: **S. Novarro**	Project Name	**Owens Brockway**
DRILLING METHOD(S): **Percussion - XD-1 (Direct Push)**	DRILL BIT(S) SIZE: **3.6 inch**	Project Number	**950007.20**
ISOLATION CASING: **n/a**	FROM **n/a** TO **n/a** FT	ELEVATION AND DATUM: **n/a**	TOTAL DEPTH: **28 ft. BGS**
BLANK CASING: **1-in. PVC (temporary)**	FROM **0** TO **18** FT	DATE STARTED: **1/27/99**	DATE COMPLETED: **1/27/99**
SLOTTED CASING: **1-in. PVC 0.010-in. (temporary)**	FROM **18** TO **28** FT	STATIC WATER ELEVATION: **16.25 ft. BGS (1/27/99)**	
SIZE AND TYPE OF FILTER PACK: **n/a**	FROM **n/a** TO **n/a** FT	LOGGED BY: **M. McLeod**	
SEAL: **n/a**	FROM **n/a** TO **n/a** FT	SAMPLING METHODS: **Continuous**	WELL COMPLETION: ☐ SURFACE HOUSING
GROUT: **Bentonite Cement**	FROM **0** TO **28** FT		☐ STAND PIPE ____ FT

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
								0 - 1 FT. ASPHALT AND BASE ROCK, NOT SAMPLED
	2.0						10YR 5/4-5/6	SANDY SILT WITH GRAVEL (ML) YELLOWISH BROWN, 5-10% GRAVEL, ~25%-40% FINE-GRAINED SAND TO COARSE-GRAINED SAND, UP TO ~60% SILT, DENSE, DRY, NO ODOR, NO STAINS
				OVM = 0 PPM	ML			
	1.0		5					
	2.0						10YR 2/1	CLAY (CL) BLACK OVERALL, SCATTERED COARSE-GRAINED SAND, MEDIUM STIFF TO STIFF (PP = 2.0 TSF), MEDIUM PLASTICITY, DRY, NO ODOR, NO STAINS
				OVM = 0 PPM	CL			
			10					
	3.0						2.5Y 6/3-6/4	GRADES TO CLAY TO SILTY CLAY (CL) LIGHT YELLOWISH BROWN OVERALL, SOFT (PP = 1 TSF), MEDIUM TO LOW PLASTICITY, DRY TO MOIST, NO ODOR, NO STAINS
				OVM = 0 PPM				
	3.0				CL			
			15				2.5Y 6/3	15 FT. COLOR GRADES TO MOTTLED LIGHT YELLOWISH BROWN AND WHITE
				▼			10YR 8/1	

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name Owens Brockway **Project Number** 950007.20 **Boring/Well Name** KB-1

Samples: Type & No	Samples: Recovery (Feet)	Samples: Penetr. Resist. Blows/6"	Drill Depth (Feet)	Well Construction	USCS Log	Lithology	Color	Sample Description and Drilling Remarks
	3.0				CL			
				OVM = 0 PPM	SC		5Y 6/2	GRADES TO **CLAYEY SAND (SC)** LIGHT OLIVE GRAY, ~60% FINE-GRAINED SAND, ~40% SILT AND CLAY, VERY STIFF (PP = 4.5 TSF), LOW PLASTICITY, MOIST TO WET, NO ODOR, NO STAINS
			20					
	1.5							**SAND WITH SILT (SM)** LIGHT YELLOWISH BROWN OVERALL, ~90% FINE-GRAINED SAND, ~10% SILT, MOIST TO WET, NO ODOR, NO STAINS
				OVM = 0 PPM			2.5Y 6/3	22 - 25 FT. DARK YELLOWISH BROWN (10YR 4/6) STREAKING; SCATTERED THIN LAYERS OF POORLY GRADED SAND (SP)
	2.0				SM			
			25					
	3.0				CL		10YR 5/4	**CLAY (CL)** MOTTLED YELLOWISH BROWN AND LIGHT GRAY, SOFT TO MEDIUM STIFF (PP = 1-1.5 TSF), MEDIUM PLASTICITY, MOIST
							10YR 7/2	

28 FT. TERMINATE BORING. INSTALL TEMPORARY 1-INCH PVC CASING WITH 0.010-INCH SLOTTED SCREEN FROM 18 TO 28 FT. AND COLLECT RECONNAISSANCE GROUNDWATER SAMPLE ON 1/27/99.

