

PRAFEREPORT - VOLUME II (APPENDICES)
SITE ASSESSMENT INVESTIGATION
CHEVRON-GULF REFINERY
PHILADELPHIA, PENNSYLVANIA

FEBRUARY 13, 1987

UC

Dames & Moore

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APPENDIX A

Background Data

Concord, CA May 8, 1985

SITE CONDITIONS REVIEW PHILADELPHIA REFINERY (543.710)

MR. F. M. PARKER San Francisco

Introduction

As requested, an environmental review of the Chevron-Gulf Philadelphia refinery was made to ascertain the probable extent of any subsurface contamination and to identify the general scope of work needed to delineate known problems. This review was based upon a one-day site inspection and discussions with refinery personnel. No groundwater investigations have been conducted at the refinery, therefore, no site-specific data were available for review.

The refinery has identified nearly 70 acres as inactive waste disposal sites under CERCLA, including 57 acres of leaded tank bottoms and 13 acres of landfill. These sites represent the largest potential expenditures should closure or remedial work be required. On-site closure without remedial work is estimated to range from 5 to 10 million dollars, off-site removal of waste is not economically feasible. It is recommended that a timely legal review of potential closure requirements and options be made by PM&S.

Recoverable quantities of subsurface oil are known to be present beneath three locations within the southern portion of the main plant but are not adequately delineated with the existing monitoring well network. No investigation for subsurface oil accumulations has been conducted in the remainder of the main plant or at either of the two remote tankfields. Localized accumulations of oil may be present in the uninvestigated areas but the plant history suggests that extensive accumulations are unlikely. Currently, there appears to be little opportunity for offsite or third party impacts due to subsurface oil at this location except for possible seepage to surface waters. A phased investigation of the shallow aquifer is recommended for each of the refinery properties at a total cost of 50,000 to 100,000 dollars.

Much of the refinery contains oily dirt due to small leaks or spills typical of operations at a plant of this type. This material cannot be economically removed or cleaned up. It is recommended that this material be left in-place and accepted as-is should a property transfer occur. The following report and recommendations are for your

consideration. This review was facilitated by the knowledgeable assistance of Messrs. F. L. Hannigan and R. J. Schumacher of the Philadelphia refinery.

Facility Description

General

The Philadelphia refinery consists of four separate pieces of property including the main plant, two remote tankfields, and a remote marine unloading facility. Crude oil deliveries to the refinery by ship are unloaded at the Hog Island unloading headers and are then pumped to the Darby Creek Tankfield. Crude oil is then transferred via pipeline under the Schuylkill River to the main plant for refining. Finished products are then transferred back across the river by a second set of underwater pipelines to the Schuylkill River Tankfield where they enter the Colonial Pipeline system for distribution.

Main Plant

The main plant occupies an area of approximately 350 acres along the Schuylkill River. For purposes of site evaluation, the main plant has been divided into three areas as shown figure 1. Area A, south of the Penrose Avenue Bridge, is the oldest portion of the facility dating back to the 1920's. This area, referred to as the "terminal", contains a gasoline tank truck loading rack, a petrochemicals tank truck and rail loading rack, lube oils rail loading facility, a package and grease plant, a marine loading facility, and attendant piping and tankage.

Area B, north of Penrose Bridge and south of Pennypacker Avenue, contains the petrochemical process plants, wastewater treatment system, maintenance and laydown yards, and attendant piping and tankage. Area B formerly contained the original refining units, most of which have been removed except for their foundations. The area also includes the refinery office buildings and laboratory. Two abandoned water supply wells are located adjacent to the laboratory.

Area C, north of Pennypacker Avenue, contains the primary refining units, several separators, and associated piping and tankage. The refining units were constructed during the 1940's. Area C also includes the "Ballfields" a small lot east of the process areas. From the 1940's to the 1970's this property was owned by Union Tank Car Cleaning Company and contained nearly 100 sidings where tank cars were slopped out. The property was sold to Philadelphia Electric then to Arco Oil Company which traded property with Gulf. In 1979, a backhoe was used to dig test pits to investigate site soil conditions. These pits were found to contain a wide variety of spent catalysists, had strong chemical odors, and showed evidence of leaching of a blushish unknown substance. A large mound of dirt of unknown origin also occupies a portion of this site. Currently, the "Ballfields" area is fenced and locked.

Schuylkill River Tankfield

The Schuylkill River Tankfield provides storage for refined products and access to the Colonial Pipeline distribution system. The facility contains approximately 60 above ground storage tanks, pipeline loading headers, a TEL addition facility, an unsegregated sewer system and separator, and assoicated piping (Figure 2). The facility is connected to the main plant by cathodically protected pipelines which run beneath the Schuylkill River.

The Schuylkill River tankfield is built over an old trash dump. The history of this property is not well known but reportedly was used for municipal trash disposal and incineration. The facility also contains an inactive leaded sludge disposal site and holding lagoon both identified as CERCLA (Superfund) sites to EPA Region III.

Darby Creek Tankfield

The Darby Creek Tankfield is a crude oil storage area built during the 1950's on the site of an old gravel quarry (Figure 3). The facility is comprised of 32 above ground storage tanks, attendant pumps and piping, a drainage and oil-water separator system, and underground crude oil pipelines leading to the main plant. The site is adjacent to the Tinicum Wildlife Refuge located across Darby Creek.

Three landfills are located on this property and have been identified as CERCLA (Superfund) sites to EPA Region III. Disposal site #1 contains H-F contaminated paper, metals, and other scrap. Disposal site #2 contains acid catalyst and sludge. The third disposal site contains oily sludge, heavy metals, and is associated with a storm water pond.

Hog Island

The Hog Island facility is composed of marine unloading headers for crude oil delivery. Crude oils unloaded at this site are pumped via underground lines to the Darby Creek Tankfield. No above-ground storage tanks are present but between 1 and 3 underground slop oil tanks are thought to be present.

SITE CONDITIONS

Regional Hydrogeology

The Philadelphia Refinery is located just east the Fall line, a physiographic feature separating the Piedmond and Atlantic Coastal Plain physiographic provinces (Figure 4). The Piedmont Province is underlain by solid bedrock consisting of weathered crystalline, metamorphic and igneous rocks, and by consolidated sedimentary rocks. This bedrock extends east under the Atlantic coastal plain, including the refinery, where it is overlain by a wedge unconsolidated sediments (Figure 5).

These unconsolidated sediments form a series of regional confined and semi-confined aquifers which dip gently to the east.

Groundwater recharge to these aquifers is primarily infiltration of rainfall along their outcrop areas near the Fall Line. The refinery probably lies within a regional groundwater recharge area although local site conditions, discussed below, indicate recharge to deeper aquifers is not likely. Regional groundwater discharge is by upward leakage into the Atlantic Ocean and by groundwater extraction wells. At the time of this writing, more detailed information on regional conditions was not available. This information is being obtained from State agencies and will be the subject of a separate report. A generalized regional geologic cross-section is shown on Figure 5.

Local Hydrogeology and Preliminary Assessment of Contamination

The refinery properties have not been the subject of a specific groundwater investigation, therefore, no quantitative data are available regarding groundwater conditions or quality at this site. The following discussion is based upon field observations made during a one-day visit to the plant. These observations cannot be confirmed without a hydrogeologic investigation of the site. Each of the refinery properties is discussed separately due to differences in hydrogeologic conditions.

Main Plant

The main plant borders the Schuylkill River which is confluent to the Delaware River. The main plant appears to have been constructed by placing artificial fill over a former salt marsh. Typically, these marsh deposits are composed of fairly thick, plastic, low permeability clays. Often, these clays will have peat or high organic content layers which may provide higher premeabilities. Some permeable alluvial materials, sands or gravels, may be interbedded with the marsh deposits.

The origin and composition of the fill materials at the site are not documented. Based on observations of excavations within the plant, refinery personnel report that the fill is heterogeneous. My observation was that the surficial fill was primarily coarse sand size granular material. The variability of fill materials and degree of compaction will influence groundwater and subsurface oil movements at this site. Tidal fluctuations in the Shuylkill River may affect groundwater movements and may limit the migration of free oil.

It is likely that the marsh deposits are underlain by unconsolidated sediments of the Coastal Plain to a depth of more than 100 feet. Abandoned refinery laboratory wells were reportedly drilled into these sediments to depths of about 100 feet. These sediments may be regional aquifers but are not likely to be contaminated by refinery contamination due to the probable existence of low permeability marsh deposits.

Initially, the fill materials were placed behind a wooden seawall constructed in the early 1920's. This was replaced in the 1950's by 1400 feet of concrete seawall near the oil and grease plant and by 8400 feet of tongue-and-groove steel sheet pile along the remaining waterfront (Photograph #1). This fill-and-bulkhead system has led to the development of a shallow water table which is perched on the underlying marsh deposits. This water table is encountered at depths of 5 to 7 feet and is recharged by rainfall. Discharge of these groundwaters is to the Schuylkill River. The configuration of the water table cannot be determined without a sufficient number of monitor wells but flow directions are expected to be generally towards the river.

Observations regarding contamination at this site are summarized below:

(1) A known accumulation of free oil is present in the "terminal-area" south of Penrose Bridge. Recoverable quantities of oil appear to be present near the package and grease plant and also along "B-Street." It is not known whether these accumulations are comingled or are separate. Delineation of product source(s), areal extent, thickness, and economics of oil recovery would require a site investigation. Minor seepage to the Schuylkill River is occurring through the bulkhead near the package and grease plant (Photograph #2).

The effected area appears to cover about 20 acres with oil thicknesses observed of several inches in monitor wells near the bulkhead (Figure 6, Photograph #6). Products involved may include #2-oil, jet fuel, lube oils, and perhaps gasoline. This area contains several loading facilities and underground pipeways which are common sources of leakage. Tank leaks and overfills are generally subordinate sources. Oil contaminated soil is obvious along most of the pipeways (Photographs 3, 4 & 5).

- (2) A second known accumulation of free product is present along ARCO crude oil pipelines which parallel Penrose Avenue Bridge. Information on the magnitude of the pipeline leakage or the extent of subsurface oil is sketchy. This accumulation is likely to be localized to the pipeline area due to the limited mobility of crude oils in the subsurface. A site investigation would be needed to determine the extent of this accumulation and to identify a proper recovery system. Recovery efforts could be funded by ARCO if proof exists that their pipelines are the source of this oil.
- (3) Free oil has been noted in some excavations at various locations within the remainder of the refinery, specifically near tanks #1133 and #1134, along the bulkhead near Unit #137, and within the "North Tankfield." There is no indirect evidence, such as seepage to the Schuylkill River, of extensive subsurface oil. It is likely that small, localized accumulation are present in these and other locations within the main plant.
- (4) Significant quantities of oily dirt are present throughout much of the refinery, principally along pipeways. Lessor sources of oily

dirt are separators, tank overfills, and process units. This material cannot be economically removed or cleaned-up and would have to be accepted on an as-is basis.

Schuylkill River Tankfarm

This facility is constructed on top of an old trash dump. Soil conditions are poorly known and it is uncertain whether natural soils were disturbed during site preparation for the dump. The surficial materials are primarily porous, sands and large rock fragments.

Unconfined groundwaters are likely to be present at depths of less than 20 feet. The bank of the Schuylkill River was not inspected but appeared to be reinforced by rip-rap. Groundwater levels are likely to be several feet above river level and are expected to respond to river stage. Groundwater flow is expected to be eastward toward the river although a component of flow may be directed southward toward a small tributary.

No obvious indications of subsurface oil accumulations were present at the facility. The existence of any localized oil accumulations would require a site investigation but it is nearly certain that any such problems would be limited to Company property. Oil soruces would include occasional back-up and overflow of the oil-storm water sewer system and tank overflows. Evidence of tank over-flows were present for the #6-fuel oil tanks. Oily dirt is present along some pipeways and adjacent to overfilled tanks.

Darby Creek Tankfield

Soil conditions at the Darby Creek Tankfield are poorly known. The nature, extent, and thickness of artificial fill at this site is not known. Inspection of the ground surface indicates that coarse granular fill, including brick fragments, was emplaced over much of the site. Natural soils did not outcrop and could not be inspected. Refinery personnel report this area was formerly a gravel pit.

The water table is expected to be encountered several feet above the level of Darby Creek with a generally east gradient. A small unlined impoundment in the northeast area of the plant may create a local groundwater mound. This impoundment is adjacent to some piles of solid waste, mostly soil.

As with the Schuylkill River Tankfarm, there are no obvious indications of subsurface oil at this facility. Any localized accumulations would be confined to Company property. Refinery personnel report few oil problems at this site stemming from tank overfills or pipeline leaks. Some oily dirt, nevertheless, is likely to be present at this site.

Hog Island and Pipelines

This site borders the Delaware River but was not inspected due to a shortage of time. Refinery personnel report that the facility consists of crude oil unloading headers and transfer lines to the Darby Creek Tankfield. It was also reported that between one and three underground slop oil tanks are present at this site and that some leakage is suspected. This information is poorly documented and additional inspection should be conducted.

Underground pipeline systems are present between Hog Island and the Darby Creek Tankfield and also between the main plant and both remote tankfield facilities. Refinery personnel report that these pipelines are cathodically protected. A history of any leaks or repairs to these lines was not obtained. The frequency of pipeline integrity testing, if any, was also not determined.

CERCLA (SUPERFUND) SITES

The refinery has provided EPA Region III with required notice of a total of thirteen CERCLA sites, nine within the main plant, one at Schuylkill River Tankfield, and three at the Darby Creek Tankfield. This notification was made in 1981 and no subsequent contacts with regulatory agencies have been made. These sites were identified by refinery personnel based on knowledge of plant operations, past tank bottom cleaning methods, visible inspections of waste sites, and some records. The boundaries and areal extent of these sites are estimates only are not substantiated by either sampling or by documentation. No conceptual closure plans have been developed and, therefore, no cost estimates are available. The thirteen waste sites may cover a surface area of nearly 70 acres although the size of the leaded sludge sites appear to be over estimated.

Within the main plant, six areas have been identified as possibly containing leaded tank bottoms, a listed hazardous waste (K052) (Figure 1). Other wastes associated with some of these areas may be slop oil emulsion solids, separator sludge, oily solids, and heavy metals. The areas identified to EPA cover approximately 57.6 acres $(2,500,000~\rm{ft}^2)$. Two smaller areas containing API separator sludge and spent caustic cover areas of about 0.8 acre $(35,000~\rm{ft}^2)$ and 0.46 acre $(20,000~\rm{ft}^2)$, respectively.

The "Ballfields" area described previously was also identified to EPA as a CERCLA site. The contents and boundaries of this site are not known but may cover more than one acre.

The Schuylkill River Tankfarm contains a leaded tank bottom sludge (K052) disposal site covering perhaps 1.8 acres $(80,000 \text{ ft}^2)$. Some separator sludge may also be present at this location.

The Darby Creek Tankfield contains three inactive landfills (Figure 3). Landfill #1 contains H-F contaminated paper, metals, scrap, etc. and

covers an approximate area of 4.6 acres (200,000 ft²). Landfill #2 contains spent acid catalyst and oily sludge covering an area of about 0.92 acres (40,000 ft²). Landfill #3 contains oil sludge, heavy metals, and some unknown soil waste piles. This site covers approximately 7.3 acres (320,000 ft²).

Conclusions

1. The largest potential expenditures at this site would be closure of the thirteen CERCLA sites which may total nearly 70 acres. The physical boundaries and contents of these waste sites have not been verified or documented. A legal review of closure requirements, options, standards, and time frames is needed to identify the scope of investigation of these sites. If these sites are found to require closure, a detailed analysis of all on-site closure methods would be required. Removal of the waste by excavation and off-site disposal is not economically feasible, 0.6 to 1.0 billion dollars is estimated.

The simplest on-site closure generally includes construction of a soil-synthetic liner cap to prevent infiltration of rainfall or storm water. Unit costs for these caps range from two to three dollars per square foot giving potential closure costs for all disposal sites of six to 10 million dollars. Consolidation of sites would lower these costs, any requirements for groundwater monitoring or remedial action would increase costs significantly. On-site capping has the adverse side-effect of removing land from future refinery construction.

- 2. Recoverable quantities of free oil are present beneath the package and grease plant area, "B-Street", and along the Arco crude oil lines. No direct evidence of significant accumulations of subsurface oil were observed in the remainder of the main plant or the Schuylkill River and Darby Creek Tankfields. It is probable that localized oil accumulations may be present at one or more of these locations and the presence of a large accumulation cannot be ruled out. A full evaluation of these sites would cost between 50,000 and 100,000 dollars. Oil recovery costs would depend upon the areal extent of the accumulation(s), specific site conditions, and the volume of oil. Estimated costs range from 0.5 to 1.5 million dollars over a three to five year period.
- 3. Third party impacts due to subsurface oil accumulations appear to be limited to the potential for seepage to surface waters. The sites are located in a heavily industrialized area and appear to be downgradient of any adjoining properties. While a review of regional hydrogeologic information is not complete, it seems unlikely that any refinery contamination could impact either municipal or domestic water supplies. A review of pertinent literature on this issue is currently underway.

- 4. Oily dirt is present throughout much of the refinery principally along pipeways and loading/unloading facilities. Due to the large volume of this material, it will have to be left in-place and assumed as-is.
- 5. This review is based upon a one-day inspection of the plant and discussions with refinery personnel. Very little information is available on groundwater conditions at this refinery as no specific studies or monitoring have been conducted. Investigation of this site may alter some of the observations and conclusions stated above.

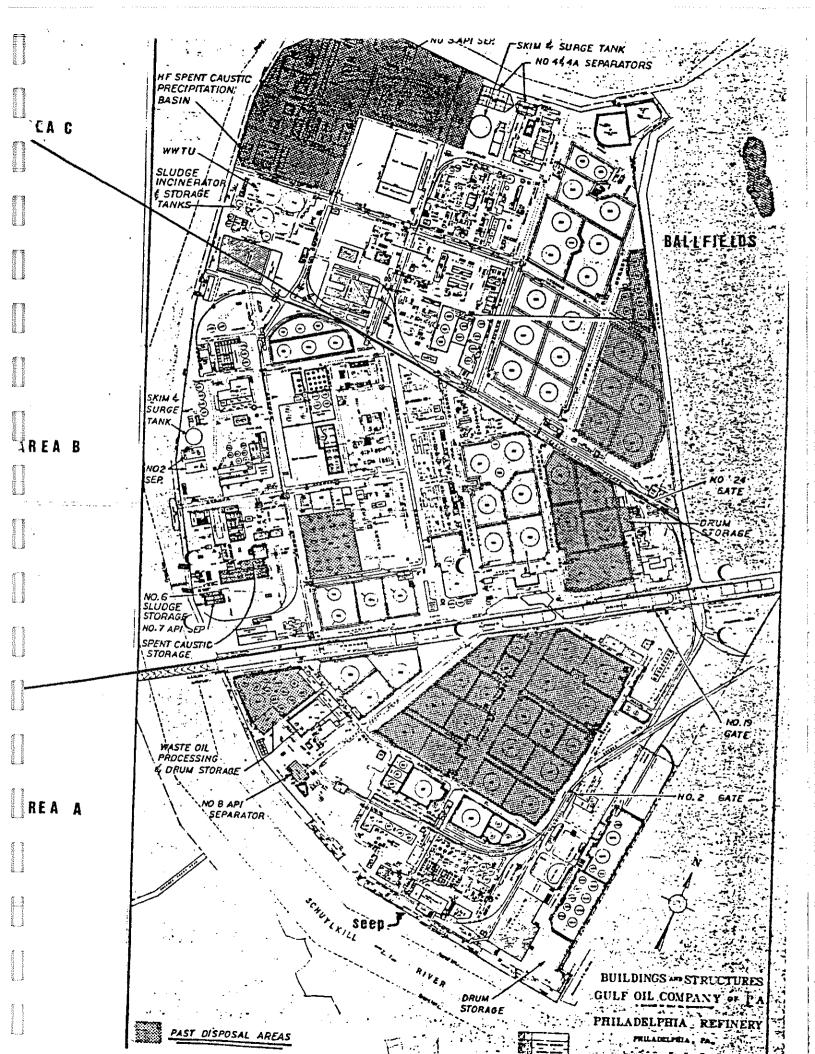
Suggested Actions

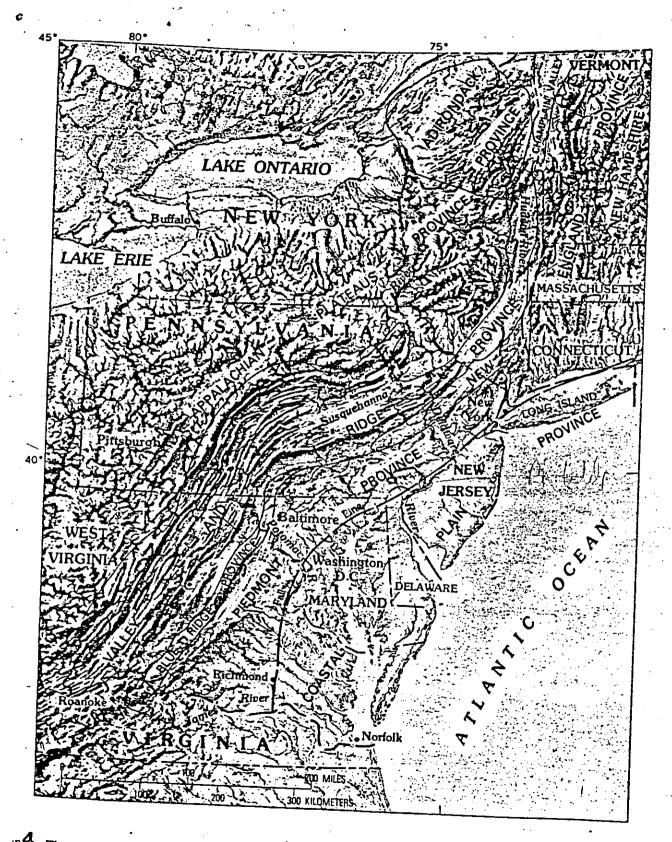
- 1. A thorough review of legal requirements for the CERCLA sites should be conducted to establish whether any closure is needed. Due to the great expense of such closures all legal options should be explored. If closure of one or more sites appears necessary, a program combining site investigations and evaluation of on-site closure options would be needed. These efforts would probably require two to four months to complete.
- 2. A phased program to evaluate the extent of subsurface hydrocarbons at each of the four properties is suggested. The first phase would be designed to establish the presence of any free oil near surface waters which ajoin property lines, loading facililties, and areas suspected to have contamination based on past operations. These initial investigations should be broad enough to identify the extent of significant oil accumulations with some certainty, identify the hydraulic gradient and soil conditions affecting oil recovery, and to allow certification that a piece of property is "clean" if the findings support this conclusion. Any additional work including oil recovery would be based on results of the first phase. Cost is estimated between 50,000 and 100,000 dollars.
- 3. In the event of a property transfer, Chevron should identify the standards to which the Company is willing to clean-up subsurface oil. This standard should comply with Company policy and any applicable laws. Suggested standards include removal of liquid oil to a trace amount defined as 1/8". Residual oil and oil contaminated soil would be left in-place. Any subsequent incident by a new owner such as a spill, leak, or overfill which adds significantly to the existing problem would result in transfer of clean-up responsibility to the new owner.

J. J. PATRY

JJP:fw

cc: Mr. M. R. Young - San Francisco
Mr. T. L. Wright





E4—The major physiographic divisions of the Mid-Atlantic Region also define, in a general way, the principal geologic terranes. (After Fenneman and others, 1946.)

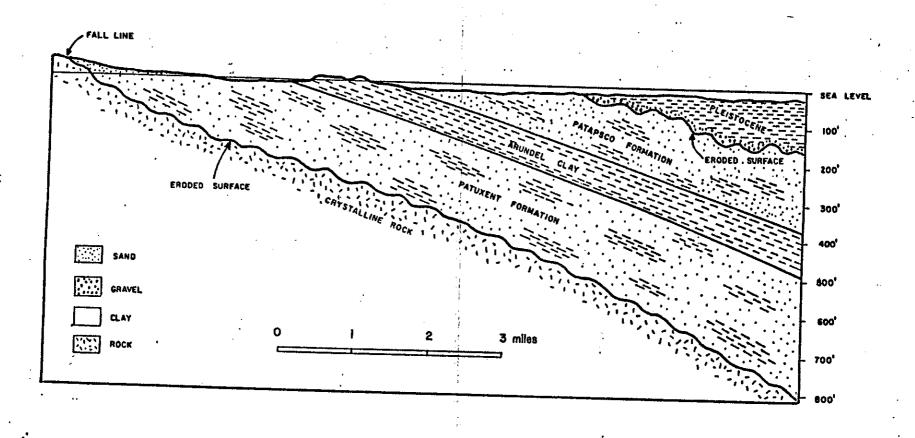
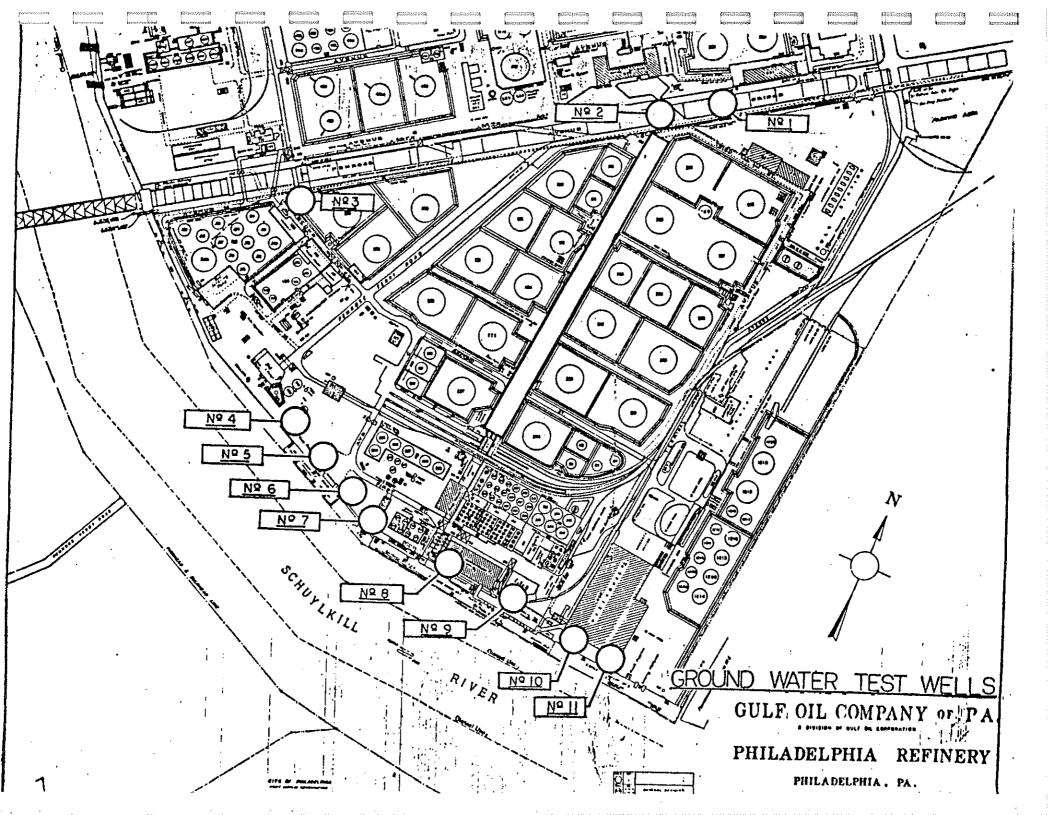
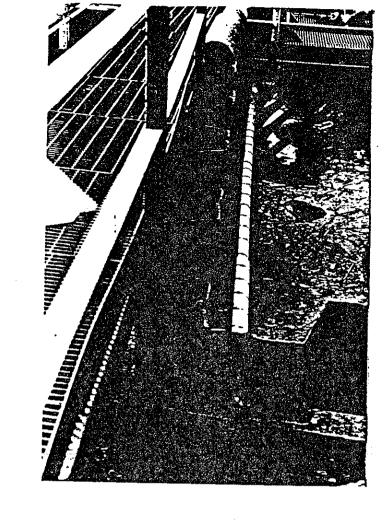