NOTES

1. ALL CONTACTS ARE APPROXIMATE
2. VERTICAL SCALE IS 1-INCH = 2.5 FEET
3. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93
4. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
5. BGS = BELOW GROUND SURFACE
6. OVM = ORGANIC VAPOR METER; READINGS OF HEADSPACE OBTAINED FROM SOIL PLACED IN AIRTIGHT PLASTIC BAG
7. PPM = PARTS PER MILLION
8. PP = POCKET PENETROMETER; TSF=TONS PER SQUARE FOOT
9. FIRST ENCOUNTERED WATER DEPTH: APPROXIMATELY 18 FEET BGS
10. FINAL GROUNDWATER DEPTH: 16.25 FEET BGS

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Alameda Avenue at Fruitvale Ave., Oakland, CA				Boring/Well Name: KB-2
DRILLING COMPANY: Precision Sampling, Inc.	DRILLER: S. Novarro			Project Name: Owens Brockway
DRILLING METHOD(S): Percussion - XD-1 (Direct Push)	DRILL BIT(S) SIZE: 3.5 inch			Project Number: 950007.20
ISOLATION CASING: n/a	FROM n/a	TO n/a	FT	ELEVATION AND DATUM: n/a; TOTAL DEPTH: 19 ft. BGS
BLANK CASING: 1-in. PVC (temporary)	FROM 0	TO 14	FT	DATE STARTED: 1/26/99; DATE COMPLETED: 1/26/99
SLOTTED CASING: 1-in. PVC 0.010-in. (temporary)	FROM 14	TO 19	FT	STATIC WATER ELEVATION: 15.4 ft. BGS (1/27/99)
SIZE AND TYPE OF FILTER PACK: n/a	FROM n/a	TO n/a	FT	LOGGED BY: M. McLeod
SEAL: n/a	FROM n/a	TO n/a	FT	SAMPLING METHODS: Continuous; WELL COMPLETION: ☐ SURFACE HOUSING
GROUT: Bentonite Cement	FROM 0	TO 28	FT	☐ STAND PIPE ___ FT

Samples: Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	Well Construction	USCS Log	Lithology	Color	Sample Description and Drilling Remarks
								0 - 1 FT. ASPHALT AND BASE ROCK, NOT SAMPLED
	2.4				ML		7.5YR 4/4	SANDY SILT WITH GRAVEL (ML) DARK BROWN OVERALL WITH MULTICOLORED GRAINS, 5-10% GRAVEL, ~15% COARSE-GRAINED SAND, UP TO ~85% SILT, VERY DENSE, MOIST, NO ODOR, NO STAINS
	0.5							
			5					5 FT. SHORT RUN DUE TO BLOCKAGE OF TUBE
	1.0							
								7 - 10 FT. NOTE LOW RECOVERY
	1.0						2.5Y 7/3 2/0 5Y 8/2	CLAYEY SILT TO SILT (ML) MOTTLED BLACK AND PALE YELLOW WITH WHITE SPECKS, VERY STIFF, LOW PLASTICITY, DRY, NO ODOR, NO STAINS
			10	OVM = 0 PPM				SCATTERED FINE WOOD (?) FRAGMENTS, SCATTERED WHITE ZONES (0.1 FT. DIAMETER)
	3.0				ML		2.5Y 7/2	11 FT. COLOR GRADES TO LIGHT GRAY OVERALL
				OVM = 0 PPM				
	3.0		15	▼	CL		2.5Y 7/0	GRADES TO CLAY TO SANDY CLAY (CL) LIGHT GRAY OVERALL, SOFT TO MEDIUM STIFF (PP = 1.5 TSF), MEDIUM PLASTICITY, NO ODOR, NO STAINS
				OVM = 0 PPM ▽	SM		2.5Y 6/4	GRADES TO SAND WITH SILT (SM) LIGHT

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name: Owens Brockway | Project Number: 950007.20 | Boring/Well Name: KB-2

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	2.5				SM		2.5Y 6/4	YELLOWISH BROWN OVERALL, ~90% FINE-GRAINED SAND, ~10% SILT, LOOSE, NO PLASTICITY, WET, NO ODOR, NO STAINS

19.0 FT. TERMINATE BORING. INSTALL TEMPORARY 1-INCH PVC CASING WITH 0.010-INCH SLOTTED SCREEN FROM 14 TO 19 FT. AND COLLECT RECONNAISSANCE GROUNDWATER SAMPLE. SAMPLE COLLECTED AND BORING GROUTED 1/27/99.

NOTES

1. ALL CONTACTS ARE APPROXIMATE
2. VERTICAL SCALE IS 1-INCH = 2.5 FEET
3. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93
4. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
5. BGS = BELOW GROUND SURFACE
6. OVM = ORGANIC VAPOR METER; READINGS OF HEADSPACE OBTAINED FROM SOIL PLACED IN AIRTIGHT PLASTIC BAG
7. PPM = PARTS PER MILLION
8. PP = POCKET PENETROMETER; TSF=TONS PER SQUARE FOOT
9. FIRST ENCOUNTERED WATER DEPTH: APPROXIMATELY 17 FEET BGS
10. FINAL GROUNDWATER DEPTH: 15.4 FEET BGS (1/27/99)