FIGURE 5 GENERALIZED CROSS-SECTION OF ATLANTIC COASTAL PLAIN



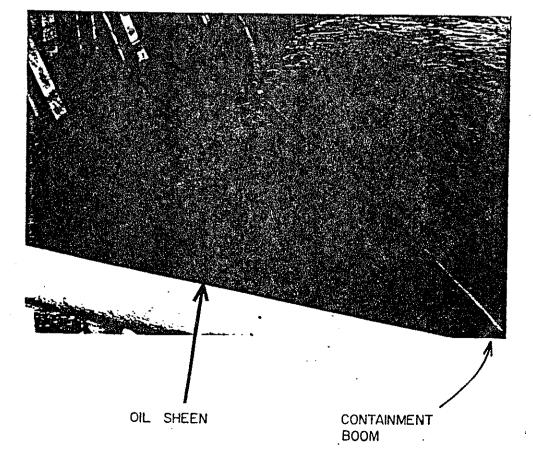
PHOTOGRAPH #1

TONGUE AND GROOVE STEEL SHEET PILES



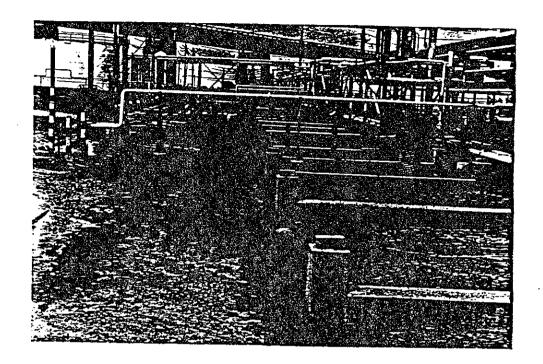
PHOTOGRAPH #2

OIL SEEPAGE INTO SCHUYLKILL RIVER NEAR PACKAGE AND GREASE PLANT



PHOTOGRAPH #3

OILY DIRT ALONG . PIPEWAY



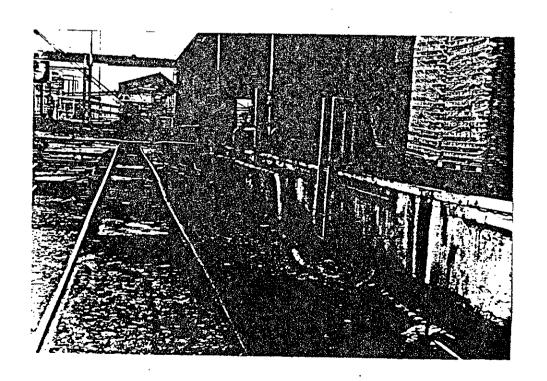
PHOTOGRAPH #4

OILY DIRT AND

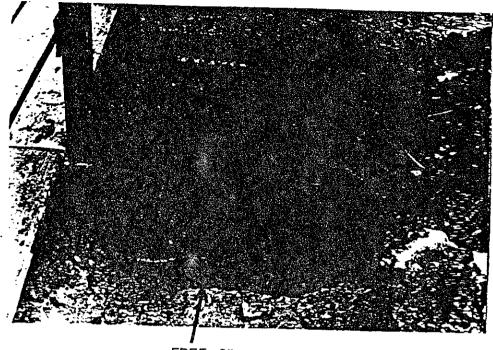
STANDING OIL

PACKAGE AND

GREASE PLANT



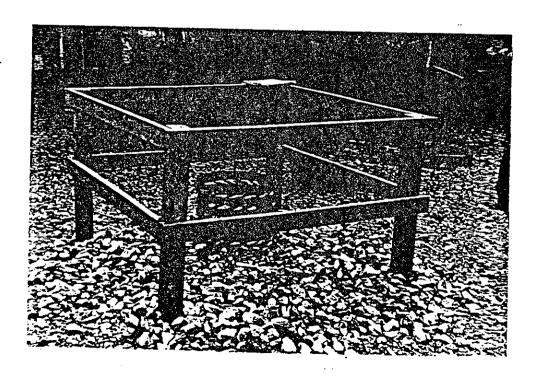
FREE OIL NEAR
PIPEWAY "B-STREET"



FREE OIL

PHOTOGRAPH #6

"MONITORING" WELL OF PERFORATED CULVERT



REVIEW OF HISTORICAL AERIAL PHOTOGRAPHS

Three sets of historical, black and white, stereo aerial photographs, for the years 1940, 1959 and 1975, were obtained for each refinery area. The photographs, which will be submitted to Chevron upon completion of this project, were provided by Aero Services of Houston, Texas. A number of the locations selected for the installation of monitoring wells during this investigation were based on the aerial photo observations. The following subsections describe Dames & Moore's observations.

The Main Plant

Between 1940 and 1959, major expansion occurred at the Main Plant. In 1940, only the western half of the area C was involved in refinery activities. A large basin, approximately 300 feet by 300 feet in area was located at the northwest corner of Area C. In 1959 and 1975, all three area, A, B, and C were completely involved in refinery activities. No major changes appear to have taken place between 1959 and 1975 although many minor changes were observed. Minor changes included additions, modifications, and deletions of tanks, small buildings and small impoundments or separator units.

The Ballfields

In 1940 and 1959, the entire Ballfields area was occupied by a railcar cleaning operation. Tank cars were parked both on sidings and off-track. Heavy staining characterized most of the ground surface. A group of buildings was present, including one large building on the southern portion of the Ballfields. In 1975, all activities related to the tank car cleaning operation were gone. The area appeared to have been graded, and a ballfield was present. The large mound of soil which is currently present near the center of the site, was present in 1975.

Schuylkill River Tank Farm

In 1940, the Schuylkill River Tank Farm was not yet constructed. At that time, the area was being used for shallow soil borrow activities. In 1959, the tank farm appeared essentially as it is today. The TEL disposal area and an adjacent separator unit were present. The disposal area contains ponded water. In 1975, a small collection basin was present between the TEL disposal area and the small separator unit. The disposal area appears essentially the same as it did in 1959, with ponded water present.

Darby Creek Tank Farm

In 1940, the Darby Creek Tank Farm had not yet been constructed. At that time, the northern half of the property was occupied by a brick factory and extensive soil borrow activities existed in areas where tanks are now present. In 1959 and 1975, the site appeared essentially as it does at the present time. Four separate basins were present adjacent to Darby Creek on the east side of the property. The northernmost basin showed evidence of disposal activities as it was partially filled with sediment. In 1959 and 1975, the brick factory activities were confined to a smaller area in the west-central portion of the site.

Hog Island

In 1940, the Hog Island Wharves had not yet been constructed. At that time, the area was undeveloped. In 1959 and 1975, the site appeared essentially as it does at present, with three unloading stations. No evidence of above ground tanks or significant surface spills were present in 1959 or 1975.

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APPENDIX B

Drilling and Monitoring Well Construction Procedures, Soil Sampling Procedures, and Slug Test Procedures

DRILLING AND MONITORING WELL CONSTRUCTION PROCEDURES, SOIL SAMPLING PROCEDURES, AND SLUG TEST PROCEDURES

INTRODUCTION

This Appendix presents the following information pertaining to monitoring well construction and soil sampling:

- o Quality Assurance Procedures
- o Drilling Procedures
- o Monitoring Well Construction Procedures
- o Soil Sampling Procedures
- o Slug Test Procedures

QUALITY ASSURANCE PROCEDURES

- o To prevent cross-contamination, all equipment was cleaned after each use at either the drill site or at the decontamination (laundry area) area. The type of cleaning required varied according to the nature of contamination. For example, heavy oils were removed by steam-cleaning.
- o To prevent cross-contamination between shallow levels and deeper levels in the aquifer, the annular space between the borehole and the well casing was tremie-grouted to the surface.
- o To prevent surface contamination from entering the well, a protective steel casing with a locking cap was installed at the surface.

DRILLING PROCEDURES

Method of drilling:

Hollow-stem augers.

Formation sampling:

Samples were collected every fivefeet, beginning with the 4-6' interval. A standard split-spoon sampler was used to obtain samples. After obtaining each soil sample, the split-spoon was thoroughly rinsed with potable water. Diameters of borings:

Six- and ten-inches.

Decontamination requirements:

All downhole tools, including, augers, tremie-pipes, and drill rods were steam cleaned at the laundry area or at the well site using potable water. This procedure was repeated between each well, and at the start and conclusion of the drilling program.

Site cleanup:

All debris, paper, etc., were disposed of in areas designated by Chevron personnel.

Abandoning a Boring:

Abandoned borings were backfilled to the surface by pressure grouting with a tremie pipe lowered to the bottom of the boring. If the boring was incomplete, and very shallow (above the water table), it was backfilled with drill cuttings and natural material.

MONITORING WELL CONSTRUCTION PROCEDURES

Casing and screen:

Four-inch I.D. Schedule 40 PVC. No solvent glue was used in assembling the well screen and riser casing.

Screen slot size:

0.020-inch, machine-slotted.

Bottom cap:

A bottom cap was installed at the bottom of the well screen in all cases.

Sand pack:

By weight, 90 percent of the sand pack is larger than the size of the screen slot.

Placement of the sand pack:

The sand pack extends to a minimum of one foot above the top of the well This screen. was confirmed measuring down the annular space with weighted tape or a measured small-diameter pipe, or rod. The sand poured down the pack was annular space.

Bentonite seal:

A minimum one-foot bentonite seal was placed in the annular space above the sand pack in each well by emplacing 1/4-inch diameter volclay pellets in the annular space.

Grouting annular space: (Deep wells only)

In most cases, a bentonite grout was tremie-piped into the annular space from the top of the bentonite seal to the ground surface being careful not to disrupt the bentonite seal. The grout was emplaced so that it completely displaced the drilling water.

Top cap:

A cap was installed on the top of all wells.

Well development:

Each well was developed for about one hour or until the water removed was visually clean (free of sediment). If practical, a minimum of five times the volumes of water standing in the well was removed.

Wells were developed by a centrifugal or submersible pump. All pumps were equipped with check valves to prohibit well water within the discharge lines from entering the well. Dedicated 3/4" poly-pipe was used for each Water pumped from the wells was discharged to the ground surface, but not allowed to enter streams or other surface water bodies. All poly-pipe was disposed of in areas designated by Chevron personnel.

Protective casing:

A five-foot long section of six-inch I.D. steel casing was placed over the PVC well casing in order to protect the well. The steel casing was set about two to three feet below ground surface, extending to three feet above about two above the A lockable cap was affixed surface. protective casing. the Where necessary, the finished well was surrounded by protective posts.

Flush mounting:

In some cases, such as roadways, wells were installed flush with the ground surface. In such cases, the wells were finished within a manhole. A lockable waterproof seal was affixed to each well to prevent rain or other surface water from entering the well.

Well labeling:

The complete identification number of each monitoring well was painted on the protective casing or manhole cover.

Surveying:

Α level survey was performed Associates of Philadelphia. Pennsylvania in which the elevation of the top of the PVC well casing of each well was determined to + 0.01 feet. reference point marked. the Elevations were referenced to the National Geodetic Vertical Datum (NGVD).

SOIL SAMPLING PROCEDURES

General

At a minimum, sampling procedure standards and techniques were performed in accordance with EPA and PADER guidelines and regulations. In situations not covered by the guidelines or regulations, the procedures were designed to be appropriate for the sample type, location and analyses to be performed.

Soil Sampling Procedures

Collection of soil samples in hand-auger borings was performed using a standard three-inch hand auger. When retrieved, the sample was transferred from the auger to sample jars by means of a scoop or trowel. To the extent possible, soil which came in contact with the walls of the auger was discarded. Soil samples collected in test pits were obtained directly from the walls of the pit and transferred to the sample jars by means of a scoop or trowel.

Before the start of the sampling program and between the gathering of each sample, the sampling equipment was rinsed with a non-phosphate soapy water solution, distilled water, nitric acid, and distilled water, in that order. For each site sampled, all sampling equipment was handled with a new pair of surgical gloves. All necessary information was recorded in a field notebook, including depth, description, and location of sample.

Environmental Testing and Certification (ETC) of Edison, New Jersey, and Century Laboratories of Thorfare, New Jersey provided all the sample containers in shipping shuttles or coolers. The shuttles or coolers were opened and inspected to make sure that all required bottles were present and labeled. After sample collection, all chain-of-custody forms were filled out, signed and sealed in the shuttles or coolers along with the sample jars. Sample shuttles and coolers were packed with ice. All shuttles and coolers were transported to their respective laboratories within 48 hours after the samples were collected.

SLUG TEST PROCEDURES

- o Measured the static water level in the well and recorded the data on a Slug Test Data Form.
- o Washed the steel cylindrical slug with alcohol, steamcleaned and rinsed with distilled water.
- Lowered the slug rapidly, but smoothly, into the water column of the well and noted the time, to the second, of slug's introduction.
- o Measured the decline of the water level (to the nearest .01 feet) frequently until the water returned to its original static level. Recorded the measurements on the Slug Test Data Form.
- o Continued taking time and water level readings until the water level had recovered to at least 90 percent of the original static water level.
- o Removed the slug rapidly from the water, and the well.
- o Frequently measured and recorded the rising water level as it returned to the static level. Recorded the data on the Slug Test Data Form.
- o Continued taking readings until the water level had recovered to at least 90 percent of the original static water level.
- O Completed the information, including drawdowns, on the Slug Test Data Forms.
 0628R

APPENDIX C

Logs of Borings and Monitoring Well Construction Details

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - At Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Warren George Super vising D & M Drilling Completed -2/24/86 Andreu Ivansiu Engineer/Geologist Type of Rig ~ Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -15' Casing/Screen Type -**PVC** Sandy gravel, strong petroleum odor Casing Diam. -4" Casing Depth -15' Screen Setting -5' - 15' Slot Width -0.02" 5 S¥ 3 Fine to coarse sand and fine to medium gravel, Type of Seal -**Bentonite** dark-gray ,dry ; (fill) Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 2 Top of Casing Elevation trace silt, trace to little 8.63 clay ,wet Static Water Level Elevation -3.08 Date Measured -1/9/87 Surface Elevation -8.631 TEST DATA 15 2 Silty sandy clay , light Pump Type gray, wet Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -Notes: **WELL CONSTRUCTION KEY** * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout **DAMES & MOORE**

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project: Chevron/Philadelphia Refinery Boring/Well No. -A2 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/27/86 Driller -Warren George Supervising D & M Drilling Completed -2/27/86 Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -13' Casing/Screen Tupe -PYC Gravel with trace silty Casing Diam. -4sand, black Casing Depth -13 Screen Setting -3' ~ 13' decreasing gravel; (fill) Slot Width -0.02" Type of Seal -**Bentonite** Type of Filterpack -#2 Sand Silt with some clay and Type of Grout -Cement/Bentonite trace peat, greenish-grey MEASUREMENTS (NGVD) 10 Top of Casing Elevation -7.84 Static Water Level Elevation -6.12 Date Measured -1/9/87 Surface Elevation -7.841 **TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Project: Boring/Well No. - A3 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Warren George Supervising D & M Drilling Completed -2/24/86 Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger Depth (ft) Description CONSTRUCTION DATA Borehole Diam. -10" Borehole Depth -15" Casing/Screen Type -**PVC** Sand with some gravel. SP trace silt, dark brown Casing Diam. -4" Casing Depth -15 Screen Setting -3' - 13' Slot Width -0.02* 5 Sandy gravel, product 2 GM visible, strong petroleum Tupe of Seal -**Bentonite** odor , black Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10. trace silt and clay, grey Top of Casing Elevation -9.37 Static Water Level Elevation -5.26 Date Measured -1/9/87 Clayey silt with trace sand, dark green Surface Elevation -9.32 TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -Notes: **WELL CONSTRUCTION KEY** * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Boring/Well No. - A4 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Warren George Supervising D & M Drilling Completed -2/24/86 Andreu Iyansiu Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -15' Casing/Screen Type -PVC 4-Casing Diam. -Casing Depth -15' Screen Setting -5' - 15' Slot Width -0.02" Fine to coarse sand with 16 some fine gravel, petroleum Type of Seal -Bentonite odor Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGVD) 10 2 7.061 trace clay, wet Top of Casing Elevation -Static Water Level Elevation -1.581 Date Measured -1/9/87 Surface Elevation -6.901 **TEST DATA** 15 Silty clay, dark gray, moist Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) - . 20 Drawdown (ft) -Length of Test (Hrs) -Notes: WELL CONSTRUCTION KEY * Blows taken using a 1401b hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS

Project: Chevron/Philadelphia Refinery

Project No. 113

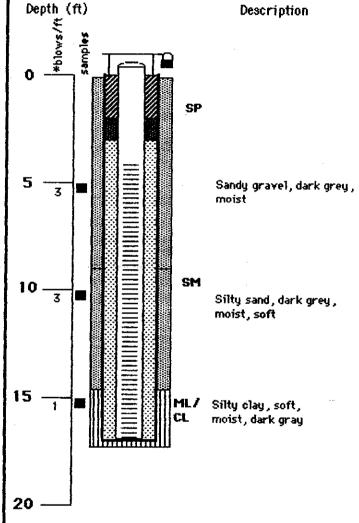
113-909-032

Date M.W. completed

2/25/86

Supervising D & M Engineer/Geologist

Andrei Ivansiu



Notes:

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

Boring/Well No. - A5

Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/25/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DA	TÁ
Borehole Diam	10"
Borehole Depth -	18'
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth -	17'
Screen Setting -	4' - 17'
Slot Width -	0.02*
Type of Seal -	Bentonite
Type of Filterpack -	●2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (NGYD)
Top of Casing Elevation -	6.93
Static Water Level Elevatio	n – Not Available
Static Water Level Elevation Date Measured -	n - Not Available 1/9/87
Date Measured -	1/9/87
Date Measured - Surface Elevation -	1/9/87
Date Measured - Surface Elevation - TEST DATA	1/9/87
Date Measured - Surface Elevation - TEST DATA Pump Type -	1/9/87
Date Measured - Surface Elevation - TEST DATA Pump Type - Depth to Intake (ft) -	1/9/87 6.77
Date Measured - Surface Elevation - TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) -	1/9/87 6.77
Date Measured - Surface Elevation - TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) - Pumping Water Level (ft) -	1/9/87 6.77

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Boring/Well No. - A6 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Warren George Supervising D & M Drilling Completed -2/24/86 Andreu Ivansiu Engineer/Geologist Type of Rig ~ Hollow Stern Auger **CONSTRUCTION DATA** Depth (ft) Description 10" Borehole Diam. -Borehole Depth -15' Casing/Screen Type -**PVC** Sandy gravel, dark grey Casing Diam. -4" Casing Depth -15 3' - 15' Screen Setting -Slot Width -0.02" 5 -Silty clay, dark grey, 2 moist, soft Type of Seal -**Bentonite** Type of Filterpack -*2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 -Clayey silt to silty clay 4 Top of Casing Elevation -7.96 with plant remnants. dank gray, moist, soft Static Water Level Elevation -3.25 Date Measured -1/9/87 Surface Elevation -7.88 **TEST DATA** 15 trace coarse grave) Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack

Bentonite Seal

Cement Grout

DAMES & MOORE

** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A7 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Warren George 2/24/86 Supervising D & M Drilling Completed -Mark Robertson Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -10" Borehole Depth -15' Casing/Screen Type -**PYC** Casing Diam. -4" Casing Depth -15' 3' - 13' Screen Setting -Silty sand with gravel, SM Slot Width -0.02" dark grey-brown 2 Type of Seal -**Bentonite** Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGVD) 10 Top of Casing Elevation -8.021 Silty sand with trace gravel. ML gray , soft Static Water Level Elevation -4.95 Date Measured -1/9/87 Surface Elevation -8.02* TEST DATA 15 Silty clay to clayey silt, gray Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -Notes: WELL CONSTRUCTION KEY * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal **Cement Grout** DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A8 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Warren George Drilling Completed -2/24/86 Supervising D & M Mark Robertson Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -10" Borehole Depth -15" Casing/Screen Type -**PYC** Silty to clayey sand with trace gravel, brown 4" Casing Diam. -Casing Depth -15" grades to dark gray-brown 5' - 15' Screen Setting -0.02" Slot Width -Tupe of Seal -**Bentonite** #2 Sand Type of Filterpack -Grades to clayey silt. Tupe of Grout -Cement/Bentonite greenish-brown, soft MEASUREMENTS (NGYD) 10 Top of Casing Elevation -6.29 Static Water Level Elevation -1.041 1/9/87 Date Measured -Surface Elevation -6.13" TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal

DAMES & MOORE

Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A9 Project No. 113-909-032 Chevron Refinery Location -Date M.W. completed 2/24/86 Driller -Warren George Supervising D & M Drilling Completed -2/24/86 Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -15" Casing/Screen Type -**PVC** Siltu sand with some SM gravel, dark grey-brown 4" Casing Diam. -Casing Depth -15 Screen Setting -3'-13' Slot Width -0.02" 5 Type of Seal -**Bentonite** *2 Sand Type of Filterpack -Cement/Bentonite Tupe of Grout ~ Changes to clayey silt ML with trace sand and gravel, MEASUREMENTS (NGVD) greenish-brown, soft 10 Top of Casing Elevation -7.17 Static Water Level Elevation -3.23 Date Measured -1/9/87 Surface Elevation -7.17 TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal DAMES & MOORE Cement Grout

LOG OF BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A10 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/25/86 Driller -Warren George Drilling Completed -Supervising D & M 2/25/86 Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -10" Borehole Depth -15 Casing/Screen Type -**PVC** Silty sand with trace Casing Diam. -4" SM gravel, brown, very soft Casing Depth -15' Screen Setting -5' - 15' Slot Width -0.02" 5 Silty clay with trace fine Type of Seal -CL Bentonite to med. sand, dark gray, visible product with sheen. Type of Filterpack -#2 Sand strong chemical oder. Type of Grout -Cement/Bentonite very soft MEASUREMENTS (NGVD) grades to greenish-grey 10 Top of Casing Elevation -9.48 ML/ Silty clay to clayey silt CL Static Water Level Elevation -6.04 Date Measured -1/13/87 Surface Elevation -9.40 TEST DATA Silty clay, light gray 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) ~ 20

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Drawdown (ft) -

Length of Test (Hrs) -



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A11 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/25/86 Driller -Warren George Drilling Completed -2/25/86 Supervising D & M Andrei Ivansiu Engineer/Geologist Hollow Stem Auger Tupe of Rig -**CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -14 Casing/Screen Type -PVC 4" Casing Diam. -Casing Depth -13'6" Screen Setting -3'6" - 13'6" Slot Width -0.02" 5 Silty sand with trace 2 gravel, black; (fill) Type of Seal -**Bentonite** Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 3 Top of Casing Elevation -5.891 Clayey sand with some pebbles, black, soft, loose Static Water Level Elevation -4.04 Date Measured -1/13/87 2 Surface Elevation -5.57 Silty clay, black, fine TEST DATA 15 Pump Type -Depth to Intake (ft) – Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -Notes: WELL CONSTRUCTION KEY * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal **Cement Grout** DAMES & MOORE

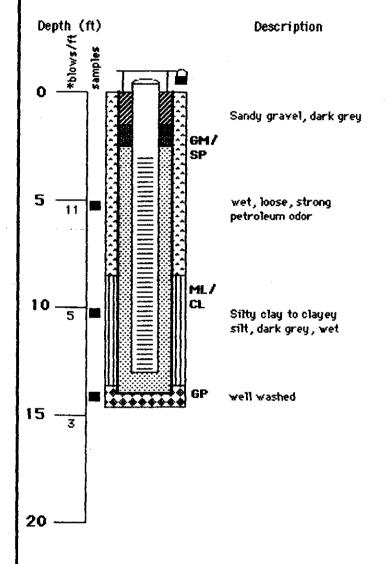
Project: Chevron/Philadelphia Refinery Project No. 113-909-032

Date M.W. completed

2/24/86

Supervising D & M Engineer/Geologist

Andrei Ivansiu



Notes:

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

Boring/Well	No A	12
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Location -

Driller -	Warren George
Drilling Completed -	2/24/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION	DATA

Chevron Refinery

2/24/86
Hollow Stem Auger
TA
10"
14'
PVC
4"
13'
3' - 13'
0.02"
Bentonite
*2 Sand
Cement/Bentonite
NGYD)
6.14*
<u>n - 3.53'</u>
1/13/87
5.90'

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



Project: Chevron/Philadelphia Refinery

Project No.

20

Notes:

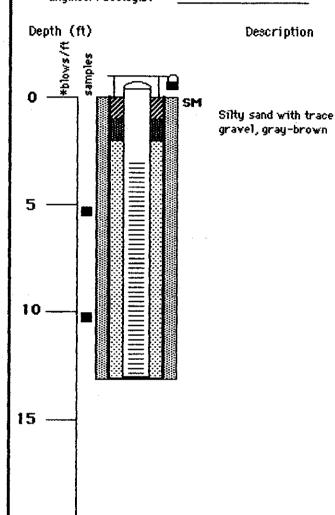
113-909-032

Date M.W. completed

2/27/86

Supervising D & M Engineer/Geologist

Mark Robertson



* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No. -A13

Location ~

Driller -	Warren George
Drilling Completed -	2/27/86

Chevron Refineru

Tune of Ria -Hollow Stem Auger

Type of Rig -	Hollow Stem Auger
CONSTRUCTION DAT	ΓΑ
Borehole Diam	10"
Borehole Depth -	13'
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth -	13'
Screen Setting -	3' - 13'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	₹2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (NGYD)
Top of Casing Elevation -	7.91'
Static Water Level Elevation	n - 4.52'

1/9/87 Date Measured -7.83 Surface Elevation -

TEST DATA

Pump Type -

Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Project: Boring/Well No. - A13D Project No. 113-950-032 Location -Chevron Refinery Date M.W. completed 11/13/86 Driller -Lambert, Inc. 11/13/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -Borehole Depth -70" Casing/Screen Type -PVC Silt with some fine to coarse sand, trace fine gravel, black, 4" Casing Diam. saturated; petroleum odor; petroleum residues present 69' Casing Depth -Fine gravel with some silt, 59' - 69' Screen Setting -10 little fine to coarse sand. black, loose, saturated; strong Slot Width -0.02 petroleum odor **Bentonite** Type of Seal -Clay with little to some silt, CL 3 dark gray, very soft, #2 Sand Type of Filterpack saturated; trace organics 20-Type of Grout -Bentonite 2 Grading to dark brown MEASUREMENTS(NGYD) 3 7.99 Top of Casing Elevation -Increasing silt; silt with some -1.951 Static Water Level Elevation -30-12/22/86 Date Measured -Surface Elevation -8.10" 3 Grading to medium brown **TEST DATA** Pump Tupe -40 -Depth to Intake (ft) -Grading to brownish-gray Satic Water Level (ft) -3 Pumping Water Level (ft) -50 Trace mica Drawdown (ft) -Length of Test (Hrs) -Silt with little to some clay, **WELL CONSTRUCTION KEY** trace fine to medium sand. gray, medium stiff, saturated; FILTER PACK trace organics; very micaceous 60 BENTONITE SEAL 19 Notes: BENTONITE GROUT

CAVE IN MATERIAL

CONCRETE

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Project: Chevron/Philadelphia Refinery

Boring/Well No. - A13D (Cont.)

Project No.

113-950-032

Date M.W. completed

11/13/86

Supervising D & M

Geologist

David Wagner

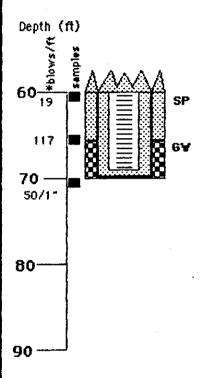
* Blows taken using a 140 lb hammer falling 30 inches.