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Alameda Avenue - North side of Sausal Creek, Oakland, CA				Boring/Well Name	KB-3
DRILLING COMPANY: Precision Sampling, Inc.	DRILLER: S. Novarro			Project Name	Owens Brockway
DRILLING METHOD(S): Percussion - XD-1 (Direct Push)	DRILL BIT(S) SIZE: 3.5 inch			Project Number	950007.20
ISOLATION CASING: n/a	FROM n/a	TO n/a	FT	ELEVATION AND DATUM: n/a	TOTAL DEPTH: 19 ft. BGS
BLANK CASING: 1-in. PVC (temporary)	FROM 0	TO 14	FT	DATE STARTED: 1/26/99	DATE COMPLETED: 1/26/99
SLOTTED CASING: 1-in. PVC 0.010-in. (temporary)	FROM 14	TO 19	FT	STATIC WATER ELEVATION: Appx. 12 ft. BGS (1/27/99)	
SIZE AND TYPE OF FILTER PACK: n/a	FROM n/a	TO n/a	FT	LOGGED BY: M. McLeod	
SEAL: n/a	FROM n/a	TO n/a	FT	SAMPLING METHODS: Continuous	WELL COMPLETION: ☐ SURFACE HOUSING
GROUT: Bentonite Cement	FROM 0	TO 28	FT		☐ STAND PIPE ____ FT

SAMPLES: Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
								0 - 1 FT. ASPHALT AND BASE ROCK, NOT SAMPLED
	1.0				CL		7.5YR 4/6	SANDY CLAY WITH GRAVEL (CL) STRONG BROWN OVERALL, 5-10% ANGULAR GRAVEL, ~25-30% COARSE-GRAINED SAND, ~60-70% CLAY, VERY STIFF, DRY, NO ODOR, NO STAINS
				OVM = 0 PPM				
	2.0		5				10YR 4/3	SANDY SILT (ML) BROWN OVERALL, 5-10% SCATTERED COARSE-GRAINED SAND, ~20% FINE-GRAINED SAND, ~80% SILT, DRY, NO ODOR, NO STAINS
					ML		10YR 5/4	7 FT. COLOR GRADES TO YELLOWISH BROWN, TRACE SCATTERED GRAVEL, DENSITY DECREASES
	2.0							9.5 FT. COLOR GRADES TO PALE YELLOW
			10				2.5Y 7/3	SILTY CLAY TO CLAY (CL) PALE YELLOW OVERALL WITH SCATTERED, FINE BLACK AND WHITE ZONES, VERY STIFF (PP > 4.5 TSF), LOW TO MEDIUM PLASTICITY, NO ODOR, NO STAINS
	2.1			▼			2.5Y 7/4	
					CL			
	2.5		15					
				▽	CL		5Y 7/2-6/2	GRADES TO SANDY CLAY (CL) MOTTLED LIGHT GRAY AND WHITE, MEDIUM STIFF (PP =~ 1.5 TSF), MEDIUM PLASTICITY, NO ODOR, NO STAINS
					SM		5GY 5/1	SAND TO SILTY SAND (SM) GREENISH GRAY TO 18 FT. ~75% FINE-GRAINED SAND, ~25% SILT, LOW DENSITY, NO PLASTICITY, MOIST, SLIGHT

Project Name: Owens Brockway | Project Number: 950007.20 | Boring/Well Name: KB-3

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
	2.5				SM		5GY 5/1 10YR 5/4 10YR 7/1 10YR 2/2	HYDROCARBON ODOR AT 18 FT. 18 FT. COLOR CHANGES TO MOTTLED YELLOWISH BROWN, LIGHT GRAY, AND VERY DARK BROWN

19.0 FT. TERMINATE BORING. INSTALL TEMPORARY 1-INCH PVC CASING WITH 0.010-INCH SLOTTED SCREEN FROM 14 TO 19 FT. AND COLLECT RECONNAISSANCE GROUNDWATER SAMPLE. SAMPLE COLLECTED AND BORING GROUTED 1/27/99.

NOTES
1. ALL CONTACTS ARE APPROXIMATE.
2. VERTICAL SCALE IS 1-INCH = 2.5 FEET
3. SOIL CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, ASTM D-2488-93
4. COLOR DESIGNATION IN ACCORDANCE WITH THE MUNSELL SOIL COLOR CHARTS (KOLLMORGEN INSTRUMENTS CORPORATION, 1990)
5. BGS = BELOW GROUND SURFACE
6. OVM = ORGANIC VAPOR METER; READINGS OF HEADSPACE OBTAINED FROM SOIL PLACED IN AIRTIGHT PLASTIC BAG
7. PPM = PARTS PER MILLION
8. PP = POCKET PENETROMETER; TSF=TONS PER SQUARE FOOT
9. FIRST ENCOUNTERED WATER DEPTH: APPROXIMATELY 17 FEET BGS
10. FINAL GROUNDWATER DEPTH: APPROXIMATELY 12 FEET BGS (1/27/99)

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Alameda Avenue - South side of Sausal Creek, Oakland, CA				
DRILLING COMPANY: Precision Sampling, Inc.	DRILLER: S. Novarro			
DRILLING METHOD(S): Percussion - XD-1 (Direct Push)	DRILL BIT(S) SIZE: 3.5 inch			
ISOLATION CASING: n/a	FROM n/a	TO n/a	FT	
BLANK CASING: 1-in. PVC (temporary)	FROM 0	TO 14	FT	
SLOTTED CASING: 1-in. PVC 0.010-in. (temporary)	FROM 14	TO 19	FT	
SIZE AND TYPE OF FILTER PACK: n/a	FROM n/a	TO n/a	FT	
SEAL: n/a	FROM n/a	TO n/a	FT	
GROUT: Bentonite Cement	FROM 0	TO 28	FT	

Boring/Well Name	KB-4
Project Name	Owens Brockway
Project Number	950007.20
ELEVATION AND DATUM: n/a	TOTAL DEPTH: 19 ft. BGS
DATE STARTED: 1/26/99	DATE COMPLETED: 1/26/99
STATIC WATER ELEVATION: 12.15 ft. BGS (1/27/99)	
LOGGED BY: M. McLeod	
SAMPLING METHODS: Continuous	WELL COMPLETION: ☐ SURFACE HOUSING ☐ STAND PIPE ____ FT

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
								0 - 1 FT. ASPHALT AND BASE ROCK, NOT SAMPLED
	2.0			OVM = 0 PPM	SW		7.5YR 5/4; 10YR 5/3	WELL GRADED SILTY SAND (SW) BROWN OVERALL, 5-10% GRAVEL, ~50% MEDIUM-GRAINED SAND, ~40% SILT, DENSE, DRY, NO ODOR, NO STAINS
	3.0		5	OVM = 0 PPM	CL		2.5Y N2/0	GRADES TO CLAY (CL) BLACK, VERY STIFF (PP = 4.5 TSF), MEDIUM PLASTICITY, DRY, NO ODOR, NO STAINS, ABUNDANT ROOTS, TRACE SCATTERED COARSE-GRAINED SAND
	2.5			OVM = 0 PPM	ML		10YR 7/2; 10YR 6/6	SILT TO SANDY SILT (ML) LIGHT GRAY TO BROWNISH YELLOW WITH SCATTTERED DARK BROWN (7.5YR 3/2) SPECKS, ~10-15% FINE-GRAINED SAND, ~85% SILT, LOW DENSITY, NO PLASTICITY, DRY, NO ODOR, NO STAINS
	3.0		10	▼	CL		2.5Y 7/2	CLAY (CL) LIGHT GRAY OVERALL, VERY STIFF TO STIFF (PP = 3.5 TSF), LOW PLASTICITY, NO ODOR TO 12.8
								12.8 FT. SHARP COLOR CHANGE TO DARK GREENISH GRAY, STRONG HYDROCARBON ODOR
	2.6		15	OVM = 117 PPM	SC		5G 4/1	CLAYEY SAND (SC) DARK GREENISH GRAY, ~50-60% FINE-GRAINED SAND, MEDIUM PLASTICITY, MOIST, STRONG HYDROCARBON ODOR
				▽	SM		10YR 5/6	GRADES TO SILTY SAND (SM) YELLOWISH BROWN OVERALL, ~70%-80% FINE-GRAINED SAND, ~20-30%

F-40.1
(6-87) (3-88) (8-90)

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION: Alameda Avenue, Oakland, CA			
DRILLING COMPANY: Precision Sampling, Inc.	DRILLER: S. Novarro		
DRILLING METHOD(S): Percussion - XD-1 (Direct Push)	DRILL BIT(S) SIZE: 3.5 inch		
ISOLATION CASING: n/a	FROM n/a	TO n/a	FT
BLANK CASING: 1-in. PVC (temporary)	FROM 0	TO 14	FT
SLOTTED CASING: 1-in. PVC 0.010-in. (temporary)	FROM 14	TO 19	FT
SIZE AND TYPE OF FILTER PACK: n/a	FROM n/a	TO n/a	FT
SEAL: n/a	FROM n/a	TO n/a	FT
GROUT: Bentonite Cement	FROM 0	TO 28	FT

Boring/Well Name	KB-5
Project Name	Owens Brockway
Project Number	950007.20
ELEVATION AND DATUM: n/a	TOTAL DEPTH: 19 ft. BGS
DATE STARTED: 1/26/99	DATE COMPLETED: 1/26/99
STATIC WATER ELEVATION: 12.3 ft. BGS (1/27/99)	
LOGGED BY: M. McLeod	
SAMPLING METHODS: Continuous	WELL COMPLETION: ☐ SURFACE HOUSING ☐ STAND PIPE ___ FT