Location - Chevron Refinery

Driller - Lambert, Inc.

Drilling Completed - 11/13/86

Type of Rig - Hollow Stem Auger



Description

Fine sand with little to some medium sand, trace silt, reddishbrown, medium dense, saturated

Fine to coarse gravel with some fine to coarse sand, reddishbrown, very dense, saturated

WELL CONSTRUCTION KEY

FILTER PACK

BENTONITE SEAL BENTONITE GROUT

ALLE MILLATERIA

CAVE IN MATERIAL

CONCRETE



ETE

** All soils classified by visual inspection.

DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. -A14 113-909-032 Project No. Chevron Refinery Location -2/26/86 Date M.W. completed Driller -Warren George **Drilling Completed -**2/26/86 Supervising D & M Mark Robertson Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -13' Borehole Depth -Casing/Screen Type -**PVC** SM/ Silty sand and gravel, 4" Casing Diam. -13" Casing Depth -3' - 13' Screen Setting grades dark greu 0.02" Slot Width -5 Type of Seal -Bentonite #2 Sand Type of Filterpack gravel decreasing Cement/Bentonite Tupe of Grout -MEASUREMENTS (NGYD) 10 8.55 Top of Casing Elevation very loose Static Water Level Elevation -4.95" Date Measured -1/13/87 Silty clay with trace sand, Surface Elevation -8.55 light gray, wet **TEST DATA** 15 -Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal **Cement Grout** DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A15 Project No. 113-909-032 Location -Chevron Refineru Date M.W. completed 2/25/86 Driller -Warren George Supervising D & M Drilling Completed -2/25/86 Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -15 Casing/Screen Type -**PYC** Silty sand with gravel, 4" Casing Diam. brown Casing Depth -15 Screen Setting -5' - 15' grades to black Slot Width -0.02" 5 1 ML/ Silty clay with trace sand. Type of Seal -**Bentonite** CL greenish-grey, very soft Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10~ Top of Casing Elevation -6.901 Static Water Level Elevation -6.48" Date Measured -1/13/87 Surface Elevation -6.841 trace peat TEST DATA 15 Pump Type -Depth to Intake (ft) – Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A16 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/25/86 Driller -Warren George 2/25/86 Drilling Completed -Supervising D & M Mark Robertson Engineer/Geologist Hollow Stern Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -15" Borehole Depth -**PYC** Casing/Screen Type -4" Silty sand with some Casing Diam. gravel and cobbles, 14' Casing Depth dark-grey Screen Setting -1'6" - 11'6" decreasing cobbles and gravel 0.02" Slot Width -5 ML/ Clayey silt, green Type of Seal -**Bentonite** *2 Sand Type of Filterpack -Cement/Bentonite Type of Grout grades to greenish-brown **MEASUREMENTS (NGVD)** 10 8.47 Top of Casing Elevation -6.33* Static Water Level Elevation -Date Measured -1/13/87 7.81 Surface Elevation grades to silty clay and TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

Project: Chevron/Philadelphia Refinery

Project No.

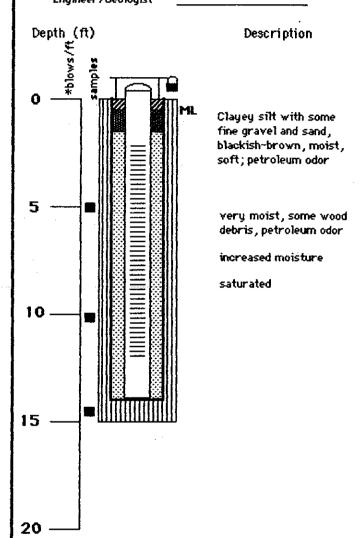
113-909-032

Date M.W. completed

2/27/86

Supervising D & M Engineer/Geologist

Ralph T. Golia



Boring/Well No. -A17

Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/27/86
Type of Rig -	Hollow Stern Auger
CONSTRUCTION DAT	TA
Borehole Diam	10"
Borehole Depth -	15'
Casing/Screen Type -	PVC
Casing Diam	4*
Casing Depth –	14'
Screen Setting –	2' - 12'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	*2 Sand
Type of Grout - Cement/Be	ntonite
MEASUREMENTS (1	NGYD)
Top of Casing Elevation -	9.42
Static Water Level Elevation	n - 6.02'
Date Measured -	1/13/87
Surface Elevation -	9.34
TEST DATA	

Notes:

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Length of Test (Hrs) -

Pump Type -

Drawdown (ft) -

Depth to Intake (ft) -Satic Water Level (ft) -



Bentonite Seal

Pumping Water Level (ft) -



Cement Grout



Project : Chevron/Philadelphia Refinery

Project No.

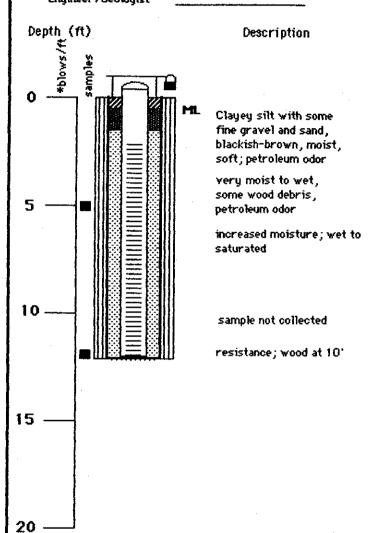
113-909-032

Date M.W. completed

2/27/86

Supervising D & M Engineer/Geologist

Ralph T. Golia



* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No. -A18

Location - Chevron Refinery

Driller - Warren George

Drilling Completed - 2/27/86

Tupe of Rig - Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. - 10"

Borehole Depth - 12'

Casing/Screen Type - PVC

 Casing Diam. 4"

 Casing Depth 12'

 Screen Setting 2' - 12'

 Slot Width 0.02"

Type of Seal - Bentonite

Type of Filterpack - *2 Sand

Type of Grout - Cement/Bentonite

MEASUREMENTS (NGVD)

Top of Casing Elevation - 9.52'

Static Water Level Elevation - 7.27

Date Measured - 1/13/87

Surface Elevation - 9.35'
TEST DATA

Pump Type -

Depth to Intake (ft) –

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



Project: Chevron/Philadelphia Refinery

Project No.

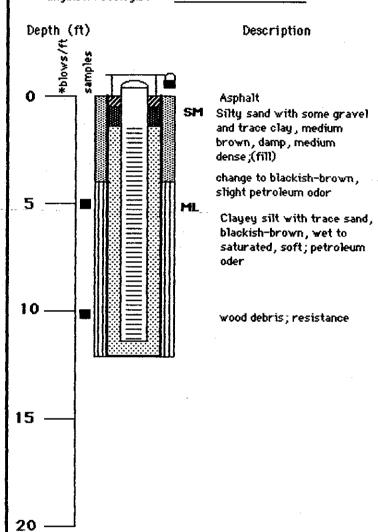
113-909-032

Date M.W. completed

2/27/86

Supervising D & M Engineer/Geologist

Ralph T. Golia



Boring/Well No. -A19

Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/27/86
Type of Rig –	Hollow Stern Auger
CONSTRUCTION DAT	TA
Borehole Diam	10"
Borehole Depth -	12'
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth -	11'6"
Screen Setting -	1'6" - 11'6"
Slot Width -	0.02*
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (I	NGYD)
Top of Casing Elevation -	9.52'
Static Water Level Elevation	n - 5.77'
Date Measured -	1/13/87
Date Measured - Surface Elevation -	-
	1/13/87
Surface Elevation -	1/13/87
Surface Elevation - TEST DATA	1/13/87
Surface Elevation - TEST DATA Pump Type -	1/13/87
Surface Elevation - TEST DATA Pump Type - Depth to Intake (ft) -	1/13/87 9.28'
Surface Elevation - TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) -	1/13/87 9.28'

Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A19D Project No. Chevron Refinery 113-950-032 Location -Date M.W. completed 10/30/86 Driller -Lambert, Inc. **Drilling Completed -**10/30/86 Supervising D & M David Wagner Geologist Tupe of Rig -Hollow Stein Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -10" 60' Borehole Depth -PVC Casing/Screen Type -Silt with some fine to coarse sand, trace clay, brown, soft, Casing Diam. moist; petroleum odor Casing Depth -60' Grading to very dark gray, saturated 50" - 60" Screen Setting -10 -Fine to coarse sand with some 0.02" fine gravel, little silt, blackish- Slot Width gray, medium dense, saturated; Type of Seal -**Bentonite** resistance encountered - wood 2 #2 Sand Type of Filterpack -20 Bentonite Type of Grout -2 Silt with some clay, dark gray, MEASUREMENTS(NGYD) soft, moist; organics; micaceous; weak petroleum 5 Top of Casing Elevation -11.69 odor -1.711 Static Water Level Elevation -30 SHELBY TUBE taken 12/22/86 Date Measured from 30' to 31.5' Surface Elevation -8.691 3 TEST DATA Increasing clay; silt and clay Pump Type -40 3 Depth to Intake (ft) -Clay with some silt and little fine sand, reddish-brown, soft, Satio Water Level (ft) saturated, micaceous Pumping Water Level (ft) -Drawdown (ft) -28 Fine to coarse sand with some fine gravel, reddish-brown, Length of Test (Hrs) medium dense, saturated 46 WELL CONSTRUCTION KEY Grading to brownish-gray FILTER PACK Increasing density: dense increasing gravel: fine gravel BENTONITE SEAL BENTONITE GROUT Notes: Blows taken using a 140 lb hammer falling 30 inches. CAVE IN MATERIAL ** All soils classified by visual inspection. CONCRETE DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project :Chevron/Philadelphia Refinery Boring/Well No. - A20 Project No. Chevron Refinery 113-909-032 Location -Date M.W. completed 2/24/86 Driller -Warren George Drilling Completed -2/25/86 Supervising D & M Andreu Ivansiu Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 10* Borehole Diam. -15' Borehole Depth -Casing/Screen Type -PVC 4" Casing Diam. -Silty to clayey fine sand, 14 Casing Depth black, moist, soft, 4'-14' Screen Setting petroleum odor 0.02* Slot Width -5 Type of Seal -**Bentonite** Type of Filterpack -*2 Sand Cement/Bentonite Tupe of Grout -**MEASUREMENTS (NGYD)** 10 8.81 Top of Casing Elevation -Sand with some pebbles, black, wet, petroleum oder 4.08" Static Water Level Elevation -Date Measured -1/13/87 Surface Elevation -8.73 TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: Bentonite Seal * Blows taken using a 140 lb hammer falling 30 inches. Cement Grout ** All soils classified by visual inspection. DAMES & MOORE

Project: Chevron/Philadelphia Refinery

Project No.

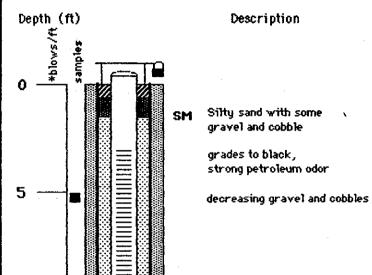
113-909-032

Date M.W. completed

2/25/86

Supervising D & M Engineer/Geologist

Mark Robertson



Boring/Well No. - A21

Location - C	heyron Refinery
Driller -	Warren George
Drilling Completed -	2/25/86
Type of Rig - Ho	llow Stem Auger
CONSTRUCTION DATA	
Borehole Diam	10"
Borehole Depth -	13'
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth -	13'
Screen Setting -	3' - 13'
Slot Width -	0.02"
Type of Seal ~	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout - C	ement/Bentonite
MEASUREMENTS (NGV	D)
Top of Casing Elevation -	9.841
Static Water Level Elevation -	Not Available
Date Measured -	1 /17 /07
	1/13/87
Surface Elevation -	9.02
Surface Elevation - TEST DATA	
TEST DATA	
TEST DATA Pump Type -	
TEST DATA Pump Type - Depth to Intake (ft) -	
TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) -	
TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) - Pumping Water Level (ft) -	

Notes:

10

15

20

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Filter Pack



Bentonite Seal



Cement Grout



Project: Chevron/Philadelphia Re	efinery Boring/Well No A21D
Project No. <u>113-950-032</u>	Location - Chevron Refinery
Date M.W. completed 10/28/86	Driller - Lambert, Inc.
Supervising D & M	Drilling Completed - 10/28/86
Geologist David Wagner	Type of Rig - HoTlow Stern Auger
Depth (ft) Description	CONCTRICTION DATA
	Borehole Diam 10"
**************************************	Borehole Depth - 85'
0 7 7	Casing/Screen Type - PVC
SV Fine to coarse so silt, little fine g	and with some
dark brown, soft	t, very moist;
wood debris, bri petroleum odor;	oibi
CL Clay with little s	silt trace fine
sand, very dark	brown, soft, Slot Width - U.U.2
saturated; very leum odor; oily	strong petro- Type of Seal - Bentonite
2 ML Silt with some contact sand, medium gr	
20 saturated; trace	mica; trace Tupe of Grout - Cement/Bentonite
organics; petrole Decreasing clay	
3 weak petroleum	
SHELBY TUBE ta	ken Static Water Level Elevation4.13*
7 Decreasing clay	
fine sand; trace little fine sand	to little clay, Surface Elevation - 8.48'
7 2" sand lense at	36'; fine to TEST DATA
medium sand wit medium gray , tr	
7 Silt with little to	some clay,
little fine sand, o soft, saturated;	20 4 9 09 ,
Increasing clay a	nd decreasing
fine sand; some of fine sand Decreasing clay:	
Mis notraloum od	NAP.
CL Clay with little s	tength of test (Hrs) *
soft, saturated;	
60	BENTONITE SE AL
Notes: 2 Notes: 2	BENTONITE/CEMENT
* Blows taken using a 140 lb hammer falling 3	
** All soils classified by visual inspection. DAMES & MOORE	CONCRETE

Project: Chevron/Philadelphia Refinery

Boring/Well No. - A21D (Cont.)

Project No.

113-950-032

Date M.W. completed

10/28/86

Supervising D & M

Geologist

David Wagner

<u>Location - Chevron Refinery</u>

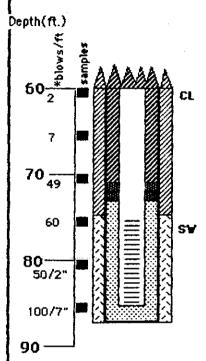
Driller - Lambert, Inc.

Drilling Completed -

10/28/86

Tupe of Rig -

Hollow Stem Auger



Description

Increasing silt : some silt

6" lense of fine to medium sand with little coarse sand at 66', grayish-brown, saturated
Clay with some silt, trace to little fine sand, dark-gray, soft, saturated

Little to some fine gravel and little fine to coarse sand Fine to coarse sand with some fine gravel, brownish-gray, very dense, saturated

Fine to coarse sand with some fine gravel, trace clay(white), very light gray, very dense, saturated

Weathered bedrock: Wissahickon Schist

Notes

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

WELL CONSTRUCTION KEY

FILTER PACK

BENTONITE SEAL

BENTONITE/CEMENT

CAVE IN MATERIAL

CONCRETE



Project: Chevron/Philadelphia Refinery Boring/Well No. -A22 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/26/86 Driller -Warren George 2/26/86 Supervising D & M Drilling Completed -Mark Robertson Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -Borehole Depth -15" **PYC** Casing/Screen Type -Silty sand with trace 4" gravel, discolored, Casing Diam. strong petroleum odor 15' Casing Depth -5' - 15' Screen Setting -SC Silty to clayey fine to 0.02" coarse sand with trace fine Slot Width -5 gravel, petroleum odor Type of Seal -**Bentonite** *2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 9.02" Top of Casing Elevation -Silty clay , gray , petroleum CL odor Static Water Level Elevation -1.71 1/13/87 Date Measured -8.78 Surface Elevation -TEST DATA 15 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -Notes: WELL CONSTRUCTION KEY * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal DAMES & MOORE

Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. -A23 Project No. 113-909-032 Location -Chevron Refinery 2/27/86 Date M.W. completed Warren George Driller -2/27/86 Drilling Completed -Supervising D & M Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -Borehole Depth -13' **PVC** Casing/Screen Tupe -Silty sand with some 4" Casing Diam. gravel and mica flakes, light brown 13' Casing Depth -3' - 13' Screen Setting -Slot Width -0.02" 5 grades to dark brown with Type of Seal -**Bentonite** trace gravel, very soft #2 Sand Type of Filterpack grades to grey-brown Cement/Bentonite Tupe of Grout -MEASUREMENTS (NGYD) 10 4.71 Top of Casing Elevation -4.311 Static Water Level Elevation -Date Measured -1/13/87 Fibrous peat 4.71 Surface Elevation -**TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - A24 Project No. 113-909-032 Location -Cheyron Refinery Date M.W. completed 2/24/86 Driller -Warren George Drilling Completed -2/24/86 Supervising D & M Mark Robertson Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 10" Borehole Diam. -Borehole Depth -14 6" Casing/Screen Type -PVC Silty sand with gravel. brown 4" Casing Diam. -Casing Depth -14'6" Silt with some sand, black, discolored, strong 2' - 12' Screen Setting odor 0.02" Slot Width -5 **Bentonite** Type of Seal -Type of Filterpack -#2 Sand Cement/Bentonite Type of Grout -**MEASUREMENTS (NGYD)** 10 6.541 Top of Casing Elevation -Static Water Level Elevation 3.78" Silty clay with trace sand, ML green, medium stiff Date Measured -1/9/87 grades to brown with some Surface Elevation -6.46 peat fibers TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. **Cement Grout** DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. -A25 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/27/86 Driller -Warren George Drilling Completed -Supervising D & M 2/27/86 Mark Robertson Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 10" Borehole Diam. -Borehole Depth -13' Casing/Screen Type -**PVC** Silty sand with trace 4" gravel, brown Casing Diam. -Casing Depth -13" 3' - 13' Screen Setting decreasing sand and graye) Slot Width -0.02 5 Type of Seal -**Bentonite** *2 Sand Type of Filterpack very moist Cement/Bentonite Tupe of Grout -MEASUREMENTS (NGYD) Silty clay, grey CL 10 10.461 Top of Casing Elevation -Static Water Level Elevation -5.16 Date Measured -1/13/87 10.381 Surface Elevation -TEST DATA 15 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -Notes: WELL CONSTRUCTION KEY * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout DAMES & MOORE

Project: Chevron/Philadelphia Refinery

Project No.

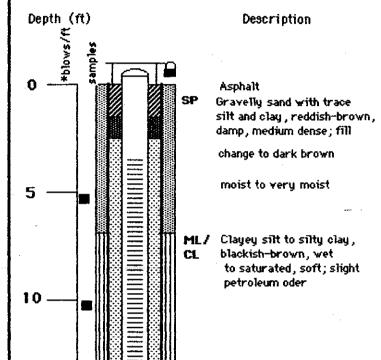
113-909-032

Date M.W. completed

2/27/86

Supervising D & M Engineer/Geologist

Ralph T. Golia



Boring/Well No. -A26

Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/27/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DA	TA
Borehole Diam	10*
Borehole Depth -	15'
Casing/Screen Type -	P∀C
Casing Diam	4-
Casing Depth -	15'
Screen Setting -	3'6" - 13'6"
Slot Width -	0.02
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (NGYD)
Top of Casing Elevation -	11.381
Static Water Level Elevatio	n - 4.23°
Date Measured -	1/13/87
Surface Elevation -	11.241
TEST DATA	
Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	

15

20

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



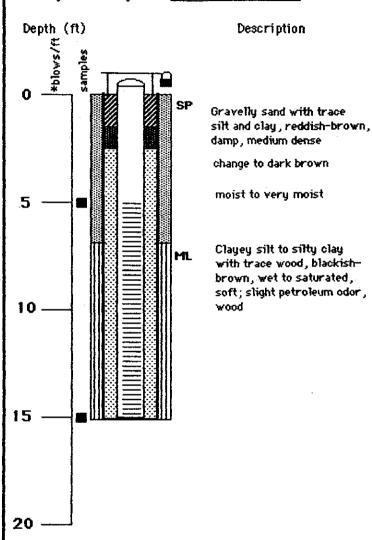
Project : Chevron/Philadelphia Refinery Project No. __113-909-032__

Date M.W. completed

2/27/86

Supervising D & M Engineer/Geologist

Ralph T. Golia



Boring/Well No. -A27

Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/27/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DAT	Α
Borehole Diam	10"
Borehole Depth -	15'
Casing/Screen Type -	PVC
Casing Diam	4-
Casing Depth -	15'
Screen Setting -	5'-15'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (N	GYD)
Top of Casing Elevation -	12.08
Static Water Level Elevation	- 3.84'
Date Measured -	1/13/87
Surface Elevation -	11.58

Notes:

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Length of Test (Hrs) -

TEST DATA

Depth to Intake (ft) Satic Water Level (ft) Pumping Water Level (ft) -

Pump Type -

Drawdown (ft) -



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Boring/Well No. - A91 Chevron/Philadelphia Refinery Project: Location -Chevron Refinery Project No. 113-950-032 Driller -Lambert, inc. Date M.W. completed 10/21/86 Drilling Completed -10/21/86 Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -15" Borehole Depth -Casing/Screen Type -PVC 4-Casing Diam. -13 Casing Depth -3'-13' Screen Setting -0.02" Slot Width -CL Clay with some silt, blackish-1 **Bentonite** Type of Seal brown, very soft, saturated; organics; petroleum odor *2 Sand Type of Filterpack -Type of Grout -MEASUREMENTS(NGVD) 10 10.85 Top of Casing Elevation -3 Decreased clay; silt and clay 5.931 Static Water Level Elevation -1/14/87 Date Measured -7.85 Surface Elevation -TEST DATA inceased silt; silt with some 15 clay; weak petroleum odor Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAVE IN MATERIAL XX DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - B39 Project No. 113-909-032 Chevron Refinery Location -Date M.W. completed 2/19/86 Driller -Warren George Supervising D & M Drilling Completed -2/19/86 David Wagner Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -15" Casing/Screen Type -PVC Sandy silt with trace clay , black-brown-grey , Casing Diam. -4" very moist, loose Casing Depth -15' Screen Setting -3'-15' Slot Width -0.02" SM Silty sand with some gravel Type of Seal -**Bentonite** visible product, black-brown, oily Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite Silty clay with clay lenses, MEASUREMENTS (NGYD) CL black-brown, organic content 10 increasing toward bottom; Top of Casing Elevation -8.73 wood fragments Static Water Level Elevation -6.681 Date Measured -1/13/87 increasing silt 8.331 Surface Elevation -TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout **DAMES & MOORE**

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - B40 113-909-032 Project No. Chevron Refinery Location -Date M.W. completed 2/18/86 Warren George Driller -Supervising D & M Mark Robertson Engineer/Geologist Drilling Completed -2/18/86 Type of Rig -Hollow Stem Auger Depth (ft) Description CONSTRUCTION DATA Borehole Diam. -10" 15" Borehole Depth -Silty sand with trace **PYC** Casing/Screen Type cobbles, brown; Casing Diam. -4" petroleum odor changes to dark gray Casing Depth -13' Screen Setting -3' - 13' 5 0.02" Slot Width -Sandy gravel with trace SP Type of Seal -**Bentonite** silt and clay, dark gray, #2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 7.17 Top of Casing Elevation -5.56 Static Water Level Elevation -1/13/87 Clayey silt with trace sand Date Measured and fibrous peat, brown. 7.17 Surface Elevation -15 TEST DATA Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project :Chevron/Philadelphia Refinery Boring/Well No. - 841 Project No. 113-909-032 Chevron Retinery Location -Date M.W. completed 2/21/86 Driller -Warren George Drilling Completed -2/21/86 Supervising D & M Mark Robertson Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description 10" Borehole Diam. -Borehole Depth -15" PYC Silty sand with some Casing/Screen Type -SM gravel, brown Casing Diam. -12' grades to black Casing Depth -2' - 12' Screen Setting -0.02" Slot Width -5 Type of Seal -Bentonite *2 Sand Type of Filterpack -Cement/Bentonite Tupe of Grout -MEASUREMENTS (NGYD) 10 -8.85 Top of Casing Elevation -6.77 Static Water Level Elevation-1/13/87 Date Measured -Silty clay with trace peat, CL 8.781 Surface Elevation grades to brown **TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 -Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack

** All soils classified by visual inspection.



Bentonite Seal

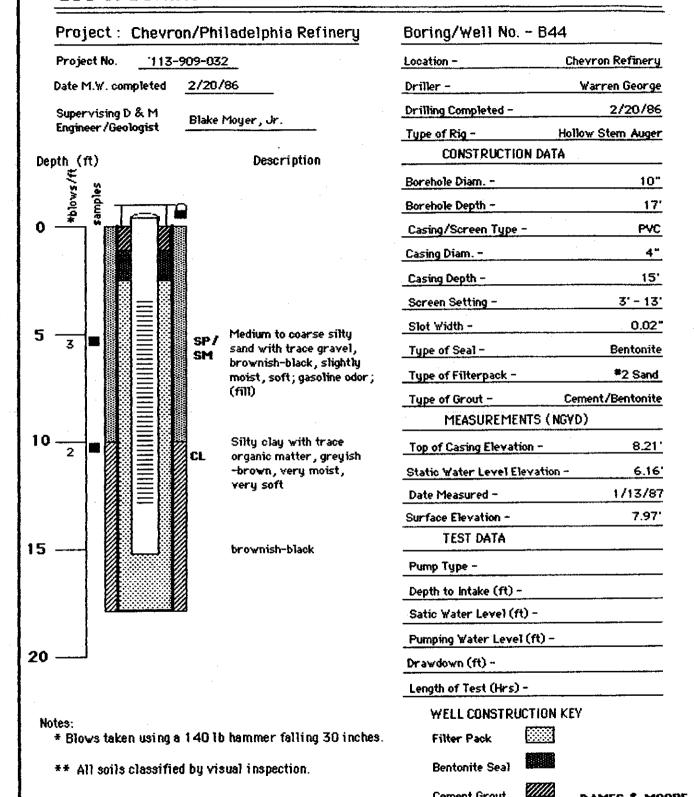


Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project :Chevron/Philadelphia Refinery Boring/Well No. - B42 Project No. 113-909-032 Chevron Refinery Location -Date M.W. completed 2/19/86 Warrien George Driller -2/19/86 Drilling Completed -Supervising D & M Engineer/Geologist Mark Robertson Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -Borehole Depth -17" PVC Casing/Screen Type -Silt with some sand and 4" cobbles, dark grey, Casing Diam. very soft; petroleum odor 15' Casing Depth -2.5' - 15' Screen Setting -Clayey silt with trace 0.02" Slot Width sand and wood, greenish -grey ,very soft Tupe of Seal -**Bentonite** #2 Sand Type of Filterpack -Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 Grades to silty sand with 8.041 Top of Casing Elevation trace gravel, dark grey-SM brown Static Water Level Elevation-7.111 1/13/87 Date Measured -8.041 Surface Elevation -TEST DATA 15 Silt, laminated, 5 greenish brown medium Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

Project: Chevron/Philadelphia Refinery Boring/Well No. - B43 Project No. Chevron Refinery 113-909-032 Location -Date M.W. completed 2/19/85 Warren George Driller -2/19/86 Drilling Completed -Supervising D & M David Wagner Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description 10" Borehole Diam. -15' Borehole Depth -PVC Casing/Screen Tupe -Silty sand with some pebbles and cobbles, black-brown, 4" Casing Diam. moist; (fill) Casing Depth -14.5 Silty clay, with coarse 3' - 14.5' Screen Setting sand, black-brown, fairly moist; brick 0.02" Slot Width fragments, (fill) 3 Bentonite Type of Seal -#2 Sand Type of Filterpack very moist Cement/Bentonite Type of Grout -MEASUREMENTS (NGVD) 9.361 Top of Casing Elevation -2 Silty to sandy clay, black-brown; (fill) Static Water Level Elevation -4.301 1/13/87 Date Measured mica flakes 9.28 Surface Elevation -TEST DATA 15 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION DETAILS * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack ** All soils classified by visual inspection. Bentonite Seal Cement Grout DAMES & MOORE



Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refineru Boring/Well No. - B45 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/20/86 Driller -Warren George 2/20/86 Drilling Completed -Supervising D & M Blake Moyer, Jr. Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" Borehole Depth -17' PVC Casing/Screen Tupe -4" Casing Diam. -Casing Depth -15' Screen Setting -3' - 15' Slot Width -0.02" Sandy clay with fine to 3 medium, silt and gravel, black, Type of Seal -**Bentonite** very moist to wet, soft; (fill) Type of Filterpack -#2 Sand Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) Silty clay to clayey 7.301 Top of Casing Elevation silt with trace fine sand, brownish-black, very moist Static Water Level Elevation -5.70 to wet, very soft; 1/13/87 Date Measured -Surface Elevation -6.981 TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - B46 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/21/86 Driller -Warren George Drilling Completed -2/21/86 Supervising D & M David Wagner Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 10" Borehole Diam. -15 Borehole Depth -Casing/Screen Type -PVC 4" Casing Diam. -Silty sand to sandy silt, SM/ Casing Depth -15" with trace gravel, brownish-GM grey, wet to saturated 2' ~ 12' Screen Setting -Slot Width -0.02" Grading to silty sand with 2 gravel, brownish-grey, Type of Seal -**Bentonite** saturated #2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 Silty clay, grey-brown, 10.561 Top of Casing Elevation -CL saturated 9.031 Static Water Level Elevation -1/13/87 Date Measured -Surface Elevation -10.47 TEST DATA 15 trace organics Pump Type -Depth to Intake (ft) ~ Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -

Notes:

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Length of Test (Hrs) -



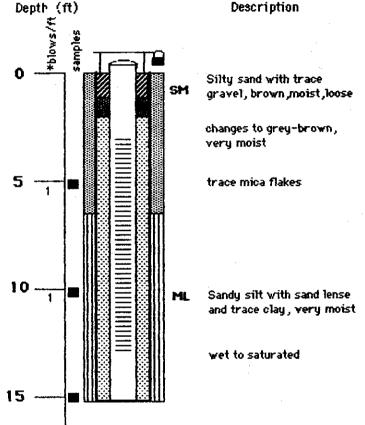
Bentonite Seal



Cement Grout



Project: Chevron/Philadelphia Refinery Project No. 113-909-032 Date M.W. completed 2/21/86 Supervising D & M David Wagner Engineer/Geologist Description



Durillan -

Boring/Well No. - B47

Dorning, morring.	
Location -	Chevron Refinery
Driller -	Warren George
Drilling Completed -	2/21/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DATA	
Borehole Diam	10"
Borehole Depth -	15'
Casing/Screen Type -	PVC
Casing Diam	4-
Casing Depth -	15'
Screen Setting -	3' - 13'
Slot Width -	
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (NGYD)	
Top of Casing Elevation -	10.561
Static Water Level Elevation	n - 7.28'
Date Measured -	1/13/87
Surface Elevation -	10.32*
TEST DATA	
Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	

Notes:

20

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - B48 Project No. Chevron Refinery 113-909-032 Location -Warren George Date M.W. completed 2/21/86 Driller -Drilling Completed -2/21/86 Supervising D & M Mark Robertson Engineer/Geologist กบะเบพ องยก ลังเดีย Type or Kig **CONSTRUCTION DATA** Deoth (ft) Description 10" Borehole Diam. -16 Borehole Depth -**PVC** Casing/Screen Type -Silty sand with trace SM gravel, brown, petroleum 4-Casing Diam. grades to dark grey 14' Casing Depth -Screen Setting -4'-14' 0.02" Slot Width trace gravel and clau Type of Seal -**Bentonite** Type of Filterpack -*2 Sand Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 very soft Top of Casing Elevation -8.901 Static Water Level Elevation -8.35 Date Measured -1/13/87 Surface Elevation -8.901 **TEST DATA** OH/ Silty sand and fibrous peat 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection.

Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Boring/Well No. - B48D Chevron/Philadelphia Refinery Project: Chevron Refinery Location -Project No. 113-950-032 Lambert, Inc. Driller -11/6/86 Date M.W. completed 11/6/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Description Depth (ft) 10" Borehole Diam. -55' Borehole Depth -**PVC** Casing/Screen Type -Fine to coarse sand with little to some fine gravel, little clay 4" Casing Diam. and silt, very dark brown, 55' soft, saturated; strong Casing Depth petroleum odor 45' - 55' Screen Setting -10 -Silt with little clay, very dark brown, soft, very moist; 0.02" Slot Width micaceous; strong petroleum Bentonite Type of Seal odor 2 increasing clay; some clay with #2 Sand Type of Filterpack abundant organics Tupe of Grout -20-Increasing clay; silt and clay MEASUREMENTS (NGYD) Decreasing clay; some clay and Top of Casing Elevation -9.82 trace fine sand; organics; weak -2.17 Static Water Level Elevation petroleum odor CL 30 Clay with some silt, dark gray, Date Measured -12/22/86 soft, very moist; organics; 8.90" Surface Elevation yery weak petroleum odor SHELBY TUBE taken TEST DATA from 30' to 31.5' Pump Tupe ~ 40 Fine to coarse sand with some Depth to Intake (ft) fine grayel, trace silt, reddish-Satic Water Level (ft) -SY 20 brown, medium dense, Pumping Water Level (ft) -Fine gravel with little to some **50** 45 fine to coarse sand, trace silt Drawdown (ft) and clay, dark reddish-brown, Length of Test (Hrs) dense, saturated; micaceous Fine to coarse sand with some 47 **WELL CONSTRUCTION KEY** fine gravel, light reddish-brown FILTER PACK to light reddish-gray, dense, BENTONITE SEAL 60saturated Notes: BENTONITE GROUT * Blows taken using a 140 lb hammer falling 30 inches. CAVE IN MATERIAL ** All soils classified by visual inspection. CONCRETE DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refineru Boring/Well No. - B92 Project No. 113-950-032 Location -Chevron Refinery Date M.W. completed 10/21/86 Driller -Lambert, Inc. Supervising D & M Drilling Completed -10/21/86 David Wagner Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -10" Borehole Depth -20. **PVC** Casing/Screen Type -Clay with little silt trace fine sand, blackish ~ brown, very 4* Casing Diam. soft, saturated; organics; 15.5 petroleum odor Casing Depth -5.5' - 15.5' Screen Setting -Slot Width -0.02" Type of Seal -**Bentonite** #2 Sand Type of Filterpack ~ Type of Grout -Increased silt; silt with some MEASUREMENTS (NGYD) 10 Top of Casing Elevation -12.33 Static Water Level Elevation -7.19" Date Measured -1/14/87 Surface Elevation -9.331 TEST DATA 15 Decreased clay; little to some Pump Type clay Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** FILTER PACK Notes: **BENTONITE SEAL**

CONCRETE

CAVE IN MATERIAL

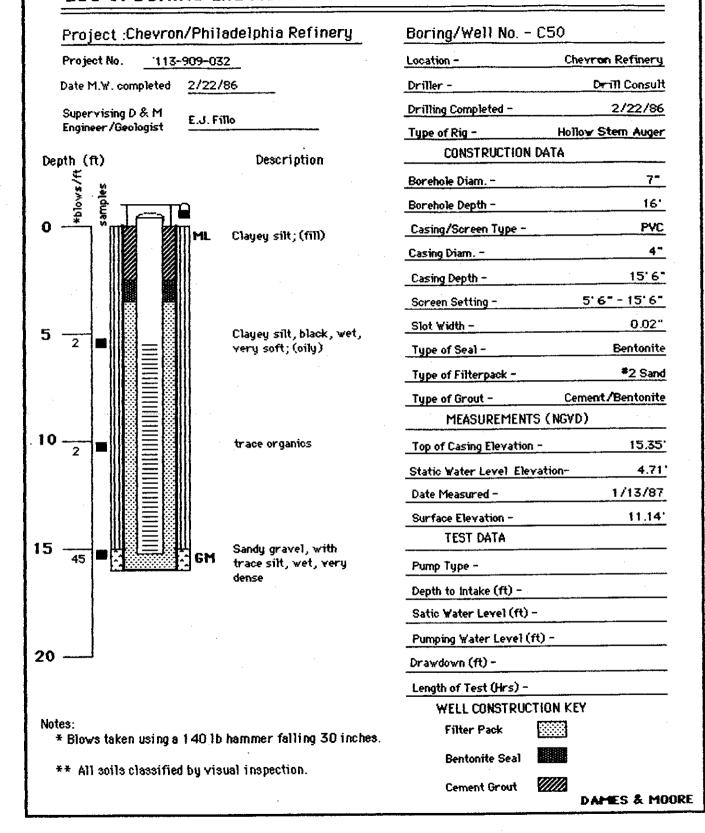
* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - 893 Project No. 113-950-032 Location -Chevron Refinery Date M.W. completed 10/22/86 Driller -Lambert, Inc. 10/22/86 Drilling Completed -Supervising D & M Dayid Wagner Geologist Hollow Stem Auger Tupe of Rig -CONSTRUCTION DATA Depth (ft) Description 10 Borehole Diam. -201 Borehole Depth -**PVC** Fine to coarse sand with little Casing/Screen Type silt and little to some fine Casing Diam. gravel, very dark brown, loose, slightly moist 13.5 Casing Depth -Fine to medium sand with SP little coarse sand and little silt <u>Screen</u> Setting -3.5' - 13.5' blackish - brown medium dense, Slot Width -0.02" saturated: micaceous: 11 petroleum odor; sheen on **Bentonite** Type of Seal water #2 Sand Type of Filterpack -Tupe of Grout -MEASUREMENTS (NGYD) Silt with little to some clay, 10 dark - brownish - gray, soft, Top of Casing Elevation -12.83" saturated; micaceous; weak petroleum odor 7.79" Static Water Level Elevation -1/14/87 Date Measured -9.83 Surface Elevation -TEST DATA 15 -CŁ Increased clay; clay with little. to some sift Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAYE IN MATERIAL DAMES & MOGRE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - B94 Chevron Refinery Location -Project No. 113-950-032 Lambert, Inc. Date M.W. completed 10/22/86 Driller -10/22/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Description Depth (ft) 10" Borehole Diam. -15* Borehole Depth -PVC Silt and fine to coarse sand and Casing/Screen Type fine gravel, dark gray, loose, 4-Casing Diam. moist Clay with little to some silt, CL 14" Casing Depth trace fine to medium sand, 4' - 14' Screen Setting dark gray, soft, moist; micaceous 0.02 Slot Width -5 Fine to coarse sand with fine 2 **Bentonite** grayel, little silt, trace clay, Tupe of Seal dark brown, loose, saturated; Type of Filterpack -*2 Sand weak petroleum odor; sheen on water Type of Grout -MEASUREMENTS (NGYD) 10 11.21 Top of Casing Elevation -5.11 Clay with some silt, dark gray, Static Water Level Elevation -CL soft, saturated; micaceous 1/14/87 Date Measured -8.03 Surface Elevation -TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY FILTER PACK** BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAVE IN MATERIAL DAMES & MOORE

Project :Chevron/Phi	ladelphia Refinery	Boring/Well No C	.49
Project No. 113-909-032		Location -	Chevron Refinery
Date M.W. completed 2/22/	86	Driller -	Drill Consult
Supervising D & M		Drilling Completed -	2/22/86
Engineer/Geologist T. Hele	<u>Jason</u>	Type of Rig ~	Hollow Stem Auger
Depth (ft)	Description	CONSTRUCTION D	ATA
		Borehole Diam	7"
*blows/ff		Borehole Depth -	
) The second sec	Gravelly silt with trace	Casing/Screen Type -	PVC
	brick fragments, brown	Casing Diam	4"
CL		Casing Depth ~	18'
		Screen Setting -	8' - 18'
	074	Slot Width -	0.02"
11	Silty clay with some fine sand, greyish-brown,	Type of Seal -	Bentonite
	slightly moist	Type of Filterpack -	#2 Sand
		Type of Grout -	Cement/Bentonite
0 -3 -		MEASUREMENTS	(NGYD)
	petroleum odor, decomposed material trace coarse sand, wet	Top of Casing Elevation -	12.16
		Static Water Level Elevat	ion - 5.94'
		Date Measured -	1/13/87
		Surface Elevation -	10.92'
5		TEST DATA	
3		Pump Type -	
		Depth to Intake (ft) –	
		Satic Water Level (ft) -	
		Pumping Water Level (ft)	! -
		Drawdown (ft) -	
		Length of Test (Hrs) -	
		WELL CONSTRUCTION	ON KEY
lotes:		Filter Pack	
* Blows taken using a 140 lb hammer falling 30 inches.		Bentonite Seal	
** All soils classified by visual inspection.		Cement Grout	DAMES & MOOR



Project: Chevron/Philadelphia Refinery

Project No.

113-950-032

Date M.W. completed

11/4/86

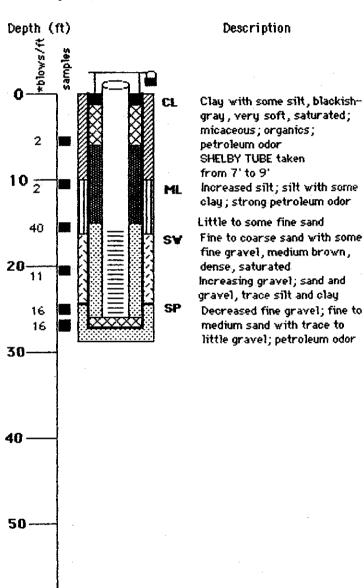
Supervising D & M

Geologist

60-

DAMES & MOORE

David Wagner



* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No C	50D
Location -	Chevron Refinery
Driller -	Lambert, Inc.
Drilling Completed -	11/4/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DA	ΓA
Borehole Diam	10"
Borehole Depth -	27'
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth -	26'
Screen Setting -	16' - 26'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	
MEASUREMENTS()	IGYD)
Top of Casing Elevation -	13.76
Static Water Level Elevation	n - 1.43'
Date Measured -	12/22/86
Surface Elevation -	10.97
TEST DATA	.,
Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	·

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WELL CONSTRUCTION KEY

FILTER PACK
BENTONITE SEAL
BENTONITE GROUT
CAYE IN MATERIAL



CONCRETE

Length of Test (Hrs) -

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C51 Project No. 113-909-032 Chevron Refinery Location -Date M.W. completed 2/25/86 Drill Consult Driller -2/25/86 Drilling Completed -Supervising D & M Blake Moyer, Jr. Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -7" Borehole Depth -14 Casing/Screen Type -PYC 4" Casing Diam. -. Casing Depth -13 Screen Setting -3' - 13' Slot Width -0.02" 5 2 Silty clay, reddish brown, CŁ Type of Seal -**Bentonite** very moist, very soft #2 Sand Type of Filterpack -Tupe of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 trace organics, moist, Top of Casing Elevation -10.711 soft Static Water Level Elevation -7.861 Date Measured -1/13/87 Surface Elevation -9.06 very moist to wet TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 -Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal Cement Grout ** All soils classified by visual inspection. DAMES & MOORE

Project: Chevron/Philadelphia Refinery Project No. 113-909-032 Date M.W. completed 2/25/86 Supervising D & M Blake Moyer, Jr Engineer/Geologist Depth (ft) Description Silty clay with trace 2 organics, reddish-brown,

moist, very soft

trace sand, soft

greyish-black, moist to wet, petroleum odor

Notes	

20

10

15

2

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

Borir	ng/Well	No.	- C52

DUTING WELL NO C	J <u>Z</u>
Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/25/86
Type of Rig –	Hollow Stem Auger
CONSTRUCTION DA	TA
Borehole Diam	7"
Borehole Depth -	14'
Casing/Screen Type -	PYC
Casing Diam	4"
Casing Depth -	13'
Screen Setting -	3' - 13'
Slot Width -	0.02"
Type of Seal -	Bentonite
Type of Filterpack -	#2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (NGYD)
Top of Casing Elevation -	10.14
Static Water Level Elevati	on - 2.91'
Date Measured -	1/13/87
Surface Elevation -	9.07*
TEST DATA	
Pump Type -	
Depth to intake (ft) –	
Satic Water Level (ft) -	<u> </u>
Pumping Water Level (ft)	
Drawdown (ft) -	
Length of Test (Hrs) -	

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C53 Project No. Chevron Refinery 113-909-032 Location -2/24/86 Drill Consult Date M.W. completed Driller -Drilling Completed -2/24/86 Supervising D & M T. Helgason Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Description Depth (ft) 7" Borehole Diam. -16" Borehole Depth -PYC Casing/Screen Tupe -ML Clayey silt to silty sand with some fine sand, trace 4" Casing Diam. brick fragments and gravel, 15' black; (fill) Casing Depth -5' - 15' Screen Setting -0.02" Slot Width -Sandy silt, fine 11 Type of Seal -**Bentonite** #2 Sand Type of Filterpack -Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 11.931 2 Top of Casing Elevation -Silty clay with trace fine sand, black 6.781 Static Water Level Elevation -1/13/87 Date Measured -10.13" Surface Elevation grading to gray, less fine **TEST DATA** 15 3 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Filter Pack Notes: Bentonite Seal * Blows taken using a 140 lb hammer falling 30 inches. Cement Grout ** All soils classified by visual inspection. DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C54 Project No. Chevron Refinery 113-909-032 Location -Date M.W. completed 2/24/86 **Drill Consult** Driller -Drilling Completed -2/24/86 Supervising D & M T. Helgason Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 7" Borehole Diam. -Borehole Depth -16 Casing/Screen Type -PVC Clayey silt with some fine sand and trace cobbles. 4" Casing Diam. black 14' Casing Depth -4'-14' Screen Setting -0.02" Slot Width -Sandy silt with trace 2 **Bentonite** brick fragments, black; (fill) Type of Seal -#2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 9.581 Top of Casing Elevation -2 trace fine to coarse sand Static Water Level Elevation -8.44 1/13/87 Date Measured -8.26 Surface Elevation -TEST DATA 15 Silty clay with trace wood 3 Pump Type blackish-grey, Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

Project: Chevron/Philadelphia Refinery Project No. 113-909-032

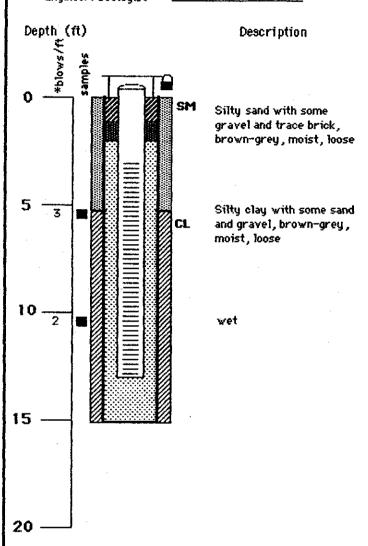
Date M.W. completed

2/24/86

Supervising D & M Engineer/Geologist

Notes:

David Wagner



* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No. - C55

Location -

Chevron Refinery Driller -Warren George

Drilling Completed -2/24/86

Type of Rig -Hollow Stem Auger

CONSTRUCTION DATA

Borehole Diam. -10" Borehole Depth -15'

Casing/Screen Type -**PYC**

4" Casing Diam. -Casing Depth -15'

5' - 15' Screen Setting -0.02* Slot Width -

Bentonite Type of Seal -

#2 Sand Type of Filterpack -

Type of Grout -Cement/Bentonite MEASUREMENTS (NGVD)

Top of Casing Elevation -12.211

Static Water Level Elevation -6.73"

Date Measured -1/13/87 Surface Elevation -8.31'

TEST DATA

Pump Type -

Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C56 Project No. 113-909-032 Chevron Refinery Location -Date M.W. completed 2/24/86 Driller -Drill Consult Drilling Completed -2/24/86 Supervising D & M T. Helgason Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -14" Borehole Depth -PVC Casing/Screen Type -Clayey silt with some fine to coarse sand, trace Casing Diam. cobbles and trace brick Casing Depth -13" fragments , blackish-grey 3' - 13' Screen Setting -Slot Width -0.02" Type of Seal -Bentonite #2 Sand Type of Filterpack -Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 11.77" trace fine sand Top of Casing Elevation -Static Water Level Elevation -9.39" 1/13/87 Date Measured -10.041 trace wood Surface Elevation -**TEST DATA** 15 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection.

Cement Brout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C57 Location -Chevron Refinery Project No. 113-909-032 Date M.W. completed 2/24/86 **Drill Consult** Driller -2/24/86 Drilling Completed -Supervising D & M T. Helgason Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 7" Borehole Diam. -15'6" Borehole Depth -PVC Casing/Screen Tupe -SM Silty sand, fine brown 4" Casing Diam. -14'6" Casing Depth -Clayey slit with some fine 4'6" - 14'6" Screen Setting sand, black 0.02" Slot Width -3 Type of Seal -**Bentonite** #2 Sand Type of Filterpack -Silty clay to clayey silt CL with some fine sand, black; Cement/Bentonite Type of Grout wood fragments MEASUREMENTS (NGYD) 10 10.77" Top of Casing Elevation -Static Water Level Elevation -7.67" Date Measured -1/13/87 10.61 Surface Elevation -TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C58 Chevron Refinery Project No. 113-909-032 Location -Date M.W. completed 2/29/86 Driller -Drill Consult Drilling Completed -2/29/86 Supervising D & M Dave Wagner Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 7" Borehole Diam. -14'6" Borehole Depth -PVC Casing/Screen Type -Silty sand with trace clay 4" and gravel, black, wet, loose Casing Diam. -Casing Depth -13' 3' - 13' Screen Setting -0.02" Slot Width -5 3 Bentonite Type of Seal -#2 Sand Tupe of Filterpack -Type of Grout -Cement/Bentonite **MEASUREMENTS (NGYD)** 10 9.75 Top of Casing Elevation -Silty claywith trace CL organics, black-brown, Static Water Level Elevation -8.57" wet, loose 1/13/87 Date Measured -9.581 Surface Elevation -TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C59 Project No. Chevron Refinery 113-909-032 Location -Date M.W. completed 2/24/86 Driller -**Drill Consult** Drilling Completed -2/24/86 Supervising D & M David Wagner Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -15 Borehole Depth -PVC Casing/Screen Type -Silty clay with some gravel, 4" black, moist, loose Casing Diam. -Casing Depth -14' 4' - 14' Screen Setting -Slot Width -0.02" black-brown 5 2 Type of Seal -Bentonite *2 Sand Type of Filterpack wet to saturated Type of Grout -Cement/Bentonite **MEASUREMENTS (NGYD)** 10 Top of Casing Elevation -9.75" Static Water Level Elevation -8.73 1/13/87 Date Measured -9.67 Surface Elevation -TEST DATA 15 trace sand, very moist Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C60 Project No. 113-909-032 Location -Chevron Refinery 2/24/86 Date M.W. completed Driller -Drill Consult Supervising D & M Drilling Completed -2/24/86 Dave Wagner Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -7" Borehole Depth -14" Casing/Screen Type -PVC 4" Casing Diam. -GM/ Sandy to silty gravel, GC black-brown, moist, loose Casing Depth -13" Screen Setting -3' - 13' Slot Width -0.02 2 Bentonite Type of Seal -Sandy to silty clay, Type of Filterpack -*2 Sand brown-grey, wet, yery soft Tupe of Grout -Cement/Bentonite MEASUREMENTS (NGVD) 10 Top of Casing Elevation -9.85 black-brown, trace organics Static Water Level Elevation -6.05 Date Measured -1/13/87 Surface Elevation -8.61 TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal

DAMES & MOORE

Cement Grout

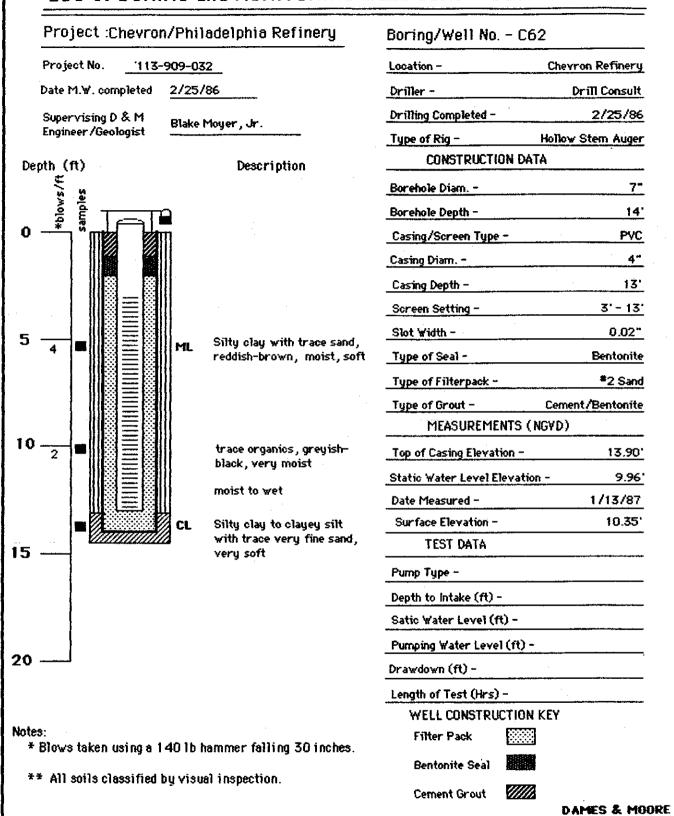
** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C61 Chevron Refinery Project No. Location -113-909-032 **Drill Consult** 2/25/86 Driller -Date M.W. completed Drilling Completed -2/25/86 Supervising D & M Blake Moyer, Jr. Engineer/Geologist Hollow Stern Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 7-Borehole Diam. -14 Borehole Depth -Casing/Screen Type -PVC SP 4" Casing Diam. -Sand with trace gravel 13" Casing Depth -3' - 13' Screen Setting -0.02" Slot Width -5 Silty clay with trace Bentonite Type of Seal sand, brownish-black, slightly moist, very soft CL #2 Sand Type of Filterpack -Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 11.27 Top of Casing Elevation -7.72 Static Water Level Elevation -1/13/87 Date Measured -9.871 Surface Elevation very moist, soft **TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Bentonite Seal

Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C63 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/24/86 Driller -Drill Consult Drilling Completed -2/24/86 Supervising D & M T. Helgason Engineer/Geologist Hollow Stern Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description 7" Borehole Diam. -Borehole Depth -17' Casing/Screen Tupe -PVC Sandy silt, fine, black 4" Casing Diam. -Casing Depth -13" 3' - 13' Screen Setting -Slot Width -0.02" 5 Clayey silt with some fine 2 Type of Seal -**Bentonite** to coarse sand, blackish-Type of Filterpack -*2 Sand Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) CL 10 Top of Casing Elevation -9.22 Silty clay with trace wood, blackish grey 4.02" Static Water Level Elevation -Date Measured -1/13/87 Surface Elevation -7.821 TEST DATA 15 Clayey peat with some wood 2 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection.

Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C64 Chevron Refinery Project No. 113-909-032 Location -Date M.W. completed 2/24/86 **Drill Consult** Driller -2/24/86 Drilling Completed -Supervising D & M Daye Wagner Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -14'6" Borehole Depth -**PVC** Casing/Screen Type -Silty clay with gravel and brick, black-brown, 4" Casing Diam. moist; (fill) 13' Casing Depth -3' - 13' Screen Setting -0.02" Slot Width -Sandy clay with trace SC/ silt, gravel and brick, Type of Seal -**Bentonite** SP błack-brown, very moist Type of Filterpack -#2 Sand Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 Silty clay with trace Top of Casing Elevation -10.211 ML organics, moist Static Water Level Elevtation -3.72" 1/13/87 Date Measured -8.401 Surface Elevation wet TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Bentonite Seal

Cement Grout

Project: Chevron/Philadelphia Refinery

Project No.