SAMPLES Type & No.	Recovery (Feet)	Penetr. Resist. Blows/6"	Drill Depth (Feet)	WELL CONSTRUCTION	USCS Log	Lithology	Color	SAMPLE DESCRIPTION and DRILLING REMARKS
								0 - 1 FT. ASPHALT AND BASE ROCK, NOT SAMPLED
	2.0				ML		10YR 4/4	SANDY SILT WITH GRAVEL (ML) DARK YELLOWISH BROWN OVERALL, ~15% GRAVEL ~5% COARSE-GRAINED SAND, ~25% FINE-GRAINED SAND, ~55% SILT, DENSE, NO PLASTICITY, NO ODOR, NO STAINS
							2.5Y N2/0	CLAY (CL) BLACK, VERY STIFF (PP = 3.5 TSF) LOW TO MEDIUM PLASTICITY, DRY, NO ODOR, SCATTERED ROOTS
	2.5		5		CL			
							2.5Y 6/3	CLAY TO SILTY CLAY (CL) LIGHT YELLOWISH BROWN OVERALL WITH WHITE, BLACK, AND YELLOWISH BROWN SPECKS, MEDIUM STIFF (PP = 2.0 TSF), MEDIUM TO LOW PLASTICITY, DRY, NO ODOR, NO STAINS
	2.2				CL		2.5Y N2/0	8 FT. STIFFNESS DECREASES TO PP = 1.5 TSF, PLASTICITY DECREASES TO LOW
				OVM = 0 PPM			10YR 8/1	
			10				10YR 5/6	
	3.0				CL		2.5Y 8/2	SANDY CLAY (CL) WHITE OVERALL, ~20% FINE-GRAINED SAND, SOFT (PP = 1.0 TSF), MEDIUM PLASTICITY, MOIST, NO ODOR
				OVM = 0 PPM ▼	SM		5Y 6/2	GRADES TO SILTY SAND (SM) LIGHT OLIVE GRAY, ~80% FINE-GRAINED SAND, ~20% SILT, LOOSE, LOW PLASTICITY, MOIST, NO ODOR TO 13 FT. 12.5 FT. COLOR GRADES TO GREENISH GRAY, LIGHT HYDROCARBON ODOR
	3.0			▽			5G 5/1	GRADES TO POORLY GRADED SAND (SP) GREENISH GRAY, ~90-95% FINE-GRAINED SAND, ~10-5% SILT, WET, LIGHT HYDROCARBON ODOR TO 14 FT.
			15	OVM = 0 PPM	SP			

F-40.1
(6-87) (3-88) (8-90)

APPENDIX C

Table C1

Cost Estimate Details for Current Action (MNA with absorbent socks)

Technology Name	Calendar Year 1	Calendar Year 2	Calendar Year 3	Calendar Year 4	Calendar Year 5	Calendar Year6	Calendar Year 7	Calendar Year 8	Calendar Year 9	Calendar Year 10	Calendar Year 11	Calendar Year 12	Calendar Year 13	Calendar Year 14	Calendar Year 15
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**24-Feb**
CAPITAL COST															
Absorbent Socks ($120 each)	$600	$600	$600	$600	$630	$630	$630	$630	$630	$662	$662	$662	$662	$662	$695
ISCO chemical															
ISCO injection															
Excavation															
O&M															
Long Term Monitoring (30 Years assuming 5% cost increase ev	$4,400	$4,400	$4,400	$4,400	$4,400	$4,620	$4,620	$4,620	$4,620	$4,851	$4,851	$4,851	$4,851	$4,851	$5,094
Operate and Maintain	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Annual Monitoring Report	$1,500	$1,500	$1,500	$1,500	$1,500	$1,575	$1,575	$1,575	$1,575	$1,654	$1,654	$1,654	$1,654	$1,654	$1,736
5 Year Reviews (200 hrs x$100/hr)					$20,000					$21,000					$22,050
Close Out Report															
Sub-Total (With Markups)	**$6,500**	**$6,500**	**$6,500**	**$6,500**	**$26,530**	**$6,825**	**$6,825**	**$6,825**	**$6,825**	**$28,166**	**$7,166**	**$7,166**	**$7,166**	**$7,166**	**$29,575**
Contingency (20%)	$1,300	$1,300	$1,300	$1,300	$5,306	$1,365	$1,365	$1,365	$1,365	$5,633	$1,433	$1,433	$1,433	$1,433	$5,915
Total Cost (With Contingency and Markups)	$7,800	$7,800	$7,800	$7,800	$31,836	$8,190	$8,190	$8,190	$8,190	$33,799	$8,599	$8,599	$8,599	$8,599	$35,490

Technology Name	Calendar Year 16	Calendar Year 17	Calendar Year 18	Calendar Year 19	Calendar Year 20	Calendar Year 21	Calendar Year 22	Calendar Year 23	Calendar Year 24	Calendar Year 25	Calendar Year 26	Calendar Year 27	Calendar Year 28	Calendar Year 29	Calendar Year 30	Row Total
	2025	**2026**	**2027**	**2028**	**2029**	**2030**	**3031**	**2032**	**3033**	**Mar-34**	**3035**	**3036**	**2037**	**2038**	**2039**	
CAPITAL COST																
																$0
Absorbent Socks ($120 each)	$695	$695	$695	$695	$729	$729	$729	$729	$729	$766	$766	$766	$766	$766	$766	$20,572
ISCO chemical																$0
ISCO injection																$0
Excavation																$0
O&M																
Long Term Monitoring (30 Years assuming 5% cost increase ev	$5,094	$5,094	$5,094	$5,094	$5,348	$5,348	$5,348	$5,348	$5,348	$5,616	$5,616	$5,616	$5,616	$5,616	$5,616	$150,638
Operate and Maintain	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Annual Monitoring Report	$1,736	$1,736	$1,736	$1,736	$1,823	$1,823	$1,823	$1,823	$1,823	$1,914	$1,914	$1,914	$1,914	$1,914	$1,914	$51,354
5 Year Reviews (200 hrs x$100/hr)					$23,153					$24,308					$25,523	$136,033
Close Out Report															$20,000	$20,000
Sub-Total (With Markups)	**$7,525**	**$7,525**	**$7,525**	**$7,525**	**$31,053**	**$7,901**	**$7,901**	**$7,901**	**$7,901**	**$32,603**	**$8,296**	**$8,296**	**$8,296**	**$8,296**	**$53,819**	**$378,596**
Contingency (20%)	$1,505	$1,505	$1,505	$1,505	$6,211	$1,580	$1,580	$1,580	$1,580	$6,521	$1,659	$1,659	$1,659	$1,659	$10,764	$75,718
Total Cost (With Contingency and Markups)	$9,030	$9,030	$9,030	$9,030	$37,264	$9,481	$9,481	$9,481	$9,481	$39,124	$9,955	$9,955	$9,955	$9,955	$64,583	**$454,314**