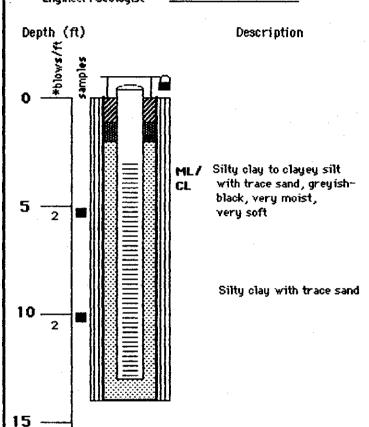
113-909-032

Date M.W. completed

2/25/86

Supervising D & M Engineer/Geologist

Blake Moyer, Jr.



Boring/Well No. - C65

Location - Chevron Refinery

Driller - Drill Consult

Drilling Completed - 2/25/86

Type of Rig - Hollow Stern Auger

CONSTRUCTION DATA

 Borehole Diam. 7"

 Borehole Depth 14"

 Casing/Screen Type PVC

Casing/Screen Type - PVC
Casing Diam. - 4*

Casing Depth - 13'

 Screen Setting 3' - 13'

 Slot Width 0.02"

Type of Seal - Bentonite

Type of Filterpack - *2 Sand

Type of Grout - Cement/Bentonite

MEASUREMENTS (NGYD)

Top of Casing Elevation - 13.33'

Static Water Level Elevation - Not Available

 Date Measured 1/15/87

 Surface Elevation 9.70°

TEST DATA

Pump Type -

Depth to Intake (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -

Drawdown (ft) -

Length of Test (Hrs) -

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



DAMES & MOORE

Notes:

20

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Project: Boring/Well No. - C65D Project No. 113-950-032 Chevron Refineru Location -Date M.W. completed 11/11/86 Lambert, Inc. Driller -11/11/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -75' Borehole Depth -PVC Casing/Screen Type -Silt with trace to little fine to 4" coarse sand, trace fine gravel, Casing Diam. black, moist; strong petroleum 751 Casing Depth odor; brick fragments Silt with little clay, medium Screen Setting -65' - 75' 10 gray , soft , moist ; organics 0.02" Slot Width -Tupe of Seal -**Bentonite** 5 #2 Sand Tupe of Filterpack -20 Type of Grout -**Bentonite** MEASUREMENTS (NGYD) SHELBY TUBE taken 11.96 from 25' to 27' Top of Casing Elevation -Trace mica Static Water Level Elevation --2.16" 30 Decreasing density; very soft Date Measured -12/22/86 9.94 Surface Elevation -TEST DATA Pump Type -40 Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -Increasing density; soft 50 Drawdown (ft) -Decreasing clay; trace clay and trace fine sand Length of Test (Hrs) -8 **WELL CONSTRUCTION KEY** Increasing sand; little fine sand, stratified FILTER PACK BENTONITE SEAL 60 Notes: 6 BENTONITE GROUT * Blows taken using a 140 lb hammer falling 30 inches. CAVE IN MATERIAL ** All soils classified by visual inspection. CONCRETE DAMES & MOORE

Project: Chevron/Philadelphia Refinery

Boring/Well No. - C65D (Cont.)

Project No.

113-950-032

Date M.W. completed

11/12/86

Supervising D & M Geologist

David Wagner

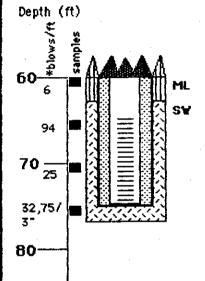
* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Location -	Chevron Refinery	
Driller -	Lambert, Inc.	
Drilling Completed -	11/12/8	

Type of Rig -

Hollow Stem Auger



Description

1" interbeds of fine to coarse sand from 60' to 62' Fine to coarse sand with little fine gravel, trace to little clay, trace silt, brownish-gray, medium dense, saturated

Decreasing clay; no clay

WELL CONSTRUCTION KEY

FILTER PACK
BENTONITE SEAL
BENTONITE GROUT
CAVE IN MATERIAL



CONCRETE

DAMES & MOORE

Notes:

90

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - C95 Chevron Refinery Froject No. 113-950-032 Location -Date M.W. completed 10/22/86 Lambert, Inc. Driller -10/22/86 Drilling Completed -Supervising D & M David Wagner Geologist Type of Rig -Hollow Stern Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -10" 20' Borehole Depth -PYC Casing/Screen Type -Macadam underlain by gravel Fine to coarse sand with some 4" Casing Diam. fine gravel, little silt, black, 201 Casing Depth dry; brick fragments 10' - 20' Screen Setting -Silt with little to some clau. dark - gray, soft, moist; 0.02" Slot Width organics; micaceous; weak 3 petroleum odor Type of Seal -**Bentonite** #2 Sand Type of Filterpack -Type of Grout -MEASUREMENTS(NGYD) 10 14.84 Top of Casing Elevation -Static Water Level Elevation -8.71 1/14/87 Date Measured -12.381 Surface Elevation -TEST DATA 15 increasing moisture; saturated Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAYE IN MATERIAL [XX] **DAMES & MOORE**

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LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Boring/Well No. - C96 Chevron/Philadelphia Refinery Project: Chevron Refinery Location -Project No. 113-950-032 Lambert, inc. 10/23/86 Driller -Date M.W. completed 10/23/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Description Depth (ft) 10 Borehole Diam. -20' Borehole Depth -**PYC** Casing/Screen Type -Slag, silt and sand 4-Casing Diam. -ML Silt with little to some clay and trace fine sand, dark -17 Casing Depth gray, soft, slightly moist, 7' - 17' organics; micaceous; Screen Setting petroleum odor 0.02" Slot Width -2 Bentonite Tupe of Seal -Increased moisture; moist *2 Sand Type of Filterpack -Tupe of Grout -MEASUREMENTS (NGYD) 10. Top of Casing Elevation -14.61 7 Increased moisture; saturated 9.96 Static Water Level Elevation -1/14/87 Date Measured -11.51 Surface Elevation -TEST DATA 15 . 3 Increased organics Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY**

Notes:

Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

FILTER PACK

BENTONITE SEAL CONCRETE



CAVE IN MATERIAL

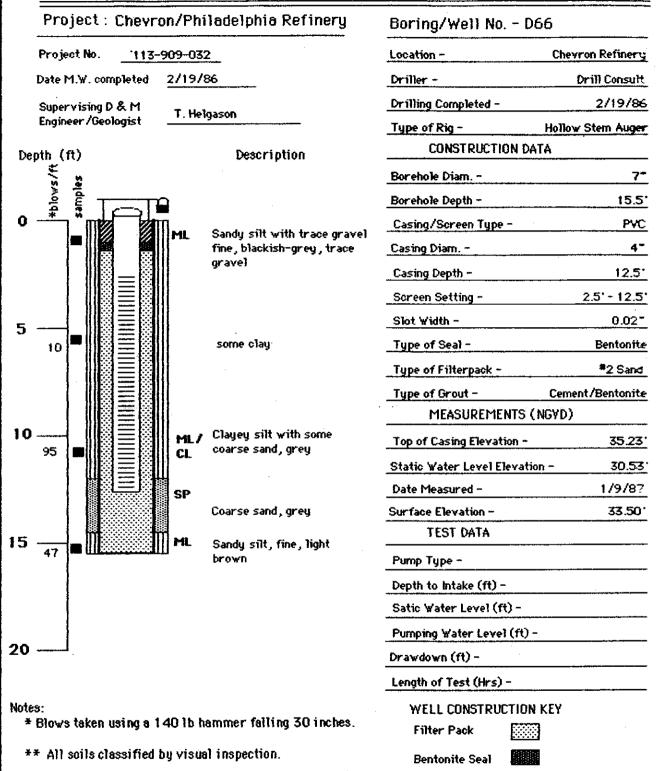


LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Boring/Well No. - C97 Project: Chevron Refinery Location -Project No. 113-950-032 Lambert, Inc. Driller -Date M.W. completed 10/23/86 10/23/86 Drilling Completed -Supervising D & M David Wagner Hollow Stem Auger Geologist Type of Rig -CONSTRUCTION DATA Description Depth (ft) 10" Borehole Diam. -20' Borehole Depth -PYC Casing/Screen Type -Silt with little to some clay, little fine gravel, trace fine to 4" Casing Diam. coarse sand, blackish - brown, soft, slightly moist to moist; 15" Casing Depth brick fragments; petroleum 5' - 15' Screen Setting -0.02" Slot Width -5 Bentonite Type of Seal -2 Sand Type of Filterpack -Type of Grout -Fine to coarse sand with some MEASUREMENTS (NGYD) fine gravel, little silt, little clay, blackish - gray and 10 13.071 Top of Casing Elevation brown, loose, saturated; brick fragments; strong Static Water Level Elevation -3.17" petroleum odor; sheen on water 1/14/87 Date Measured -9.68 Surface Elevation -TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -Silt with some clay, blackish-20 Drawdown (ft) gray, soft, very moist; organics; petroleum odor Length of Test (Hrs) -WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 1401b hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAVE IN MATERIAL DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Boring/Well No. - C98 Chevron/Philadelphia Refinery Project: Chevron Refinery Location -Project No. 113-950-032 Lambert, Inc. Driller -Date M.W. completed 10/23/86 10 /23/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Tupe of Rig -CONSTRUCTION DATA Description Depth (ft) 10" Borehole Diam. -20. Borehole Depth -PVC Casing/Screen Type -Fine to medium sand and gravel SP 4" Casing Diam. -Silt with little clay, little to 16.5" Casing Depth fine to medium sand, little to some fine gravel, grayish -6.5' - 16.5' Screen Setting black, medium stiff, moist; micaceous; glass and brick 0.02" Slot Width fragments; strong petroleum 5 7 Type of Seal -Bentonite odor #2 Sand Type of Filterpack -Type of Grout -MEASUREMENTS (NGYD) 10 12.901 Top of Casing Elevation -Silt with some clay, grayish -3 brown, soft, moist, weak 5.98" Static Water Level Elevation petroleum odor 1/14/87 Date Measured -9.47 Surface Elevation -TEST DATA 15 Increasing moisture; saturated Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY **FILTER PACK** BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE

CAVE IN MATERIAL

** All soils classified by visual inspection.



DAMES & MOORE

Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Boring/Well No. - D67 Project: Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/19/86 Driller -**Drill Consult** Drilling Completed -Supervising D & M 2/19/86 E.J. Fillo Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -Borehole Depth -25' Casing/Screen Type -PVC Crushed Stone; (fill) Casing Diam. -Casing Depth -24' Screen Setting -14' - 24' Silty clay with trace fine sand, dark gray, moist, Slot Width -0.02" very soft; micaceous Type of Seal -Bentonite Type of Filterpack -*2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 Top of Casing Elevation -16.12" Static Water Level Elevation -2.33 1/9/87 Date Measured -Surface Elevation -12.821 medium stiff TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Fine sandy and silty GM Drawdown (ft) gravel,dark gray Length of Test (Hrs) -WELL CONSTRUCTION KEY Silty clay, dark gray Filter Pack Bentonite Seal 25 weathered bedrock; mica schist Cement Grout DAMES & MOORE

Boring/Well No. - D68 Project: Chevron/Philadelphia Refinery Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/20/86 Driller -Drill Consult. Drilling Completed -2/20/86 Supervising D & M T. Helgason Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -7-15'6" Borehole Depth -PVC Casing/Screen Type -Sandy silt with some cobbles, ML fine , light brown Casing Diam. -Casing Depth -12'6" 2'6" - 12'6" Screen Setting -0.02" Slot Width -SP 5 Silty fine to coarse sand with some cobbles, tan, Type of Seal -**Bentonite** moist Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 -Top of Casing Elevation -13.28" Mica schist, weathered to Static Water Level Elevation -9.04 ms 1/9/87 Date Measured -Surface Elevation -9.73 **TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. **Cement Grout**

Project: Chevron/Philadelphia Refinery Project No. 113-909-032 Date M.W. completed 2/19/86 Supervising D & M T. Helgason Engineer/Geologist Depth (ft) Description Sand with some grayel, fine to coarse, brown Sandy silt, fine, greyish-black, wet 5 10 Sand, fine to coarse, SM hight brown; (fill) 15 20 * Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No. - D69

Boring/Well No DE	9
Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/19/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DAT	ſA
Borehole Diam	7"
Borehole Depth -	
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth -	13.51
Screen Setting -	2.5' - 12.5'
Slot Width -	0.02*
Type of Seal -	Bentonite
Type of Filterpack -	*2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (1	NGYD)
Top of Casing Elevation -	14.97
Static Water Level Elevation	on ~ 10:60*
Date Measured -	1/9/87
Surface Elevation -	12.91
TEST DATA	
Pump Type -	
Depth to Intake (ft) -	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	· · · · · · · · · · · · · · · · · · ·
Length of Test (Hrs) -	
WELL CONSTRUCTION	ON KEY

Filter Pack

Bentonite Seal



Cement Grout



Project: Chevron/Philadelphia Refinery Boring/Well No. - D70 Project No. 113-909-032 Location -Cheyron Refinery 2/19/96 Date M.W. completed Driller -Supervising D & M Drilling Completed -E.J. Fillo Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -Borehole Depth -Casing/Screen Tupe -Oily crushed stone; (fill) Casing Diam. -Casing Depth -Screen Setting -Slot Width -5 Sandy silt, very fine, ML dark brown, wet, very Type of Seal soft; oily Type of Filterpack -Cement/Bentonite Tupe of Grout -MEASUREMENTS (NGYD) 10 Silty clay, dark gray, Top of Casing Elevation moist, very soft; micaceous Static Water Level Elevation-Date Measured -Surface Elevation -**TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -

Notes:

- * Blows taken using a 140 lb hammer falling 30 inches.
- ** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



DAMES & MOORE

Drill Consult

2/19/86

7"

17

PYC

4"

15

5' - 15'

0.02"

Bentonite

#2 Sand

12.54

9:691

1/9/87 11.381

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - D71 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/20/86 Driller -Drill Consult Drilling Completed -2/20/86 Supervising D & M Andre Ivansiu Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description 7" Borehole Diam. -25' Borehole Depth -**PVC** Casing/Screen Tupe -4" Casing Diam. -20' Casing Depth -Screen Setting -5' - 20' SM/ SC Slot Width -0.02" 5 Silty sand to clavey sand. Type of Seal dark grey to black, moist, **Bentonite** soft *2 Sand Type of Filterpack -Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 -Top of Casing Elevation -13.22 CL Static Water Level Elevation -5.79 1/9/87 Date Measured -Surface Elevation -10.41 TEST DATA 15 Silty clay, dark grey, moist, soft Pump Type ~ Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Silty sand, dark grey, Drawdown (ft) moist, soft Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack 25 Bentonite Seal Cement Grout DAMES & MOORE

Project: Chevron/Philadelphia Refineru Boring/Well No. - D72 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/20/86 Driller -Drill Consult Drilling Completed -Supervising D & M 2/20/86 T. HELGASON Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 7" Borehole Diam. -Borehole Depth -15'6" Casing/Screen Type -PYC Sand with trace cobbles. SP fine to coarse, dark brown 4" Casing Diam. -Casing Depth -14 4' - 14' Screen Setting ~ Slot Width -0.02" 5 grading to light brown ML/ 5 with increased silt content Type of Seal -**Bentonite** Tupe of Filterpack -#2 Sand Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 -Clayey silt with trace Top of Casing Elevation -15.581 14 fine sand, light brown, moist Static Water Level Elevation -6.54 Date Measured -1/9/87 Surface Elevation -13.76" 13 TEST DATA 15 -Weathered bedrock, tan; mica schist Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Filter Pack

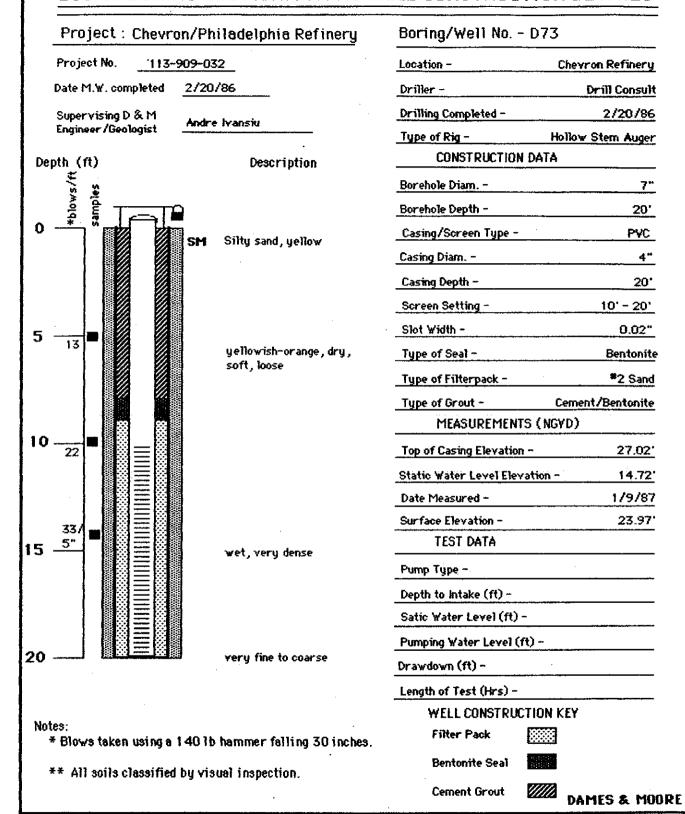


Bentonite Seal



Cement Grout





LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - D107 Chevron Refinery Project No. 113-950-032 Location -10/1/86 Date M.W. completed Driller -Lambert, inc. 10/1/86 Drilling Completed -Supervising D & M David Wagner Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Description Depth (ft) Borehole Diam. -17' Borehole Depth -PVC Casing/Screen Type -Silt with little clay, some fine ML gravel, brown, soft, moist 4" Casing Diam. -12.5 Casing Depth -Grades to grayish - brown Increased moisture; very moist Screen Setting -2.5' - 12.5' Sift and clay, medium gray, 0.02" Slot Width soft to medium stiff, moist; 5 2 wood debris; micaceous Tupe of Seal -Bentonite Type of Filterpack -#2 Sand Type of Grout -MEASUREMENTS (NGYD) Medium sand with little silt, 10 ____ trace coarse sand, brown, 10.27 Top of Casing Elevation medium dense, very moist 4.871 Static Water Level Elevation -1/14/87 Date Measured -7.27 Surface Elevation -TEST DATA 15 Decreasing silt; trace silt 12 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAVE IN MATERIAL XX DAMES & MOORE

Chevron/Philadelphia Refinery Boring/Well No. - D108 Project No. 113-950-032 Location -Chevron Refinery Date M.W. completed 10/1/86 Driller -Lambert, Inc. Supervising D & M Drilling Completed -10/1/86 David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -Borehole Depth -Casing/Screen Type -Silt with little to some clau and trace fine sand grauish -Casing Diam. brown, soft, slightly moist; micaceous Casing Depth -CL Clau with some silt, trace. 4'-14' Screen Setting fine to medium sand, trace fine gravel, gray and brown. Slot Width -0.02" medium dense, slightly moist 18 Type of Seal -Bentonite Increasing sand; some sand Silt with some clay and some Type of Filterpack -#2 Sand fine to medium sand, trace Type of Grout fine gravel, gray and brown, MEASUREMENTS(NGVD) dense , moist Top of Casing Elevation -10.871 33 Fine sand with some silt and Static Water Level Elevation -5.32" trace to little clay, grayish -Date Measured -1/14/87 brown, dense, saturated Surface Elevation -8.37 **TEST DATA** 15 50/5" Refusal at 15'; Wissahickon Pump Type -Schist

20

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

DAMES & MOORE

WELL CONSTRUCTION KEY

FILTER PACK BENTONITE SEAL

Depth to Intake (ft) -Satic Water Level (ft) -

Length of Test (Hrs) -

Drawdown (ft) -

Pumping Water Level (ft) -



6"

15

PVC

14"

4"

CONCRETE



CAVE IN MATERIAL

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - D109 Project No. Location -Chevron Refinery 113-950-032 Date M.W. completed 10/2/86 Driller -Lambert, Inc. Drilling Completed -10/2/86 Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 6" Borehole Diam. -15 Borehole Depth -Casing/Screen Type -**PVC** Silt with some fine to coarse sand, brown, loose, slightly Casing Diam. -4" moist 12.5" Casing Depth -2.5' - 12.5' CL Screen Setting -Clay with some coarse mica and trace silt, light brown -0.02" Slot Width orange, soft, slightly moist; 18 weathered Wissahickon Schist Type of Seal -**Bentonite** #2 Sand Type of Filterpack -Type of Grout -MEASUREMENTS(NGVD) 10 Top of Casing Elevation -18.31 20 Increasing moisture and density ; medium dense , Static Water Level Elevation -14.61 saturated Date Measured -1/14/87 Surface Elevation -16.10" **TEST DATA** Increasing density; dense 15 34 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Fumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAVE IN MATERIAL XX DAMES & MOORE

Project : Chevron/Philadelphia Refinery

Project No.

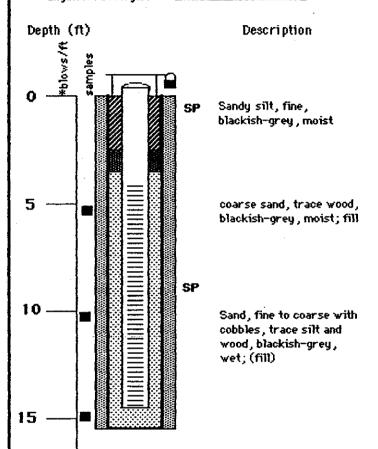
113-909-032

Date M.W. completed

2/21/86

Supervising D & M Engineer/Geologist

T. Helgason



Boring/	Well N	ln - :	S74
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501 mg/ 11011 110. 01	
Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/21/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DAT	TA
Borehole Diam	7*
Borehole Depth -	15'6"
Casing/Screen Type -	PVC
Casing Diam	4"
Casing Depth –	14*
Screen Setting -	4'-14'
Slot Width -	•
Type of Seal -	Bentonite
Type of Filterpack -	\$2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (1	NGYD)
Top of Casing Elevation -	14.54
Static Water Level Elevation	n - 6.95'
Date Measured -	1/9/87
Surface Elevation -	12.81
TEST DATA	
Pump Type -	
Depth to Intake (ft) -	

WELL CONSTRUCTION KEY

Filter Pack

Length of Test (Hrs) -

Drawdown (ft) -

Satic Water Level (ft) -

Pumping Water Level (ft) -



Bentonite Seal



Cement Grout



DAMES & MOORE

Notes:

20

 \star Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

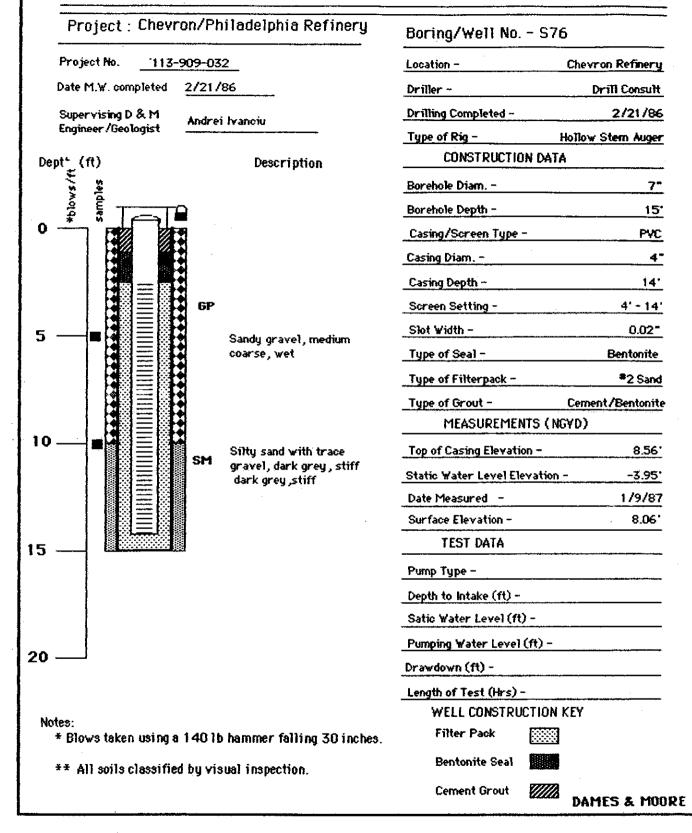
Project: Chevron/Philadelphia Refinery Boring/Well No. - S75 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/21/86 Driller -Drill Consult Drilling Completed -2/21/86 Supervising D & M T. Helgason Engineer/Geologist Hollow Stem Auger Tupe of Rig -CONSTRUCTION DATA Dept'_ (ft) Description 7-Borehole Diam. -15.6 Borehole Depth -Casing/Screen Type -PVC Sandy silt with trace gravel, fine, blackish-grey, 4" Casing Diam. -15'6" Casing Depth -5' 6" - 15' 6" Screen Setting -Slot Width -0.02" Silty fine sand with SP trace grayel and wood, Type of Seal -Bentonite blackish-grey, moist ₹2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) GM 10. Coarse sandy gravel with 13.19" Top of Casing Elevation silt lenses and trace wood, 6.45 blackish-greu, Static Water Level Elevation -Date Measured -1/19/87 12.781 Surface Elevation -TEST DATA 15 -Fine sandy silt, blackish-grey Pump Type -Depth to Intake (ft) ~ Satic Water Level (ft) -Pumping Water Level (ft) -20 -Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal

** All soils classified by visual inspection.



Cement Grout





Project: Chevron/Philadelphia Refineru Boring/Well No. - S77 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/20/86 Driller -Drill Consult Supervising D & M Drilling Completed -2/20/86 T. Helgason Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description 7" Borehole Diam. -Borehole Depth -16' Casing/Screen Type -PVC Fine to coarse sand with trace silt and mica schist Casing Diam. -4" Casing Depth -15' Screen Setting -5' - 15' Slot Width -0.02" Type of Seal -Bentonite Type of Filterpack -#2 Sand SP Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 Sandy gravel with Top of Casing Elevation -6.201 trace silt, fine Static Water Level Elevation--4.11 Date Measured -1/9/87 Surface Elevation -5.201 TEST DATA 15 Silty gravel, fine, brown, coarse sand, Pump Type trace mica schist Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection.