Table C2
Cost Estimate Details for Alternative 3 Targeted Excavations With Current Action

Technology Name	Calendar Year 1	Calendar Year 2	Calendar Year 3	Calendar Year 4	Calendar Year 5	Calendar Year6	Calendar Year 7	Calendar Year 8	Calendar Year 9	Calendar Year 10	Calendar Year 11	Calendar Year 12	Calendar Year 13	Calendar Year 14	Calendar Year 15	Calendar Year 16	Calendar Year 17	Calendar Year 18	Calendar Year 19
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	24-Feb	2025	2026	2027	2028
CAPITAL COST																			
Project Management, reporting, regulatory coordination	$50,000	$50,000																	
Excavation A 1600 yds	$240,000																		
Excavation B 2700 yds		$405,000																	
Excavation C 500 yds		$75,000																	
Excavation D 600 yds	$90,000																		
ORC total	$50,000	$50,000																	
O&M																			
Long Term Monitoring (30 Years assuming 5% cost increase every 5 year	$4,400	$4,400	$4,400	$4,400	$4,400	$4,620	$4,620	$4,620	$4,620	$3,150	$3,150	$3,150	$3,150	$3,150	$3,308	$3,308	$3,308	$3,308	$3,308
Monitoring requirements will reduce over time																			
Annual Monitoring Report	$1,500	$1,500	$1,500	$1,500	$1,500	$1,575	$1,575	$1,575	$1,575	$1,654	$1,654	$1,654	$1,654	$1,654	$1,736	$1,736	$1,736	$1,736	$1,736
5 Year Reviews (200 hrs x$100/hr)					$20,000					$21,000					$22,050				
Close Out Report																			
Sub-Total (With Markups)	**$435,900**	**$585,900**	**$5,900**	**$5,900**	**$25,900**	**$6,195**	**$6,195**	**$6,195**	**$6,195**	**$25,804**	**$4,804**	**$4,804**	**$4,804**	**$4,804**	**$27,094**	**$5,044**	**$5,044**	**$5,044**	**$5,044**
Contingency (20%)	$87,180	$117,180	$1,180	$1,180	$5,180	$1,239	$1,239	$1,239	$1,239	$5,161	$961	$961	$961	$961	$5,419	$1,009	$1,009	$1,009	$1,009
Total Cost (With Contingency and Markups)	$523,080	$703,080	$7,080	$7,080	$31,080	$7,434	$7,434	$7,434	$7,434	$30,965	$5,765	$5,765	$5,765	$5,765	$32,513	$6,053	$6,053	$6,053	$6,053

Table C2
Cost Estimate Details for Alternative 3 Targeted E

Technology Name	Calendar Year 20	Calendar Year 21	Calendar Year 22	Calendar Year 23	Calendar Year 24	Calendar Year 25	Calendar Year 26	Calendar Year 27	Calendar Year 28	Calendar Year 29	Calendar Year 30	Row Total
	2029	2030	3031	2032	3033	Mar-34	3035	3036	2037	2038	2039	
CAPITAL COST												
Project Management, reporting, regulatory coordination												
Excavation A 1600 yds												$240,000
Excavation B 2700 yds												$405,000
Excavation C 500 yds												$75,000
Excavation D 600 yds												$90,000
ORC total												$100,000
O&M												
Long Term Monitoring (30 Years assuming 5% cost increase every 5 year	$2,625	$2,625	$2,625	$2,625	$2,625	$2,756	$2,756	$2,756	$2,756	$2,756	$2,756	$102,430
Monitoring requirements will reduce over time												$0
Annual Monitoring Report	$1,823	$1,823	$1,823	$1,823	$1,823	$1,914	$1,914	$1,914	$1,914	$1,914	$1,914	$51,354
5 Year Reviews (200 hrs x$100/hr)	$23,153					$24,308					$25,523	$136,033
Close Out Report											$20,000	$20,000
Sub-Total (With Markups)	**$27,601**	**$4,448**	**$4,448**	**$4,448**	**$4,448**	**$28,978**	**$4,671**	**$4,671**	**$4,671**	**$4,671**	**$50,194**	**$1,219,817**
Contingency (20%)	$5,520	$890	$890	$890	$890	$5,796	$934	$934	$934	$934	$10,039	$263,967
Total Cost (With Contingency and Markups)	$33,121	$5,338	$5,338	$5,338	$5,338	$34,774	$5,605	$5,605	$5,605	$5,605	$60,233	**$1,483,784**