Cement Grout

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - S78 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/21/86 Driller -Drill Consult Supervising D & M Drilling Completed -2/21/86 T. Helgason Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 7-Borehole Diam. -Borehole Depth -18. PVC Casing/Screen Tupe -Sandy silt, brown, slightly moist. Casing Diam. -4-14' Casing Depth -4' - 14' Screen Setting ~ 0.02" Slot Width fine, moist Type of Seal -Bentonite Type of Filterpack -#2 Sand Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 SP Fine sand with cobbles 2.77 Top of Casing Elevation and some silt lenses, wet Static Water Level Elevation --4.691 Date Measured -1/9/87 Surface Elevation -2.52 **TEST DATA** 15 Sandy gravel, coarse, brown Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -

* Blows taken using a 1401b hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - 579 Project No. 113-909-032 Location -Chevron Refinery 2/21/86 Date M.W. completed Driller -Drail Consult Drilling Completed -2/21/86 Supervising D & M Andrei Ivanciu Engineer/Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -7" 15 Borehole Depth -Casing/Screen Type -PVC Sand with trace silt. SM dark greu to black 4" Casing Diam. -14'6" Casing Depth -CL Silty clay, dark grey, 4'6" - 14'6" Screen Setting moist, soft Slot Width -0.02" 5 Type of Seal -**Bentonite** #2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite grades to sandy grayel, MEASUREMENTS (NGYD) dark grey, moist 10 GY/ 3.88° Top of Casing Elevation -Silty gravel, dark grey, Static Water Level Elevation --3.94 wet 1/9/87 Date Measured -Surface Elevation -3.72 TEST DATA 15 Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal

Cement Grout

DAMES & MOORE

** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project : Chevron/Philadelphia Refinery Boring/Well No. - \$80 Chevron Refinery Location -Project No. 113-909-032 Drill Consult 2/21/86 Date M.W. completed Driller -2/21/86 Drilling Completed -Supervising D & M Andrei ivanciu Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Description Depth (ft) *blows/f 7" Borehôle Diam. -20. Borehole Depth -PVC Casing/Screen Type -Silty sand, dark gray, SM 4" Casing Diam. -15" Casing Depth -4'8" - 14'8 " Screen Setting -0.02" Slot Width -5 Bentonite Type of Seal -2 Sand Type of Filterpack -Cement/Bentonite Tupe of Grout -MEASUREMENTS (NGVD) 10 some pebbles, dark gray, Top of Casing Elevation -3.20 wet, soft -4.80" Static Water Level Elevation -1/9/87 Date Measured -3.12" Surface Elevation -TEST DATA 15 Silty clay, dark grey, wet. Pump Type -Sandy gravel, grey to GP Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - S81 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/21/86 Driller -Drill Consult Drilling Completed -Supervising D & M 2/20/86 Andrei Ivansiu Engineer/Geologist Type of Rig - Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -7" Borehole Depth -15 Casing/Screen Type -**PVC** Clay, brown, plastic, 4" Casing Diam. stightly moist Casing Depth -13'3" Screen Setting -3'3" - 13'3" Slot Width -0.02" Silty to clayey sand 6 Type of Seal -Bentonite Type of Filterpack -#2 Sand Tupe of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 Sand with gravel, coarse, 37 Top of Casing Elevation -3.57 dark gray to brown, wet, SP stiff, dense Static Water Level Elevation --4.55 Date Measured -1/9/87 Surface Elevation -1.51 TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal

DAMES & MOORE

Cement Grout

** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - S82 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/25/86 Driller -Drill Consult Drilling Completed -2/25/86 Supervising D & M Blake Moyer, Jr. Engineer/Geologist Tupe of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description Borehole Diam. -Borehole Depth -14" PVC Casing/Screen Type -4" Casing Diam. -Casing Depth -13" Screen Setting -3' - 13' 2 Slot Width -0.02" Silty clay , greyish-black , dry to moist, very loose Tupe of Seal -**Bentonite** Type of Filterpack -#2 Sand Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) moist, soft Top of Casing Elevation -3.001 Static Water Level Elevation -1.301 Date Measured -1/9/87 SC/ Silty clay with trace sand, Surface Elevation -1.761 moist to wet, very soft **TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Filter Pack Notes: Bentonite Seal * Blows taken using a 140 lb hammer falling 30 inches. Cement Grout ** All soils classified by visual inspection. DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - S83 Project No. 113-909-032 Chevron Refinery Location -Date M.W. completed 2/22/86 Driller -Drill Consult Drilling Completed -2/22/86 Supervising D & M T. Helgason Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 7-Borehole Diam. -Borehole Depth -15'6" Casing/Screen Type -**PVC** ML Clayey silt, some fine to coarse sand, blackish-grey, 4" Casing Diam. -13 Casing Depth -Screen Setting -3' - 13' 4 Slot Width -0.02" 5 Bentonite Type of Seal -#2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite CL MEASUREMENTS (NGYD) 3 10 -Top of Casing Elevation -4.35 Silty clay with some fine sand, blackish-grey, wet Static Water Level Elevation' --0.53 Date Measured -1/9/87 3.55 Surface Elevation -TEST DATA 16 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -

Notes:

20

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

WELL CONSTRUCTION KEY

Filter Pack

Length of Test (Hrs) -

Drawdown (ft) -

Bentonite Seal

Pumping Water Level (ft) -



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Boring/Well No. - \$104 Project: Chevron Refinery . Project No. 113-950-032 Location -10/3/86 Driller -Lambert, inc. Date M.W. completed 10/3/86 Drilling Completed -Supervising D & M David Wagner Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 6" Borehole Diam. -15" Borehole Depth -PVC Casing/Screen Type -Fine to coarse sand with little loose, moist; glass and ceramic 4" fragments 15" Casing Depth -Screen Setting -5' - 15' 0.02" Slot Width -5 Type of Seal -Bentonite #2 Sand Type of Filterpack -Tupe of Grout -MEASUREMENTS(NGYD) 10 Top of Casing Elevation -11.971 Clay with little silt, gray, very Static Water Level Elevation -3.17" soft, moist; organics Date Measured -1/14/87 2 9.25 Surface Elevation -Increasing organic content, TEST DATA increased silt; clay with 15 some silt Pump Type ~ SHELBY TUBE taken from 15' to 17' Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY FILTER PACK** BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection. CAVE IN MATERIAL DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Chevron/Philadelphia Refinery Project: Boring/Well No. - \$105 Project No. 113-950-032 Chevron Refinery Location -Date M.W. completed 10/7/86 Driller -Lambert, inc. Drilling Completed -10/7/86 Supervising D & M David Wagner Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description 10" Borehole Diam. -701 Borehole Depth -Casing/Screen Type -PVC Silt with little clay and little fine sand, dark brownish-gray. Casing Diam. soft, very moist; organics; micaceous Casing Depth -12.51 Screen Setting -2.5' - 12.5' 10 ____ Slot Width -0.02" Fine gravel with little fine to coarse sand and little silt, Type of Seal -**Bentonite** 15 brown, medium dense, saturated Type of Filterpack -#2 Sand Grading to dark reddish-brown 20 Type of Grout -**Bentonite** 12 increased sand; sand and fine MEASUREMENTS(NGVD) gravel Decreased gravel: some gravel Top of Casing Elevation ~ 3.83 16 -4.351 Static Water Level Elevation -30__ Grading to light reddish-brown Date Measured -1/14/87 Surface Elevation -0.831 47 Grading to brownish-yellow. **TEST DATA** dense Pump Type -40 Grading to reddish-brown Depth to Intake (ft) -Satic Water Level (ft) -18 Grading to grayish-red-brown Pumping Water Level (ft) -50 Increased grayel: fine grayel GP Drawdown (ft) with little to some sand, light Length of Test (Hrs) grayish-brown Grading to yellowish-brown 26 SP **WELL CONSTRUCTION KEY** Decreased gravel and coarse FILTER PACK sand: fine to medium sand with 60-BENTONITE SEAL trace fine grayel Notes: BENTONITE GROUT * Blows taken using a 140 lb hammer falling 30 inches. CAVE IN MATERIAL ** All soils classified by visual inspection. CONCRETE DAMES & MOORE

Project: Chevron/Philadelphia Refinery

Boring/Well No. - S105 (Cont.)

Project No.

113-950-032

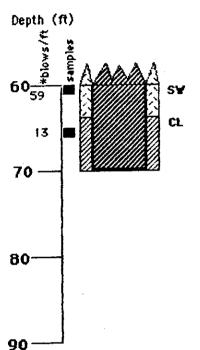
Date M.W. completed

10/7/86

Supervising D & M Geologist

David Wagner

Location -	Chevron Refinery		
Driller -	Lambert, Inc.		
Drilling Completed -	10/7/86		
Type of Rig -	Hollow Stem Auger		



increased gravel and coarse sand: fine to coarse sand with some fine gravel; micaceous Clay with little to some silt and trace fine sand; gray, stiff, moist;

Description

micaceous

WELL CONSTRUCTION KEY

FILTER PACK
BENTONITE SEAL

BENTONITE GROUT

CAVE IN MATERIAL

CONCRETE



Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Boring/Well No. - \$106 Project: Chevron/Philadelphia Refinery Chevron Refinery Location -Project No. 113-950-032 Lambert, inc. 10/2/86 Driller -Date M.W. completed 10/2/86 Drilling Completed -Supervising D & M David Wagner Geologist Hollow Stem Auger Type of Rig -**CONSTRUCTION DATA** Description Depth (ft) 6" Borehole Diam. -15' Borehole Depth -Silt with little clay, trace fine Casing/Screen Type -PVC to medium sand, trace fine 4" Casing Diam. gravel, dark brown, soft, 13" moist; glass and brick Casing Depth fragments 3' - 13' Screen Setting -0.02" Slot Width -Increasing moisture; saturated **Bentonite** Type of Seal -#2 Sand Type of Filterpack -Type of Grout -Increasing gravel; some fine MEASUREMENTS (NGYD) orave) 10 12.13" Top of Casing Elevation -7.04 Clay with little silt, trace Static Water Level Elevation fine sand, gray, soft, very 1/14/87 Date Measured -9.13' Surface Elevation -TEST DATA Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -**WELL CONSTRUCTION KEY** FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. CONCRETE ** All soils classified by visual inspection.

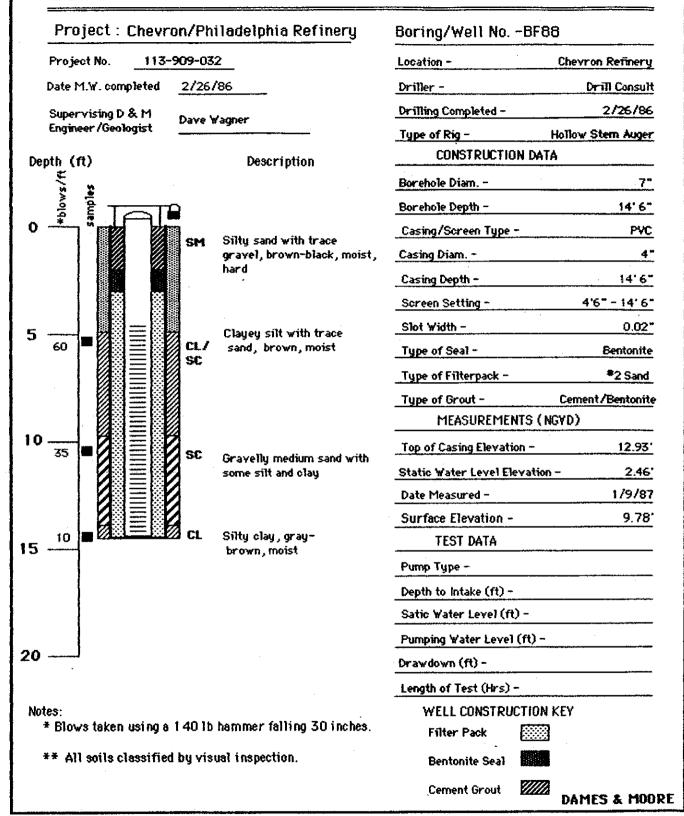
DAMES & MOORE

CAVE IN MATERIAL

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - H85 Project No. 113-909-032 Cheyron Refinery Location -2/26/86 Drill Consult Date M.W. completed Driller -2/26/86 Drilling Completed -Supervising D & M Dave Wagner Engineer/Geologist Hollow Stem Auger Type of Rig -CONSTRUCTION DATA Depth (ft) Description 7" Borehole Diam. -16' Borehole Depth -PYC Casing/Screen Type -SM Silty sand with trace 4" gravel, brown-black, moist Casing Diam. -13' Casing Depth ~ 3'-13' Screen Setting -Slot Width -0.02" 5 3 Type of Seal -Bentonite #2 Sand Type of Filterpack -Cement/Bentonite Type of Grout -**MEASUREMENTS (NGYD)** 10 Silty sand with trace Top of Casing Elevation -12.23 2 clay, brownish gray, wet, very soft Static Water Level Elevation -4.37 1/9/87 Date Measured -9.92 Surface Elevation -Silty clay with trace TEST DATA SC 15 organics, black-brown, wet Pump Type -Depth to intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE

LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - H86 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/26/86 Driller -Drill Consult Drilling Completed -2/26/86 Supervising D & M Dave Wagner Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Depth (ft) Description *blows/ft 7" Borehole Diam. -Borehole Depth -16' PVC Casing/Screen Type -SM Silty sand with trace gravel and clay, fine, 4" Casing Diam. brown-black, moist Casing Depth -13" Screen Setting -3' - 13' Slot Width -0.02" 5 Type of Seal -**Bentonite** Type of Filterpack -*2 Sand Type of Grout -Cement /Bentonite CL MEASUREMENTS (NGYD) 10 Silty clay with trace sand, Top of Casing Elevation -13.201 2 black-brown, moist Static Water Level Elevation-5.94 Date Measured -1/9/87 Surface Elevation -9.86 **TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack * Blows taken using a 140 lb hammer falling 30 inches. Bentonite Seal ** All soils classified by visual inspection. DAMES & MOORE Cement Grout

Project: Chevron/Philadelphia Refinery Boring/Well No. - H87 Project No. 113-909-032 Location -Chevron Refinery Date M.W. completed 2/26/86 Driller -**Drill Consult** Drilling Completed -2/26/86 Supervising D & M Dave Wagner Engineer/Geologist Type of Rig -Hollow Stem Auger CONSTRUCTION DATA Depth (ft) Description Borehole Diam. -Borehole Depth -14'6" Casing/Screen Type -PVC Silty sand with trace gravel, black, moist 4" Casing Diam. -13 Casing Depth -SC Silty clay, brown-black, Screen Setting -3' - 13' moist Slot Width -0.02" 5 SM/ Type of Seal -**Bentonite** Silty sand with trace gravel, SC black-brown, moist; free Type of Filterpack -*2 Sand product Cement/Bentonite Type of Grout -MEASUREMENTS (NGYD) 10 Silty clay, black-brown, CL Top of Casing Elevation -12.15" 2 wet, loose Static Water Level Elevation -6.06 Date Measured -1/9/87 9.59 Surface Elevation -**TEST DATA** 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: * Blows taken using a 140 lb hammer falling 30 inches. Filter Pack Bentonite Seal ** All soils classified by visual inspection. Cement Grout DAMES & MOORE



Project: Chevron/Philadelphia Refinery Project No. 113-909-032 Date M.W. completed 2/19/86 Supervising D & M T. Helgason Engineer/Geologist Depth (ft) Description Gravel to crushed stone, light brown Silty gravel with some course sand, dark brown 5 Gravel with some white 17 gravel with greenish deposits, reddish brown Fine to coarse sand with 14 some cobbles, dark brown 15 20 Notes:

* Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Boring/Well No. - BF89

Doi ing/ weil No. Di	
Location -	Chevron Refinery
Driller -	Drill Consult
Drilling Completed -	2/19/86
Type of Rig -	Hollow Stem Auger
CONSTRUCTION DA	ΓA
Borehole Diam	7"
Borehole Depth -	13.5
Casing/Screen Tupe -	PVC
Casing Diam	. 4"
Casing Depth -	13.5'
Screen Setting -	3.5* - 13.5*
Slot Width -	0.02
Type of Seal -	Bentonite
Type of Filterpack -	■2 Sand
Type of Grout -	Cement/Bentonite
MEASUREMENTS (NGYD)
Top of Casing Elevation -	11,81
Static Water Level Elevatio	n - 2.61 '
Date Measured -	1/9/87
Surface Elevation -	11.57
TEST DATA	
Pump Type -	
Depth to Intake (ft) –	
Satic Water Level (ft) -	
Pumping Water Level (ft) -	
Drawdown (ft) -	
Length of Test (Hrs) -	

WELL CONSTRUCTION KEY

Filter Pack



Bentonite Seal



Cement Grout



LOG of BORING and MONITORING WELL CONSTRUCTION DETAILS Project: Chevron/Philadelphia Refinery Boring/Well No. - BF90 113-909-032 Project No. Location -Chevron Refinery 2/19/86 Date M.W. completed Driller -Drill Consult 2/19/86 Drilling Completed -Supervising D & M E. J. Fillo Engineer/Geologist Type of Rig -Hollow Stem Auger **CONSTRUCTION DATA** Description Depth (ft) Borehole Diam. -7" Borehole Depth -15" Casing/Screen Type -**PYC** Black oily fill (crushed 4" stone) Casing Diam. -13' Casing Depth -Black oily fill Screen Setting -3' - 13' Slot Width -0.02 5 Silty clay with trace fine CL Type of Seal -Bentonite sand, light brown, wet, soft #2 Sand Type of Filterpack -Type of Grout -Cement/Bentonite MEASUREMENTS (NGYD) 10 Silty clay with plant 9.68 Top of Casing Elevation -2 fragments, brownish gray, wet, very soft Static Water Level Elevation -8.33* 1/9/87 Date Measured -Silty clay with plant 9.44 fragments, gray, wet, Surface Elevation -5 medium stiff TEST DATA 15 Pump Type -Depth to Intake (ft) -Satic Water Level (ft) -Pumping Water Level (ft) -20 Drawdown (ft) -Length of Test (Hrs) -WELL CONSTRUCTION KEY Notes: Filter Pack # Blows taken using a 140 lb hammer falling 30 inches.

** All soils classified by visual inspection.

Bentonite Seal



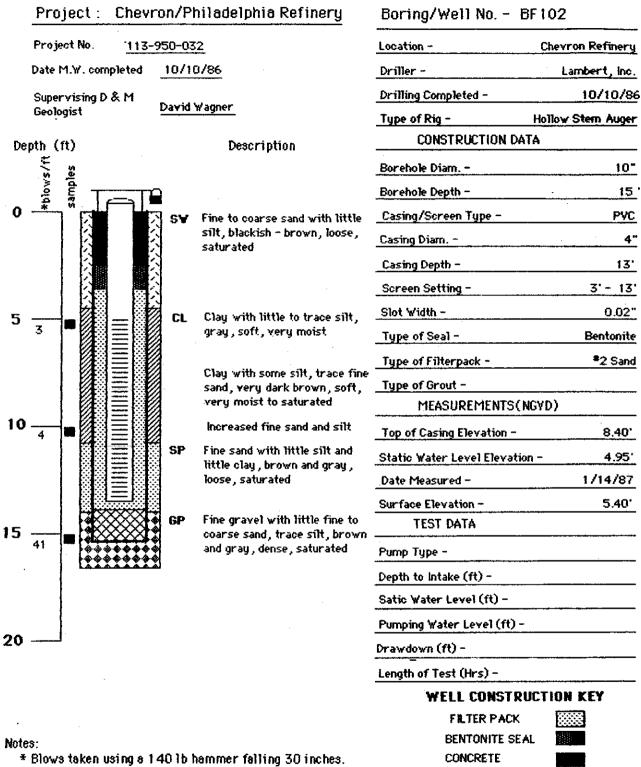
Cement Grout



Project: Chevror	n/Philadelphia Refinery	Boring/Well No BF99)
Project No. 113-95	0-032	Location - CI	vevron Refinery
Date M.W. completed 1	10/21/86	Driller -	Lambert, Inc.
Supervising D & M	****	Drilling Completed -	10/21/86
Beologist <u>Di</u>	avid 'Wagner	Type of Rig - Hol	low Stem Auger
Depth(ft.)	Description	CONSTRUCTION DATA	
		Borehole Diam	10-
samples /#/		Borehole Depth -	35.
	ML Silt with little to some fine	Casing/Screen Type -	PVC
	sand, trace clay, medium brown, medium dense, moist;	Casing Diam	4*
18	organics	Casing Depth -	19.5'
10	Fine to coarse sand with little	Screen Setting -	9.5' - 19.5'
	fine gravel, medium brown, SW dense, moist; strong petroleum	Slot Width -	0.02*
31 2 3 2 3 3	odor GP Fine gravel with little fine to	Type of Seal -	Bentonite
	coarse sand, trace silt, medium brown, dense,	Type of Filterpack -	#2 Sand
	saturated; strong petroleum	Type of Grout -	
7 8 8	odor Fine to medium sand with trace	MEASUREMENTS (NGYD)
15	silt, light brown, loose, saturated	Top of Casing Elevation -	13.37
	Grading to orange-brown	Static Water Level Elevation -	2.28
30 13	Trace to little clay and gravel; weak petroleum odor	Date Measured -	1/14/87
	Fine to coarse sand with trace	Surface Elevation -	12.62
16	fine gravel, trace silt, orange- brown, medium dense,	TEST DATA	
40	saturated	Pump Type -	3-12-11-11-11-11-11-11-11-11-11-11-11-11-
		Depth to Intake (ft) –	****
		Satic Water Level (ft) -	
		Pumping Water Level (ft) -	· · · · · · · · · · · · · · · · · · ·
50		Drawdown (ft) -	
		Length of Test (Hrs) -	
		WELL CONSTRUCT	
40		FILTER PACK	
60		BENTONITE SEAL	
	0 lb hammer falling 30 inches.	BENTONITE GROUT	
** All soils classified by visual inspection.		CAVE IN MATERIAL	XXX3
DAMES & MOORE		CONCRETE	

Date M.W. completed 10/17/86 Supervising D & 11 David Wagner Depth (rft) Description Descrip	Project: Chevron/P	hiladelphia Refinery	Boring/Well No BF10	0
Depth (ft) Description CL Clay with some silt, trace fine sand, light brown, stiff, moist Silt and clay, trace gravel, meeting fine gravel, yellowish-brown, dense, saturated SP Fine to coarse sand with some fine gravel, yellowish-brown, medium dense, saturated SP Fine to medum sand with trace to little silt, lighty gray with some silt, trace clay, gray sish-brown, medium dense, saturated 10 21 21 22 24 25 24 26 26 26 26 26 26 26 26 26 26 26 26 26	Project No. <u>113-950-03</u>	<u>32</u>	Location - Che	evron Refinery
Depth (ft) Description Descri	Date M.W. completed 10/1	7/86	Driller -	Lambert, Inc.
Depth (ft) Description Descri	Supervising D & M		Drilling Completed -	10/17/86
Borehole Diam. — 10" Borehole Diam. — 10" Borehole Diam. — 10" Borehole Diam. — 10" Casing Diam. — 4" Casing Depth — 19.5" Soreen Setting — 9.5" - 19.5" Tupe of Seal — Bentonite Fine to medum sand with trace to little sitl, trace clay, gray ish-brown, medium dense, saturated Fine to medum sand with trace to little sitl, trace clay, gray ish-brown, medium dense, saturated Fine to medum sand with trace to little sitl, trace clay, gray ish-brown, medium dense, saturated Fine to medum sand with trace to little sitl, trace clay, gray ish-brown, medium dense, saturated Fine to medum sand with trace to little sitl, trace clay with some sitl, gray moist Static Water Level Elevation — 11.46" TEST DATA TEST D	Geologist <u>David</u>	Wagner	Type of Rig - Holl	ow Stem Auger
Borehole Diam. — 10° Borehole Depth — 33° Casing Diam. — 4" Casing Diam. — 4" Sitt and clay, trace gravel, medium brown, stiff, moist horeasing sitt; sit with little to some clay Fine to coarse sand with some filt, trace of little sit, light yellowish-brown, medium dense, saturated 1° clay lense from 29° to 30°; clay with some sit, gray, moist saturated 1° clay lense from 29° to 30°; clay with some sit, gray, moist to little fine gravel, years, saturated 1° clay lense from 29° to 30°; clay with some sit, gray, moist to little fine gravel, trace clay fine to coarse sand with trace to little sit, trace clay fine to coarse sand with trace to little sit, trace clay fine to coarse sand with trace to little fine gravel, trace sit, or angish-brown, medium dense, saturated 1° clay lense from 29° to 30°; clay with some sit, gray, moist to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to coarse sand with trace to little fine gravel, trace clay fine to medium dense, saturated 1° clay lense from 29° to 30°; clay with some sit, gravel, g	Depth (ft)	Description	CONSTRUCTION DATA	
CL Clay with some silt, trace fine sand, light brown, stiff, moist Silt and clay, trace gravel, medium brown, stiff, moist increasing silt, silt with little to some clay Ph. Increasing silt, silt with little to some clay Fine to coarse sand with some fine gravel, yellowish-brown, medium dense, saturated Fine to medium sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated 1 clay into some clay SP Fine to coarse sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated 1 clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 1 clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 50 SV Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated SV Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated SV Decreasing Denth Casing Denth 19.5' Soreen Setting 9.55-19.5' Solt Width - 0.02" Type of Grout - Bentonite MEASUREMENTS (NGYD) Top of Casing Elevation - 1.79' Static Water Level Elevation - 1.79' Date Measured - 1/14/87 Early Date Measured - 1/14/87 Date Measured - 1/14/87 Early Date Measured - 1/14/87 Date Measured - 1/14/87 Early Date Measured - 1/14/87 Date Measured - 1/14/87 Early Date Measured - 1/14/87 Ea	·		Borehole Diam	10"
CL Clay with some silt, trace fine sand, light brown, stiff, moist Silt and clay, trace gravel, medium brown, stiff, moist increasing silt, silt with little to some clay Ph. Increasing silt, silt with little to some clay Fine to coarse sand with some fine gravel, yellowish-brown, medium dense, saturated Fine to medium sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated 1 clay into some clay SP Fine to coarse sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated 1 clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 1 clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 50 SV Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated SV Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated SV Decreasing Denth Casing Denth 19.5' Soreen Setting 9.55-19.5' Solt Width - 0.02" Type of Grout - Bentonite MEASUREMENTS (NGYD) Top of Casing Elevation - 1.79' Static Water Level Elevation - 1.79' Date Measured - 1/14/87 Early Date Measured - 1/14/87 Date Measured - 1/14/87 Early Date Measured - 1/14/87 Date Measured - 1/14/87 Early Date Measured - 1/14/87 Date Measured - 1/14/87 Early Date Measured - 1/14/87 Ea			Borehole Depth -	33.
fine sand, light brown, stiff, moist nereasing silt; silt with little to some clay Increasing silt; silt with little to some clay Fine to coarse sand with some fine gravel, yellowish-brown, medium dense, saturated Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated Fine to coarse sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated Fine to medum sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace olay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated Sy Price to coarse sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace clay Fine to coarse sand with trace to little fine gravel, trace clay Fine to medum dense, startade Fine to medum sand with trace to little clay, little silt, jet of Grout — MEASUREMENTS(NGVD) Tupe of Grout — MEASUREMENTS(NGVD) Static Water Level Elevation — 1.79' Date Measured — 1.714/87 Satic Water Level (ft) — Davedown (ft) — Davedown (ft) — Ength of Test (Hrs) — WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL BENTONITE SEAL BENTONITE SEAL BENTONITE SEAL CANE IN MATERIAL CONNECTE		Clau with some silt trace		PYC
Silt and clay, trace gravel, medium brown, stiff, moist increasing silt; silt with little to some clay 21 20 21 21 21 20 21 21 20 21 21 20 21 21 20 21 21 20 21 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 21 20 21 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 20 21 21 20 21 20 21 20 21 20 21 21 20 21 21 20 21 21 20 21 21 20 21 21 20 21 21 21 21 21 21 21 21 21 21 21 21 21	1 1/1999 9899//1	fine sand, light brown, stiff,		4"
medium brown, stiff, moist Increasing silt; silt with little to some clay Fine to coarse sand with some fine gravel, yellowish-brown, dense, saturated Fine sand with little clay, little silt, hight yellowish-brown, medium dense, saturated Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense saturated Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 10			Casing Depth -	19.5'
to some clay Fine to coarse sand with some fine gravel, yellowish-brown, dense, saturated Fine sand with little clay, little sitl, light yellowish-brown, medium dense, saturated Fine to medum sand with trace to little slit, trace clay, grayish-brown, medium dense, saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 1/14/87 Surface Elevation - 11.46' Surface Elevation - 11.46' TEST DATA 1/14/87 Surface Elevation - 11.46' TEST DATA 1/14/87 Surface Elevation - 11.46' TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) - Prawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL ** All soils classified by visual inspection. ** Blows taken using a 140 lb hammer falling 30 inches. ** All soils classified by visual inspection.		medium brown, stiff, moist	Screen Setting -	9.5' - 19.5'
fine gravel, yellowish-brown, dense, saturated Fine sand with little clay, little silt, light yellowish-brown, medium dense, saturated Fine to coarse sand with trace to little fine gravel, trace clay, grayish-brown, medium dense, saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 10' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 11' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 11' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 11' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown medium dense, saturated 11' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown medium dense, saturated 11' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gray delication — 1.79' Date Measured — 1.79'			Slot Width -	0.02"
dense, saturated fine sand with little clay, little silt, light yellowish- brown, medium dense, saturated fine to medium dense, saturated fine to medium dense, saturated l' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay fine to coarse sand with trace to little fine gravel, trace silt, orangish-brown, medium dense, saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay fine to coarse sand with trace to little fine gravel, trace silt, orangish-brown, medium dense, saturated 40 50 Entrace Elevation - 11.46' TEST DATA TE	31 ■		Type of Seal -	Bentonite
silt, light yellowish- brown, medium dense, saturated Fine to medium sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 40 — Satic Water Level Elevation - 1.79' Date Measured - 1/14/87 Surface Elevation - 11.46' TEST DATA Pump Type - Depth to Intake (ft) - Satic Water Level (ft) - Pumping Water Level (ft) - Pumping Water Level (ft) - Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL BENTONITE SEAL BENTONITE SEAL CAVE IN MATERIAL ** All soils classified by visual inspection.		dense , saturated	Type of Filterpack -	*2 Sand
Fine to medum sand with trace to little silt, trace clay, grayish-brown, medium dense, saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 10		silt, light yellowish- brown,		Bentonite
to little silt, trace clay, grayish-brown, medium dense, saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated 10	21		MEASUREMENTS (NGYD))
saturated 1' clay lense from 29' to 30'; clay with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravet, trace silt, or angish-brown, medium dense, saturated 50 Date Measured -			Top of Casing Elevation -	14.62
Total with some silt, gray, moist Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, orangish-brown, medium dense, saturated Date Measured - 1/14/87		saturated	,	1.79
Decreasing clay; trace clay Fine to coarse sand with trace to little fine gravel, trace silt, or angish-brown, medium dense, saturated Depth to Intake (ft) - Satic Water Level (ft) - Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL BENTONITE SEAL BENTONITE GROUT ** Blows taken using a 140 lb hammer falling 30 inches. ** All soils classified by visual inspection. Depth to Intake (ft) - Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE GROUT CONCRETE	30 14	clay with some silt, gray,		1/14/87
to little fine gravel, trace silt, orangish-brown, medium dense, saturated Pump Type -	25 SY		Surface Elevation -	11.46'
orangish-brown, medium dense, saturated Pump Type - Depth to Intake (ft) - Satic Water Level (ft) - Pumping Water Level (ft) - Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL BENTONITE SEAL BENTONITE GROUT WE Blows taken using a 140 lb hammer falling 30 inches. ** All soils classified by visual inspection.			TEST DATA	
Depth to Intake (ft) - Satic Water Level (ft) - Pumping Water Level (ft) - Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL BENTONITE GROUT * Blows taken using a 140 lb hammer falling 30 inches * All soils classified by visual inspection.	40	orangish-brown, medium		
Pumping Water Level (ft) - Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Motes: * Blows taken using a 140 lb hammer falling 30 inches. * All soils classified by visual inspection.		dense, saturated	Depth to Intake (ft) –	
Drawdown (ft) - Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL BENTONITE GROUT * Blows taken using a 140 lb hammer falling 30 inches. * All soils classified by visual inspection.			Satic Water Level (ft) -	
Length of Test (Hrs) - WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Motes: * Blows taken using a 140 lb hammer falling 30 inches. * All soils classified by visual inspection.			Pumping Water Level (ft) -	
WELL CONSTRUCTION KEY FILTER PACK BENTONITE SEAL Motes: * Blows taken using a 140 lb hammer falling 30 inches. * All soils classified by visual inspection. * CONCRETE	50		Drawdown (ft) -	
FILTER PACK BENTONITE SEAL Notes: * Blows taken using a 140 lb hammer falling 30 inches. ** All soils classified by visual inspection. FILTER PACK BENTONITE SEAL CAVE IN MATERIAL CONCRETE			Length of Test (Hrs) -	
* Blows taken using a 140 lb hammer falling 30 inches. CAVE IN MATERIAL CONCRETE	}		FILTER PACK BENTONITE SEAL	****
** All soils classified by visual inspection.		hammer falling 30 inches		
	** All soils classified by vis	<u> </u>		

Project: Chevr	on/Ph	iladelphia Refinery	Boring/Well No BF	101
Project No. 113-9	950-032	2	Location -	Chevron Refinery
Date M.W. completed	10/15	/86	Driller -	Lambert, Inc.
Supervising D & M	B		Drilling Completed -	10/15/86
Geologist	David Y	/agner	Type of Rig -	Hollow Stem Auger
Depth (ft)		Description	CONSTRUCTION DATA	<u> </u>
		•	Borehole Diam	10"
*blows/ff	ב		Borehole Depth -	59'
	√s¥	Fine to coarse sand, little to	Casing/Screen Type -	PVC
		some silt, trace fine gravel, blackish-brown, loose, very	Casing Diam	4"
2	CL	moist Clay with little to some silt,	Casing Depth -	13'
	GP GP	grayish-brown, soft, moist;	Screen Setting -	3' - 1 <u>3'</u>
10,4		abundant organics Fine grave) with little to some	Slot Width -	0.02"
		fine to coarse sand, trace silt, very dense, saturated	Type of Seal -	Bentonite
13	SP	Fine to medium sand with trace silt, light brown, medium dense		#2 Sand
20——		saturated	Type of Grout -	
14			MEASUREMENTS (NO	GYD)
13			Top of Casing Elevation -	9.03*
	3	Grading to fine sand with little	Static Water Level Elevation	
30 9 1	3	to some silt, trace clay Grading to fine to coarse sand	Date Measured -	1/14/87
		with little to some silt	Surface Elevation -	6.12'
37	GP	Fine gravel with little to some fine to coarse sand, trace silt,	TEST DATA	
		brown, dense, saturated	Pump Type -	
40		Fine to coarse sand with little	Depth to Intake (ft) -	
20	SA	to some fine gravel, trace silt,	Satic Water Level (ft) -	
		light brown, medium dense, saturated	Pumping Vater Level (ft) -	
50—	1	Increasing gravel; some fine	Drawdown (ft) -	
26,	3	gravel Clay with little to some silt,		
100/3"	Cr	light reddish-brown, very	Length of Test (Hrs) - WELL CONST 6	DUCTION KEY
113/6"	SW	stiff, moist Fine to coarse sand with little	FILTER PACK	****
60—		fine gravel, brown, very dense saturated	***************************************	===
Notes: * Blows taken using a 1	40 lb	hammer falling 30 inches.	BENTONITE GRO CAVE IN MATER	
** All soils classified			CONCRETE	
DAMES & MOORE				



CAVE IN MATERIAL XXX

** All soils classified by visual inspection.

Project: Chevron/Pl	niladelphia Refinery	Boring/Well No BF1	03
Project No. <u>113-950-03</u>	<u>2</u>	Location - C	hevron Refinery
Date M.W. completed 10/8	/86	Driller -	Lambert, Inc.
Supervising D & M		Drilling Completed -	10/8/86
Geologist <u>David</u>	W agner	Type of Rig - Ho	llow Stem Auger
Depth (ft)	Description	CONSTRUCTION DATA	
1		Borehole Diam	10"
*tblows/#		Borehole Depth -	35'
0 * * * SP	Fine to medium sand, some	Casing/Screen Type -	PVC
	Fine to medium sand, some silt, little fine gravel,	Casing Diam	4"
12	brownish-black, medium dense, saturated; brick fragments	Casing Depth –	14'
10 3 = 3		Screen Setting -	4' - 14'
52 GP	Fine gravel with little to some	Slot Width -	0.02"
53	fine to coarse sand, trace silt, light brown, very dense, moist	Type of Seal ~	Bentonite
		Type of Filterpack -	≇ 2 Sand
20 ₇₈ SV	Fine to coarse sand with trace to little silt, little fine gravel,	Type of Grout -	Bentonite
	light brown, very dense,	MEASUREMENTS (NGVE)
6 m / ML	26'-28' Silt with little fine to medium sand, little clay, gray,	Top of Casing Elevation -	16.731
17 ■ SP	grading to reddish-brown to-	Static Water Level Elevation -	2.09'
30 6 ML SP	ward bottom of spoon, medium stiff, saturated; wood frag-	Date Measured -	1/14/87
15 ML	ments	Surface Elevation -	13.881
25	28'-29' Fine to medium sand with trace to little silt, little	TEST DATA	
40	clay , trace coarse sand , light brown , medium dense ,	Pump Type -	
	saturated 29'-31' Silt with little fine to	Depth to Intake (ft) -	
	medium sand, trace clay,	Satic Water Level (ft) -	
	brownish-gray, medium stiff, saturated	Pumping Water Level (ft) -	
50	31'-32' Fine to medium sand with trace to little silt, little	Drawdown (ft) -	
	clay , trace coarse sand , light	Length of Test (Hrs) -	
	brown, loose, saturated 32'-37' Silt with little clay,	WELL CONSTRUCT	
60	trace to little fine sand, gray,	FILTER PACK	
60	soft, saturated	BENTONITE SEAL	
* Blows taken using a 140 lb	hammer falling 30 inches.	BENTONITE GROUT	<i>20112</i>
** All soils classified by visu		CAVE IN MATERIAL	
DAMES & MOORE		CONCRETE	

Unified Soil Classification System

Major Divisions			Major Divisions Graph Letter Symbol Typical Descriptions		Typical Descriptions
	Gravel and	Clean Gravels		GW	Well graded gravels, gravel - sand mixtures, little or no fine
Coarse Grained	Gravelly Soils	(Little or no fines)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	GP	Poorly graded gravels, gravel - sand mixtures, little or no fine
Soils	More than 50% of coarse fract- tion RETAINED	Gravels with Fines		GM	Silty gravels, gravel - sand - silt mixtures
	on No.4 sieve	(Appreciable amount of fines)		GC	Clayey gravels, gravel - sand - clay mixtures
More than 50% of material is	Sand and	Clean Sand		sw	Well - graded sands, gravelly sands, little or no fines
LARGER than No.200 sieve size	Sandy Soils	(Little or no fines)		SP	Poorly-graded sands, gravelly sands, little or no fines
	More than 50% of coarse fract-	Sands with Fines (Appreciable		SM	Silty sands, sand - silt mixtures
	No.4 sieve	amount of fines)		SC	Clayey sands, sand - clay mixtures
Fine	n•1.			ML	Inorganic silts and very fine sands or clayey silts with slight plasticity
Grained Soils	Silts and Clays	Liquid limit LESS than 50		CL	Inorganic clays of low to medium plasticity
More than 50%	'			OL	Organic silts and organic silty clays of low plasticity
of material is SMALLER thanNo.200				МН	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
sieve size Silts and Clays G		Liquid limit EATER than 50		СН	Inorganic clays of high plasticity, fat clays
	•			ОН	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils				PT	Peat, humus, swamp soils with high organic contents

Notes:

- 1. Dual symbols are used to indicate borderline classifications.
- 2. When shown on the boring logs, the following terms are used to describe the consistancy of cohesive soils and the relative compactness of cohesionless soils.

Cohesive Soils

(approximate shearing strength in KSF)

	strength in KSF)
very soft	less than 0.25
soft	0.25 to 0.5
medium stiff	0.5 to 1.0
stiff	1.0 to 2.0
very stiff	2.0 to 4.0
hard	greater than 4.0

Cohesionless Solls

very loose	These are usually
loose	based on an examina-
medium dense	tion of soil samples,
dense	penetration resist-
very dense	ance, and soil density
	data.



APPENDIX D

Product Bail Test Data and Pumping Test Data

Product Bail Test Data

MONITORING WELL A24

	Time After	Depth to	Depth to	Product
	Removal of	Product	Water	Thickness
Date	Product	<u>(ft)</u>	<u>(ft)</u>	<u>(ft)</u>
	·			
12/8/86	Static Levels	1.73	6.63	4.90
12/8/86	* 0	6.22	6.81	0.59
	0'20"	6.07	6.44	0.37
	11	5.82	6.17	0.35
	1'35"	5.59	5.96	0.37
	2'10"	5.35	5.75	0.40
	2'45"	5.19	5.60	0.41
	3 ' 15"	5.03	5.45	0.42
	3'45"	4.81	5.30	0.49
	4 ' 30 "	4.71	5.03	0.32
	5'	4.56	5.00	0.44
	5 ' 50 "	4.37	4.82	0.45
	6'50"	4.17	4.66	0.49
	81	3.97	4.47	0.50
	10'	3.66	4.19	0.53
	12'	3.42	3.97	0.55
	15'	3.14	3.71	0.57
	18'	3.01	3.54	0.53
	21'	2.83	3.40	0.57
4	25 '	2.69	3.31	0.62
	29'	2.63	3.25	0.62
	33 '	2.59	3.21	0.62

MONITORING WELL A24

	Time After	Depth to	Depth to	Product
	Removal of	Product	Water	Thickness
Date	Product	<u>(ft)</u>	<u>(ft)</u>	<u>(ft)</u>
		4		
12/8/86	38'	2.55	3.18	0.63
	43 '	2.54	3.18	0.64
	481	2.54	3.18	0.64
	55 '	2.54	3.18	0.64
	60'	2.53	3.20	0.66
	90'	2.53	3.21	0.67
	120'	2.55	3.24	0.69
	180'	2.52	3.22	0.70
	240 '	2.51	3.24	0.73
	300'	2.50	3.25	0.75
	360'	2.49	3.26	0.77
	420'	2.52	3.30	0.78
	460'	2.54	3.35	0.81
12/9/86	1,525'	2.34	3.41	1.07
	1,620'	2.24	3.35	1.11
12/10/86	2,8201	2.08	3.56	1.48
	3,100'	2.06	3.67	1.61
12/11/86	4,740'	2.03	4.02	1.99
12/12/86	5,855'	1.96	4.18	2.22
12/13/86	10,010'	2.19	4.77	2.58

Notes:

* Time "0" began after the removal of the following quantities:

Product Removed - Approximately 4 gallons

Water Removed - Approximately 6 gallons

MONITORING WELL B39

	Time After	Depth to	Depth to	Product
	Removal of	Product	Water	Thickness
Date	Product	<u>(ft)</u>	<u>(ft)</u>	<u>(ft)</u>
		•		
12/8/86	Static Level	1.90	4.53	2.63
12/8/86	* 0	2.42	2.60	0.18
	0'15"	2.39	2.58	0.19
	0'30"	2.37	2.58	0.21
	1'	2.36	2.56	0.20
	1'30"	2.35	2.55	0.20
	1'50"	2.34	2.54	0.20
	2'30"	2.33	2.53	0.20
	3'05"	2.32	2.53	0.21
	3 ' 30"	2.32	2.53	0.21
	4 1	2.32	2.53	0.21
	5'	2.31	2.53	0.22
	6'	2.30	2.50	0.20
	81	2.29	2.51	0.22
	10'	2.28	2.50	0.22
	15'	2.27	2.52	0.25
	20'	2.26	2.52	0.26
	25'	2.25	2.52	0.27
	30'	2.25	2.52	0.27
	40'	2.24	2.52	0.28
	50'	2.24	2.52	0.28
	80 1	2.23	2.54	. 0.31

MONITORING WELL B39

	Time After Removal of	Depth to Product	Depth to Water	Product Thickness
<u>Date</u>	Product	<u>(ft)</u>	<u>(ft)</u>	<u>(ft)</u>
12/8/86	110'	2.22	2.54	0.32
	170 '	2.21	2.54	0.33
	230'	2.21	2.54	0.33
	325 '	2.25	2.59	0.34
12/9′/86	1,215'	2.09	2.51	0.42
	1,365'	2.03	2.47	0.44
	1,455'	1.94	2.39	0.45
12/10/86	2,640'	1.74	2.26	0.52
	2,925'	1.76	2.29	0.53
12/11/86	4,585'	1.81	2.39	0.58
12/12/86	5,725'	1.75	2.33	0.58
12/15/86	10,370'	2.08	2.67	0.59

Notes:

* Time "O" began after the removal of the following quantities:

Product Removed - Approximately 1 gallon

Water Removed - Approximately 2 gallons

0665R

Pumping Test Data

Time - Drawdown Data Chevron/Gulf Philadelphia Refinery

Monitoring Well A24

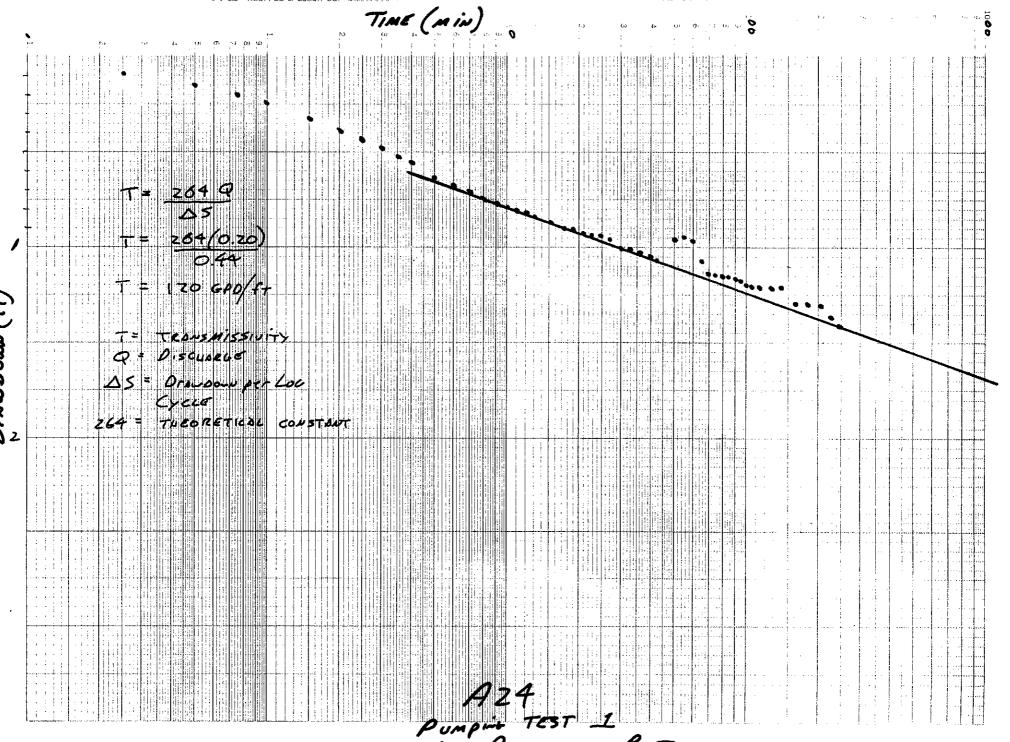
Date of Test	Time After Start Of Pump	Depth To Product <u>(ft)</u>	Drawdown <u>(ft)</u>
1/8/87	0" 25" 50" 45" 1'30" 2'30" 3'30" 4' 5' 7' 8' 117' 12' 13' 15' 17' 19' 21' 23' 25' 27' 30' 36' 40' 44' 50' 55'	2.13 2.22 2.28 2.33 2.37 2.45 2.51 2.56 2.69 2.69 2.76 2.80 2.83 2.99 2.99 2.99 2.99 2.99 3.00 3.04 3.06 3.06 3.07 3.14 3.14 3.14 3.14 3.17 3.17 3.20 3.17 3.07	0 .09 0.15 0.24 0.32 0.43 0.48 0.52 0.56 0.63 0.77 0.77 0.77 0.81 0.82 0.84 0.87 0.93 0.93 0.93 0.94 0.93
	60 ' 65 ' 70 ' 75 '	3.10 3.20 3.24 3.27	0.97 1.07 1.13 1.14

Time - Drawdown Data Chevron/Gulf Philadelphia Refinery

Monitoring Well A24

Date of Test	Time After Start Of Pump	Depth To Product <u>(ft)</u>	Drawdown <u>(ft)</u>
1/8/87	80' 85' 91' 95' 100' 106' 115' 128' 140' 162' 187' 207' 226'	3.28 3.29 3.30 3.33 3.33 3.33 3.33 3.41 3.47 3.47 3.50 3.54	1.15 1.16 1.17 1.17 1.20 1.20 1.20 1.21 1.28 1.29 1.29 1.37 1.42

Discharge Rate = 0.20 gpm



TIME - DRAWDOWN DATA MONITORING WELL - A24 CHEVRON/GULF PHILADELPHIA REFINERY

MONITORING WELL A-24

	Minutes After	Depth to	Depth to		Product
	Start of	Product	Water	Drawdown	Thickness
Date	Pump	(ft)	(ft)	(ft)	<u>(ft)</u>
1/20/87	0"	1.88	7.40	0	5.52
	15 "	7.91		.03	
	30"	2.01		.13	
	45 "	2.10		.2 2	
	1'	2.18		.30	
	1.5'	2.32		.44	
	5'15"	2.84		.96	
	6'15"	2,86		.98	
	7'45"	2.92		1.04	
	8'45"	2.98		1.10	
	10'15"	3.05		1.17	
	11 '45 "	3.09		1.21	
	13'15"	3.16		1.28	
	15'41"	3.23		1.35	
	17'12"	3.28		1.40	
	18'58"	3.33		1.45	
	20'55"	3.41		1.53	
	22 '24 "	3.47		1.59	
	23 51 "	3.54		1.66	
	25 * 22 *	3.61		1.73	
	26'52"	3.67		1.79	
	30 155 "	3.77		1.89	
	41 '52"	3.93		2.05	
	52'01"	4.05		2.17	
	62°10"	4.11		2,23	
	73'31"	4.22		2.34	
	92 158 "	4.36		2.48	
	115'25"	4.47		2.53	
	146'06"	4.48		2.60	
	176 '01 "	4.57		2.69	
	223'0"	4.60		2.72	
	277 '08"	4.66		2.78	
	342'16"	4.67	11.05	2.79	6.38
	403'26"	4.76		2.88	
	429'05"	4.78		2.90	
1/21/87	1365'	4.77	12.22	2.89	7.45
	1460'	6.00**	6.16*	4.12	0.16
	18001	6.09	6.55	4.21	0.46
1/22/87	28201	5.82	6.84	3.94	1.02

Discharge Rate = 0.26 Gallons Per Minute

^{* = 4.5 - 5} Gallons of Product Removed

^{** =} Pump was shut down several times for no more than two minutes at a time.

TIME - DRAWDOWN DATA TRENCH WELL AND PIEZOMETERS CHEVRON/GULF PHILADELPHIA REFINERY

	Tro	ench We	11	Pie	zometer	Pl	Pie	zometer	2
:	Minutes After	Depth t	:0	Minutes After I	epth to	1	Minutes After	Depth to	
Date	Start of Pump	Water (ft)	Drawdown (ft)	Start of Pump	Water (ft)	Drawdown (ft)	Start of Pump	Water (ft)	Drawdown (ft)
1/20/87	0	2.93	0	0 278'45"	4.98 5.03	0 .05	0	3.34	0
	350 47"	2.95	.02	347 '17" 406 '26"	5.05 4.69	.07 +.29	347 '48"	3.35	.01
1/21/87	1370'	2.99	.06	430 '43" 1370 ' 1800 '	4.96 5.26 4.86	+.02 .28 +.17	1370 ' 1800'	3.57 3.44	.22 .09

Discharge Rate = 0.26 Gallons Per Minute * = 4.5 - 5 Gallons of Product Removed

TIME - DRAWDOWN DATA PIEZOMETERS CHEVRON/GULF PHILADELPHIA REFINERY

	Р	<u>iezomete</u>	er P3	P1	ezomete	r P4
	Minutes After i	Depth to)	Minutes After D	epth to	
	Start of	Water	Drawdown	Start of	Water	Drawdown
Date	Pump	(ft)	(ft)	Pump	(ft)	(ft)
1/20/87	0	4.73	0	0	0.68	0
	348 '51 "	4.74	.01	349'39"	0.70	.02
1/21/87	1370'	4.77	.04	1370'	0.73	.05
	1800'	4.86	.13	1800 '	0.79	.11

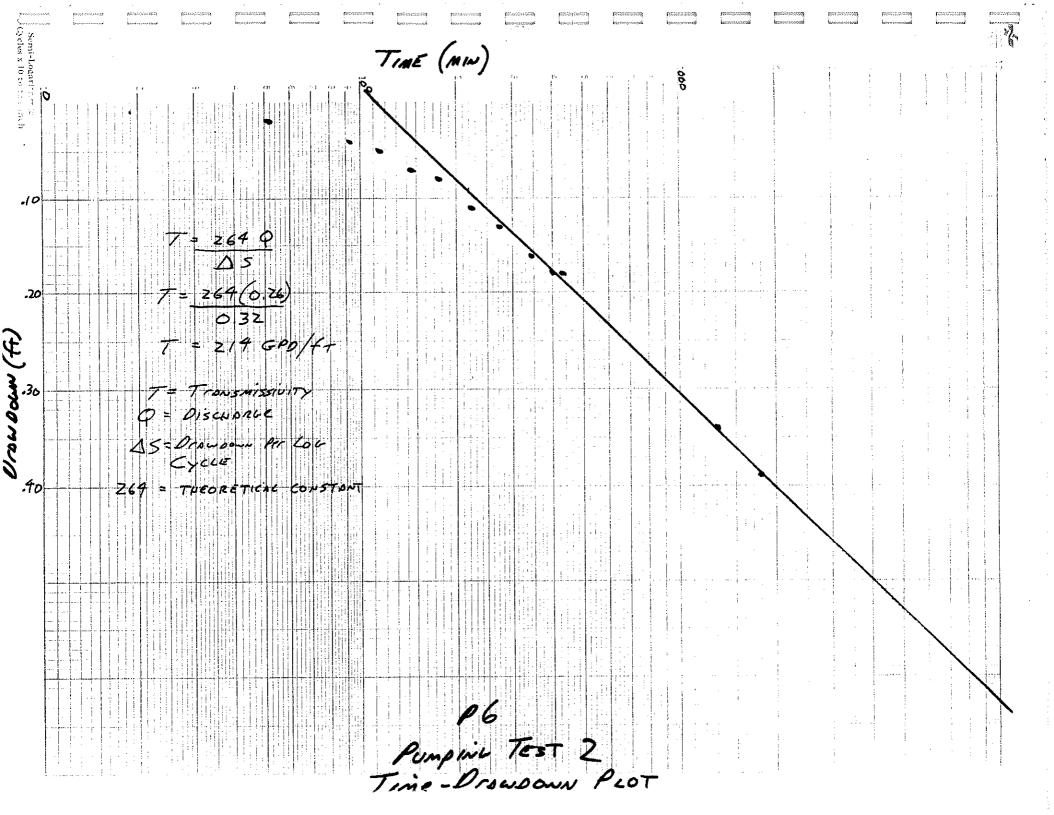
Discharge Rate = 0.26 Gallons Per Minute * = 4.5 - 5 Gallons of Product Removed