Table C3
Cost Estimate Details for Alternative 4 ISCO with Current Action

Technology Name	Calendar Year 1	Calendar Year 2	Calendar Year 3	Calendar Year 4	Calendar Year 5	Calendar Year6	Calendar Year 7	Calendar Year 8	Calendar Year 9	Calendar Year 10	Calendar Year 11	Calendar Year 12	Calendar Year 13	Calendar Year 14	Calendar Year 15	Calendar Year 16	Calendar Year 17	Calendar Year 18	Calendar Year 19	Calendar Year 20	Calendar Year 21	Calendar Year 22	Calendar Year 23	Calendar Year 24	Calendar Year 25	Calendar Year 26	Calendar Year 27	Calendar Year 28	Calendar Year 29	Calendar Year 30	Row Total
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	24-Feb	2025	2026	2027	2028	2029	2030	3031	2032	3033	Mar-34	3035	3036	2037	2038	2039	
CAPITAL COST																															
Project Management, reporting, regulatory coordination	$25,000	$25,000	$25,000	$25,000	$25,000																										
ISCO Injections 8500 feet (assumed to require 10 interations	$300,000	$300,000	$300,000	$300,000	$300,000																										$1,500,000
assuming two per year)																															$0
RegenOx Product	$300,000	$300,000	$300,000	$300,000	$300,000																										$1,500,000
																															$0
																															$0
O&M																															
Long Term Monitoring (30 Years assuming 5% cost increase every 5 years)	$4,400	$4,400	$4,400	$4,400	$4,400	$4,620	$4,620	$4,620	$4,620	$3,150	$3,150	$3,150	$3,150	$3,150	$3,308	$3,308	$3,308	$3,308	$3,308	$2,625	$2,625	$2,625	$2,625	$2,625	$2,756	$2,756	$2,756	$2,756	$2,756	$2,756	$102,430
Monitoring requirements will reduce over time																															$0
Annual Monitoring Report	$1,500	$1,500	$1,500	$1,500	$1,500	$1,575	$1,575	$1,575	$1,575	$1,654	$1,654	$1,654	$1,654	$1,654	$1,736	$1,736	$1,736	$1,736	$1,736	$1,823	$1,823	$1,823	$1,823	$1,823	$1,914	$1,914	$1,914	$1,914	$1,914	$1,914	$51,354
5 Year Reviews (200 hrs x$100/hr)					$20,000					$21,000					$22,050					$23,153					$24,308					$25,523	$136,033
Close Out Report																														$20,000	$20,000
Sub-Total (With Markups)	**$630,900**	**$630,900**	**$630,900**	**$630,900**	**$650,900**	**$6,195**	**$6,195**	**$6,195**	**$6,195**	**$25,804**	**$4,804**	**$4,804**	**$4,804**	**$4,804**	**$27,094**	**$5,044**	**$5,044**	**$5,044**	**$5,044**	**$27,601**	**$4,448**	**$4,448**	**$4,448**	**$4,448**	**$28,978**	**$4,671**	**$4,671**	**$4,671**	**$4,671**	**$50,194**	**$3,309,817**
Contingency (20%)	$126,180	$126,180	$126,180	$126,180	$130,180	$1,239	$1,239	$1,239	$1,239	$5,161	$961	$961	$961	$961	$5,419	$1,009	$1,009	$1,009	$1,009	$5,520	$890	$890	$890	$890	$5,796	$934	$934	$934	$934	$10,039	$686,967
Total Cost (With Contingency and Markups)	$757,080	$757,080	$757,080	$757,080	$781,080	$7,434	$7,434	$7,434	$7,434	$30,965	$5,765	$5,765	$5,765	$5,765	$32,513	$6,053	$6,053	$6,053	$6,053	$33,121	$5,338	$5,338	$5,338	$5,338	$34,774	$5,605	$5,605	$5,605	$5,605	$60,233	**$3,996,784**

Table C4
Cost Estimate Details for Alternative 5 Targeted Excavations with ISCO with Current Action

Technology Name	Calendar Year 1	Calendar Year 2	Calendar Year 3	Calendar Year 4	Calendar Year 5	Calendar Year6	Calendar Year 7	Calendar Year 8	Calendar Year 9	Calendar Year 10	Calendar Year 11	Calendar Year 12	Calendar Year 13	Calendar Year 14
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
CAPITAL COST														
Project Management, reporting, regulatory coordination	$50,000	$50,000												
Excavation A 1600 yds	$240,000													
Excavation B 2700 yds		$405,000												
Excavation C 500 yds		$75,000												
Excavation D 600 yds	$90,000													
ORC total	$50,000	$50,000												
Project Management, reporting, regulatory coordination	$15,000	$15,000	$15,000	$15,000	$15,000									
ISCO Injections 8500 feet (assumed to require 5 interations assuming two per year)	$150,000	$150,000	$150,000	$150,000	$150,000									
RegenOx Product	$150,000	$150,000	$150,000	$150,000	$150,000									
O&M														
Long Term Monitoring (30 Years assuming 5% cost increase every 5 years))	$4,400	$4,400	$4,400	$4,400	$4,400	$4,620	$4,620	$4,620	$4,620	$3,150	$3,150	$3,150	$3,150	$3,150
Monitoring requirements will reduce over time														
Annual Monitoring Report	$1,500	$1,500	$1,500	$1,500	$1,500	$1,575	$1,575	$1,575	$1,575	$1,654	$1,654	$1,654	$1,654	$1,654
5 Year Reviews (200 hrs x$100/hr)					$20,000					$21,000				
Close Out Report														
Sub-Total (With Markups)	**$750,900**	**$900,900**	**$320,900**	**$320,900**	**$340,900**	**$6,195**	**$6,195**	**$6,195**	**$6,195**	**$25,804**	**$4,804**	**$4,804**	**$4,804**	**$4,804**
Contingency (20%)	$150,180	$180,180	$64,180	$64,180	$68,180	$1,239	$1,239	$1,239	$1,239	$5,161	$961	$961	$961	$961
Total Cost (With Contingency and Markups)	$901,080	$1,081,080	$385,080	$385,080	$409,080	$7,434	$7,434	$7,434	$7,434	$30,965	$5,765	$5,765	$5,765	$5,765

Technology Name	Calendar Year 15	Calendar Year 16	Calendar Year 17	Calendar Year 18	Calendar Year 19	Calendar Year 20	Calendar Year 21	Calendar Year 22	Calendar Year 23	Calendar Year 24	Calendar Year 25	Calendar Year 26	Calendar Year 27
	24-Feb	2025	2026	2027	2028	2029	2030	3031	2032	3033	Mar-34	3035	3036
CAPITAL COST													
Project Management, reporting, regulatory coordination													
Excavation A 1600 yds													
Excavation B 2700 yds													
Excavation C 500 yds													
Excavation D 600 yds													
ORC total													
Project Management, reporting, regulatory coordination													
ISCO Injections 8500 feet (assumed to require 5 interations assuming two per year)													
RegenOx Product													
O&M													
Long Term Monitoring (30 Years assuming 5% cost increase every 5 years))	$3,308	$3,308	$3,308	$3,308	$3,308	$2,625	$2,625	$2,625	$2,625	$2,625	$2,756	$2,756	$2,756
Monitoring requirements will reduce over time													
Annual Monitoring Report	$1,736	$1,736	$1,736	$1,736	$1,736	$1,823	$1,823	$1,823	$1,823	$1,823	$1,914	$1,914	$1,914
5 Year Reviews (200 hrs x$100/hr)	$22,050					$23,153					$24,308		
Close Out Report													
Sub-Total (With Markups)	**$27,094**	**$5,044**	**$5,044**	**$5,044**	**$5,044**	**$27,601**	**$4,448**	**$4,448**	**$4,448**	**$4,448**	**$28,978**	**$4,671**	**$4,671**
Contingency (20%)	$5,419	$1,009	$1,009	$1,009	$1,009	$5,520	$890	$890	$890	$890	$5,796	$934	$934
Total Cost (With Contingency and Markups)	$32,513	$6,053	$6,053	$6,053	$6,053	$33,121	$5,338	$5,338	$5,338	$5,338	$34,774	$5,605	$5,605

Table C4
Cost Estimate Details for Alternative 5 Targeted Exca

Technology Name	Calendar Year 28	Calendar Year 29	Calendar Year 30	Row Total
	2037	2038	2039	
CAPITAL COST				
Project Management, reporting, regulatory coordination				
Excavation A 1600 yds				$240,000
Excavation B 2700 yds				$405,000
Excavation C 500 yds				$75,000
Excavation D 600 yds				
ORC total				
Project Management, reporting, regulatory coordination				
ISCO Injections 8500 feet (assumed to require 5 interations				$750,000
assuming two per year)				$0
RegenOx Product				
O&M				
Long Term Monitoring (30 Years assuming 5% cost increase every 5 years))	$2,756	$2,756	$2,756	$102,430
Monitoring requirements will reduce over time				$0
Annual Monitoring Report	$1,914	$1,914	$1,914	$51,354
5 Year Reviews (200 hrs x$100/hr)			$25,523	$136,033
Close Out Report			$20,000	$20,000
Sub-Total (With Markups)	**$4,671**	**$4,671**	**$50,194**	**$1,779,817**
Contingency (20%)	$934	$934	$10,039	$578,967
Total Cost (With Contingency and Markups)	$5,605	$5,605	$60,233	**$2,358,784**