TIME - DRAWDOWN DATA PIEZOMETERS CHEVRON/GULF PHILADELPHIA REFINERY

estated territori		Piez	ometer	P5	Pf	ezomet	er P6	Piez	ometer P	7	Pie	zometer	Р8
Description of the second		Minutes After	Depth :	to	Minutes After	Depth :	to	Minutes After	Depth t	:0	Minutes After	Depth to)
		Start of	Water	Drawdown	Start of	Water	Drawdown	Start of	Water	Drawdown	Start of	Water D)rawd
Signatura of the second of the	<u>Date</u>	Pump	(ft)	(ft)	Pump	(ft)	(ft)	Pump	(ft)	(ft)	Pump	(ft)	(ft
(02 Jan 1987)	1/20/87	0"	1.36	0 .	O ¹¹	2.10	0 .	0"	1.63	0	0"	2.43	0
Ø1 180		1 '50"	1.36	0	2'10"	2.0	+.1	2'18"	1.63	0	2'37"	2.43	0
Mario denis		6*38"	1.35	+.01	6 155 H	2.10	0	713*	1.63	0	7 '27"	2.43	0
1885		9'06"	1.36	0	9'20"	2.10	0	9 '40"	1.63	0	9'58"	2.43	0
		1 '04"	1.36	0	12'18"	2.10	0	12130#	1.63	0	12'50"	2.43	0
Fig.		16'04"	1.37	.01	16'20"	2.11	.01	121	1.63	0	16'51 [#]	2.43	0
Management and Manage		19'45"	1.39	.03	20 *	2.11	.01	20'10"	1.64	.01	20130"	2.43	0
		22 ' 45 "	1.40	.04	23'	2.11	.01	23'10"	1.64	.01	23'27"	2.435	.0
# P		25'39"	1.405	.045	26'	2.11	.01	26'15 "	1.63	0	26'33"	2.435	.00
Programme of the control of the cont		31'12"	1.42	.06	31 '22"	2.11	.01	31 '38 "	1.63	0	31 *54 "	2.435	.0
£		42 '09"	1.44	.08	42 '25"	2.115	.015	42 50*	1.635	.005	43 '06 "	2.435	.0:
		52 ' 20 "	1.49	.13	52'35"	2.12	.02	531	1.63	0 `	53'25"	2.435	.0:
plowers and		62'56"	1.49	.13	63'20"	2.12	.02	63'40"	1.63	0	63155°	2.435	.0 0
1		74'00"	1.49	.13	74 '20"	2.125	.025	74 '40"	1.63	0	74'55"	2.435	.0:
		93'16"	1.45	.09	93'35"	2.14	.04	941	1.64	.01	94'12"	2.44	.0.
		115'45"	1.52	.16	116'	2.15	.05	116,'20"	1.64	.01	116'36"	2.44	•0
productives:		146 '26"	1.55	.19	146'75"	2.17	.07	147 '	1.64	.01	147'10"	2.44	•0.
≅₽		176'25"	1.51	.15	176'50"	2.18	.08	177'05"	1.61	+.02	177'22"	2.45	.00
e		223 '26"	1.56	.20	223 '50"	2.21	.11	224 '05"	1.66	.03	224 '27"	2.45	.00
CTOCOCCOCCASA CTOCOCCOCCASA		277 '28"	1.50	.14	277 '50"	2.23	.13	278'05"	1.67	.04	278'22"	2.46	. 0.
E		345 '04"	1.50	.14	345 '25"	2.26	.16	346 '	1.70	.07	346'18"	2.46	.0
		403 55 "	1.48	.12	404 '15"	2.28	.18	404 " 50 "	1.71	.08	405 ' 05 "		.0:
		429 ' 24 "	1.48	.12	429 '50 "		.18	430 '02 "	1.72	.09	430'19"	2.47	.0∕
processor and pr	1/21/87	13651	1.58	.22	1366'	2.44	. 34	1366'	2.18	.55	13671	2.58	.1:
		1800	1.59	.23	1800 '	24.9	. 8	1800 '	2.42	.79	18001	2.65	.27

Discharge Rate = 0.26 Gallons Per Minute

* + 4.5 - 5 Gallons of Product Removed



April 155 Propries Contract Co	一直一直一点,这一点一点,一直一直看到一个一点,他们就会一定是1996年,1998年,是1996年1996年1996年					
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TIME-DRAWDOWN DATA CHEVRON/GULF PHILADELPHIA REFINERY

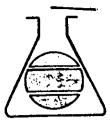
Monitoring Well A24

	Time After	Depth to	
	Start of	Product	Drawdown
<u>Date</u>	Pump	<u>(ft)</u>	<u>(ft)</u>
2/2/87	0"	4.91	0
	15"	4.96	0.05
	30"	5.05	0.14
	45 "	5.13	0.22
	71	5.23	0.32
	1'30"	5.42	0.51
	2 '	5.59	0.68
	2'30"	5.76	0.85
	3 '	5.90	0.99
	3 1 30 11	6.05	1.14
	4 '	6.18	1.27
	4'30"	6.29	1.38
	5 '	6.38	1.47
	6 '	6.55	1.64
	7'	6.68	1.77
	8 1	6.79	1.88
	9 '	6.89	1.98
	10'	7.00	2.09
	יוו	7.10	2.19
	12'	7.20	2.29
	14'	7.40	2.49
	16 '	7.64	2.73
	18'	7.77	2.86
	20'	7.97	3.06

Discharge Rate = 0.14 GPM

APPENDIX E

Laboratory Data - Lead Analysis Main Plant, Schuylkill River Tank Farm, and Darby Creek Tank Farm



ATORIES, INC.

P.O. Box 248/1501 Grandview Avenue/MidAtlantic Park, Thorofare, NJ 08086 Phone: (609) 848-3939 NJ 800-222-0589

March 10, 1986

DAMES & MOORE 6 Commerce Drive Cranford, N.J. 07016 SAMPLES REC'D: 3/6/86 PROJECT: CHEVRON REFINERY

ATTN: Mr. Robvogel

CERTIFICATE OF ANALYSIS

ANALYSIS NO.	SAMPLE IDENTIFICATION	TOTAL LEAD(mg/kg)
E3169	MTP-12B	1080
E3170	DTP-2B	14
E3170	MTP-11B	912
E3171	MTP-11A	956
E3172	STP-4A	316
E3174	MTP-12A	652
E3175	DTP-1B	83
E3176	STP-4B	379
E3177	DTP-2A	37
E3178	DTP-1A	52

Laboratory Director

NOTE: See Appendix F, Test Pit Logs for Sample Locations.

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sampl	e Source	& Clie	nt Cy	neven Refi	inay		•		F	ield Personnel (Signatur	re)
Projec	t Title		•				Job No.			·		
Date	Time	San I.D.	nple No.	Sample Type		. of ainers	Sampling	Site		. Rema	rks	
3/6/8	1245	91	В									
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7		5TP 4	A	11			11					
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1	4	OTP 1	A		<u> </u>							
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(Signa	ture)		1	Received (Signature May/MAKALIN	- 1	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
linqui: (Signa	shed by: ture	Date	Time	Received to (Signature	y: Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
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ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

DATE: 01/10/8 PAGE: 1

Chain of Custody Data Required for ETC Data Management Summary Report

See Balow

DAMES AND MOORE

CHEVPPASLP

See Below

ETC Sample No.

Company

Facility

Sample Point

Date

Parameters Units 5 18221A 5 18221B 5 18224B 5 18238 5 18242 5 18245B 5 18309A 5 18309B 861211 861211 861211 861211 861211 861212 861212 P8326 P8324 P8325 P8673 P8672 P8331					Sämple Poli	nts, Sampling Date	es, and ETC Sa	mple No.'s		
Groundwater Metals	Param étér e		\$ 18221A \$61211 P8323	S 182218 861211 P8322	5 182248 861211 P8326				S 18309A 861212 P8672	S TB309B 861212 P8331
Lead ug/kg 589000 52300 558000 1610000 2970000 230000 935000 72500\$	Groundwater Metals								X	
	Lead	ug/k ø	5 890 00	52300	558000	1610000	2970000	230000	935000	72500 0
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ETC ENVIRONMENTAL TESTING AND CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

Chain of Custody Data Required for ETC Data Management Summary Report

CHEVPPASLP

See Below

DAMES AND MOORE

DATE: 01/10/87 PAGE: 2

	ETC Sample No.	- UB	Company		Facility	Sample	Point Date		
						ates, and ETC Sa	mple No.'s		
Paramet ere	Unitt	5 18311 861212 98328	S 18313A 861212 P8329	S 18313B 861212 P8330	S 18328 861212 P8327				
roundwater Metals Lead	ug/k ∉	31 00 00	370000	130000	735000				
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ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 1

Chain of Custody Data Required for ETC Data Management Summary Report

See Below CHEVPPASLP
See Below

ETC Sample No: Company Facility Sample Point Date

		Sample Points, Sampling Dates, and ETC Sample No.'s								
Parameters		Ünits	S TB202A 861211 N9596	861211 N9603	S 1B206A 861211 N9600	S TB206B 861211 N9597	S TB209A 861211 N9604	S 1B209B 861211 N9599	S TB226A 861215 N9585	S TB226B 861215 N9584
roundwater Metals						· ·				******
_ead		ug/kg	88600	310000	840000	420000	330000	671000	370000	130000
	·						·			
						:				
•										
								<u> </u> 		
		1								
		;								
								1		

ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 2

Chain of Custody Data Required for ETC Data Management Summary Report

See Below ETC Sample No. DAMES AND MOORE

Company

CHEVPPASLP

Facility

See Below

Sample Point Date

			Sample Points, Sampling Dates, and ETC Sample No.'s								
arameters	Units	S TB243A 861211 N9593	S 18243B 861211 N9589	5 TB244A 861210 N9573	S TB224A 861211 N9601	S TB244B 861210 N9575	S TB245A 861211 N9595	S 18246A 861211 N9588	18246B 861210 N9571		
oundwater Metals .ead	ug/kg	1370000	1490000	390000	1700000	360000	190000	1440000	13900 00		
							·				
							·				

ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 3

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

DAMES AND MOORE

CHEVPPASLP

See Below

ETC Sample No.

Company

Facility

Sample Point Date

		Sample Points, Sampling Dates, and ETC Sample No.'s								
Parameters	Units	5 18251A 861211 N9587	S TB251B 861211 N9594	S 1B276A 861210 N9574	S TB276B 861210 N9572	S TB277A 861210 N9576	S TB277B 861210 N9570	S 1B286A 861210 N9577	S TB2868 861210 N9578	
roundwater Metals										
Lead	ug/kg	370000	594000	4950000	3220000	1120000	340000	1630000	480000	
		·								
·										
								:		
•										
								-		
			; :						•	

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 4

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

DAMES AND MOORE

CHEVPPASLP

See Below

ETC Sample No.

Company

Facility

Sample Point

Date

		Sample Points, Sampling Dates, and ETC Sample No.'s								
arameters Units	5 18289A 861208 N9590	S TB290A 861208 N9591	5 TB290B 861208 N9592	S TB426A 861208 N9566			S 18430B 861208 N9569	S 18438A 861208 N9563		
oundwater Metals							7.4. A.			
lead ug/kg	1970000	857000	370000	531000	340000	1760000	170000	510000		
-										
·										
·				:						



DATA MANAGEMENT SUMMARY REPORT (DM-OL) – All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 5

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

DAMES AND MOORE

CHEVPPASLP

See Below

ETC Sample No.

Company

Facility

Sample Point Date

	•		Sample Points, Sampling Dates, and ETC Sample No.'s								
Parameters	• Units	S TB438B 861208 N9564	S 18440A 861208 N9562	5 TB440A 861211 N9602	5 TB440B 861208 N9565	5 TB440B 861211 N9598	S TP202A 861204 N9555	S TP202B 861204 N9560	S TP203A 861204 N9554		
roundwater Metals											
Lead	ug/kg	50200	140000	370000	99800	51900	2000000	160000	410000		
									İ		
							,				
								<u> </u>			
	·			:							
· · · · · · · · · · · · · · · · · · ·		1	1	<u> </u>	<u> </u>	<u> </u>	l <u></u>	<u> </u>			

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) - All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 6

na na sa		Sample Points, Sampling Dates, and ETC Sample No.'s								
Parameters	Units	S TP203B 861204 N9558	5 TP205A 861204 N9556	5 TP205B 861204 N9559	S TP207A 861204 N9557	S TP207B 861204 N9561	S TP208A 861204 N9609	S TP208B 861204 N9611	5 TP215A 861204 N9605	
roundwater Metals										
Lead	ug/kg	29000	55000	41000	590000	280000	925000	119000	501000	
									<u> </u>	
			:							
						*				
						;				
									ŀ	

ETC ENVIRONMENTAL TESTING AND CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-OL) – All Parameters Tested, Samples Linked by Order

DATE: 01/11/87 PAGE: 7

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

ETC Sample No. Company Facility Sample Point Date

		Sample Points, Sampling Dates, and ETC Sample No.'s								
arameters	Units	S TP2T58 861204 N9606	S TP223A 861204 N9608	5 TP223B 861204 N9612						
oundwater Metals										
ead	ug/kg	15000	180000	120000						
						·				
					ļ					
									ļ	

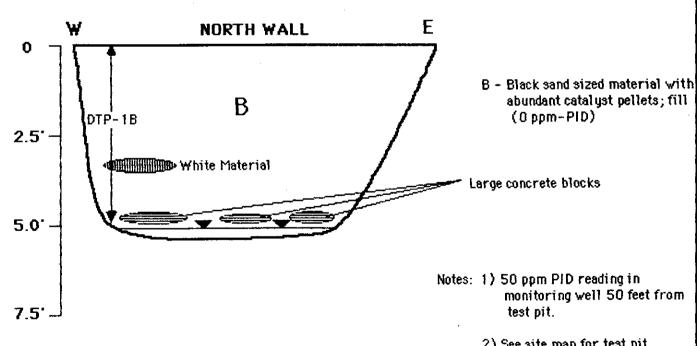
APPENDIX F

Test Pit Logs

Darby Creek Tank Farm, Schuylkill River Tank Farm, and Ballfields

CHEVRON - GULF PHILADELPHIA REFINERY

DTP-1B "DARBY CREEK TANK FARM"

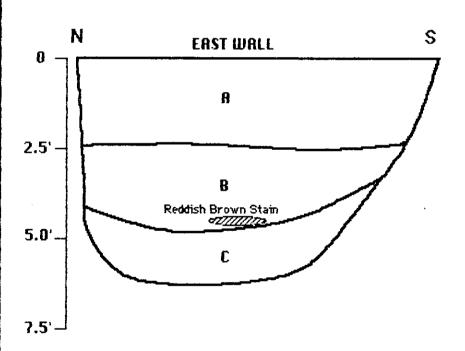


Sample: DTP - 1B (Composite O' - 5')

- 2) See site map for test pit location.
- 3) Test pit completed on 3/5/86.
- 4) Ground water level = -

CHEVRON - GULF PHILADELPHIA REFINERY

DTP-2 *DARBY CREEK TANK FARM*



- A Medium sandy silt with clay and gravel, light brown; fill
- B Black gravelly fill; debris present (wire, plastic bags, hard hat, bottles, wood)
- C Coarse sand with some clay and silt, yellowish brown

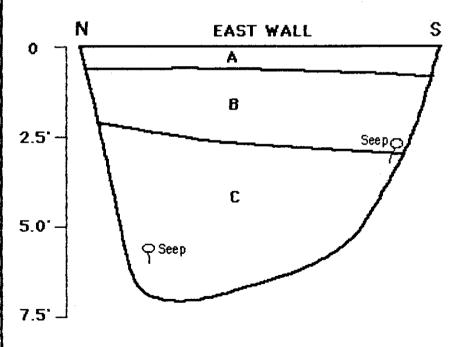
Samples: DTP - 2A (Unit A Composite)

DTP - 2B (Unit B Composite)

- Notes: 1) 0 ppm PID reading in pit.
 - 2) See site map for test pit location.
 - 3) Test pit completed on 3/5/86.

CHEVRON - GULF PHILADELPHIA REFINERY

STP-4
"SCHUYLKILL RIVER TANK FARM"



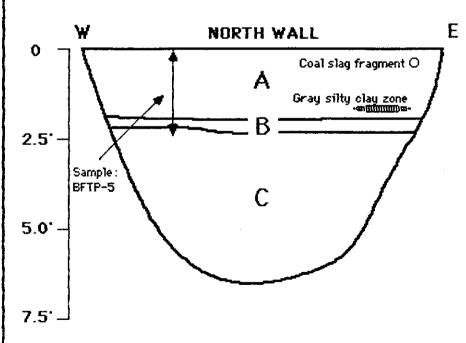
- A Reddish brown tank bottoms.
- B Sand, silt, clay and gravel, light gray; fill
- C Silty clay, dark gray

- Samples: STP 4A (Unit A Composite)
 - STP 4B (Unit B Composite)

- Notes: 1) O ppm PID reading in pit.
 - 2) See site map for test pit location.
 - 3) Test pit completed on 3/5/86

CHEVRON - GULF PHILADELPHIA REFINERY

BFTP-5 *BALLFIELDS*



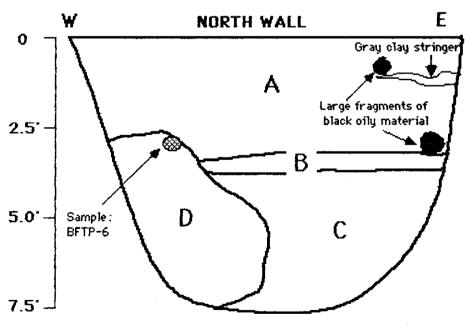
- A Sandy silt with some gravel and trace clay, light brown, damp; fill (0 ppm-PID)
- B Sandy coarse gravel, darkbrown, damp; organic debris; petroleum odor (3 ppm-PID)
- C Silty clay, light brown, moist: native soil; original ground surface, (O ppm-PID)

Sample: BFTP-5; (ETC#L3583) composite sample

- Notes: 1) See site map for test pit location.
 - 2) Test pit completed on 3/4/86.

CHEVRON - GULF PHILADELPHIA REFINERY

BFTP-6
BALLFIELDS



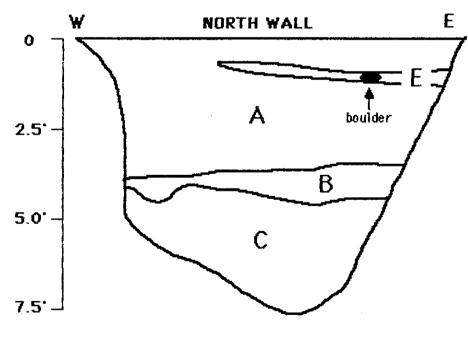
- Gray clay stringer A Sandy silt with some gravel and trace clay, light brown, damp; fill (0 ppm-PID)
 - B -Sandy coarse gravel, darkbrown, damp; organic debris; petroleum odor (O ppm-PID)
 - C Silty clay, light brown, moist: native soil; (original ground surface) (0 ppm-PID)
 - D Black oily material (silt), very moist; strong petroleum odor (50-100 ppm-PID)

Sample: BFTP-6: (ETC#L3592):

- Notes: 1) See site map for test pit location.
 - 2) Test pit completed on 3/4/86.

CHEVRON - GULF PHILADELPHIA REFINERY

BFTP-7
BALLFIELDS



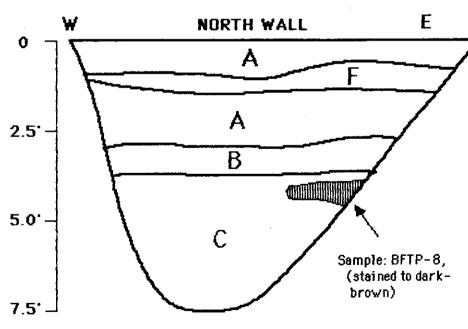
- A Sandy silt with some gravel and trace clay, light brown, damp; fill (0 ppm-PID)
- B- Cinder like fine gravel, black; 1" discontinuous silty clay to clayey silt layer at top, gray, (0 ppm-PID)
- C- Silty clay, light brown, moist: native soil; (original ground surface) (0 ppm-PID)
- E- Dark reddish brown and black powder like material; (leaded tank bottoms?), 2" of oily sludge like material beneath powder; petroleum odor (5 to 50 ppm - PID)

Sample: BFTP-7: (ETC#L3584): composite of units B and C.

- Notes: 1) See site map for test pit location.
 - 2) Test pit completed on 3/4/86.
 - 3) Mound with large pieces of coal tar residue with wood chips present just east of the test pit.

CHEVRON - GULF PHILADELPHIA REFINERY

BFTP-8
BALLFIELDS



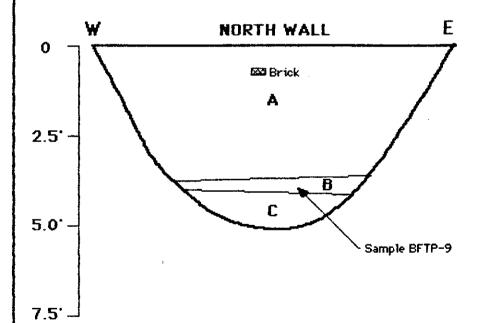
- A Sandy silt with some gravel and trace clay, light brown, damp; fill (0 ppm-PID)
- B Sand and fine gravel, black; petroleum odor (1ppm-PID)
- C Silty clay, light brown, moist; natural soil (original ground surface); stained to dark brown in areas.(O ppm-PID)
- F Gravel with tar, black; petroleum odor (8 ppm-PID)

Sample: BFTP-8: (ETC#L3589)

- Notes: 1) See site map for test pit location.
 - 2) Test pit completed on 3/4/86.

CHEVRON - GULF PHILADELPHIA REFINERY

BFTP-9 "BALLFIELDS"



- A -Sandy clay with gravel, light brown, moist; fill (0 ppm-PID)
- B Cinder like sand and fine gravel; petroleum odor (O ppm-PID)
- C Clayey silt, light brown, very moist to wet; natural soil? (O ppm-PID)

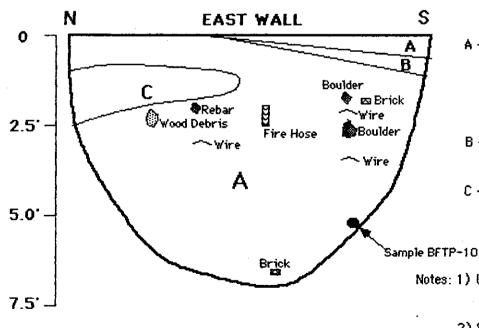
Sample: BFTP-9; (ETC #L3590)

Notes: 1) See site map for test pit location.

2) Test pit completed on 3/4/86.

CHEVRON - GULF PHILADELPHIA REFINERY

BFTP-10
BALLFIELDS



Sample: BFTP-10; (ETC #L3591)

- A Gravel, sand, silt, and clay with abundant debris, brownishblack; bricks, wire, wood, boulders, rebar, ect.; fill; petroleum odor (1ppm-PID)
- B Silt with little clay, lightbrown, damp; fill (0 ppm-PID)
- C Medium sand, light gray with dark gray laminations, damp; fill (O ppm-PID)

Notes: 1) Unit C makes up the opposite wall from a depth of 1 to 4 feet.

- 2) See site map for test pit location.
- 3) Test pit completed on 3/4/86.
- 4) Units are not correlative to any units encountered in test pits BFTP-5 through BFTP-9.

APPENDIX G

SLUGT Test Data Forms and Laboratory Permeability and Hydrometer Test Data

SLUGT Test Data Forms

SLUG TEST DATA FORM

/		Observation/	Monitoring We	ц No. A	- /4		_00//3			
-		Inner Diamet	er in inches of			Client	CherRo	00		
. }			ich water-leve	i	4"		Main Pla		÷	i
-		Inner Diamete	er in Inches of	the		D&M in	vestigators	Wagner/	,	ţ
<u> </u>		pole screet or obe	n portion of th	9	/		E.J.F	110		-
····ier		Diameter of o	friiled hole in		2 *		3/27/8		•	
- T		inches					- -	10:30 AM		
. Ł		Slug used d		560	all	(slug en	test is falling historing water col-	(amu		
T E		16	ength (in.)	<u>om</u>	<u> </u>	or rising	head (slug being ut of well)	Both 1	FROM	Top BRass
<u>s</u>			1	,	· · · · · · · · · · · · · · · · · · ·					
Figure 1		Time After introduction (Removal) of Slug	Mark Held or Nearest Foot Mark (It)	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Below Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments	To F	p of Roduct: 3.92'
(Interduct 5.19)	[™] >	0				3.92		Static Water Level (SWL)		ottom of
) · · · · · · · · · · · · · · · · · · ·		20"				3.641	6.28	O.OI Product		Product =
		30''				3.65'	0.27	PIESENT	-	3.933
- Apple Control		40"				3.661	0.26		┪┖┈	
å		5.0 "ii				3.6651	0.255		-	
ह ए		60"	·			. 3.67'	0.25		┥	
- Park		· 70*				3.681	0.14		-	
		8o"				3.685'	0.235		-	
		90"				3.69'	0.23		┥.	
. Ž	120	2.0				3.71'	0,21			
The state of the s	150	2.51				3.72'	0.20		7	
Ž.	180	3.0'			·	3.73'	0.19		+	•
· T	210	3.5'				3.745	0.175		7	
griddles de la constant de la consta	240	4.0				3.76'	0.16		1	
. <u>å</u>	300	5.0'					0.15		4	
Photography	360	6.0'				3.79	0.14		-	
Parameter Company	420	7.01				3,81'	0.12	**************************************		
Ŧ	540	9.0'				3.83'	0.10	·	-	
The state of the s	660	11.02				3,85	0.08			
.	780	13.01				3.86'	0.07		7	
* Traverse	900	15.0'				3.88'	0.05		7	
. Accepted	1080	18.0'				3.90'	0.04		7	
*	1260	21.0'				3.90'	0.04		7	•
Processor and the second secon	1440	24.0'			•	3.9051	0.015			
-	1740	29.0'				3.915'	0.005		7	
Revioue 5	2040	34.0'				3.92'	0.00		7	
introve s	ا🗲 (چ- ا	- 17."	T			4.29'	0.37		7	
2	Ť	7 25 "					0.36		7	•
- 4- 		30"			•	4.28	B.36		7	
_		- 40"				4.26	034	· · · · · · · · · · · · · · · · · · ·	1	
<u>†</u>	,{	T							⊣	

Observation/Monitoring Well No.	A-14	JOD NO. 113-90-4
Inner Diameter in inches of portion of well (screen or casing) in which water-level recovery occurred	4"	Site Main Plant
Inner Diameter in Inches of the screen or open portion of the hole	4"	D&M investigators D. Wagners/ E.J. Fillo
Diameter of drilled hole in inches	10"	Date 3/27/86
Slug used - diameter (in.)		Whether lest is falling head
length (in.)	SMALL	(slug entering water column) or rising head (slug being pulled out of well)

•	~ ~~	<u> </u>			puneu ou	r or weth	
	Time After Introduction (Removal) of Slug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Below Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments
	~ 5.0 ¹¹				4 25 1	0.33	Static Water Level (SWL)
	60''		~		4.24'	0.32	
	76"				4.23' 4.22'	0.31	
	86 1				4.22'	0.30	
	90 m				4.21'	6.29	
120" 20	للمحكمل				. 4.181	0.26	
150 2.5	2.0'				4.16'	0.24	
180" 30	2.5'				4.14'	0.22	
210 3.5	301				. 4.12'	0.20	
240 4.0	3.51				4.10'	0.18	
270 45	400				4.08'	0.16	
305 5.0	45				4.07'	0.15	
330 55	5.01				4.05'	6.13	
390 6.5	60		·		4.04'	0.12	
45075	20	<u>'</u>			4.03'	0.11	
510" 85	80°				4.01	0.09	
5 70 5					4.00'	0.08	
630 10,5	10.0				3.981	0.06	
700 115	40				3.97'	0.05	
820 73.5	13.0				3.96'	0.04	
940 5.5	1500				3.951	0.03	
1120/2:5	18.0				3.94'	0.02	
1300 = 1.5	21.0				3. 93′	0.01	
1480 245	240				3.92'	0.00	

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•	•	Observation	Mourtound Me	п мо	Z -7	Job No.	00113	- 909	
			er in inches of			Client _	Cherkon	-	
i i		portion of well casing) in whi-	ch water-level	4))		Man Plan		. ,
F -		Inner Diamete	er in inches of	the		D&M Inv	restigators <u>D</u>	. Wagner	
Paralle distribution		pole	n portion of th	4	>>		E.J. F./	10	•
ţ.		Diameter of d	kriiled hole in	10	ft	Date	<u>3/27/86</u> 9:4	n Am	
and the state of t		Slug used di	inmeter (in \						
E			ngth (in.)	Smo	.1/	(slug ent	test is falling hering water col	(ממני	
Prince		— t c	of at (Tite)	01/10		brilled or or tistud	head (slug being it of well)	Both 1	Top of BRAS
<u>.</u>							Difference	<u></u>	Top of Bras
		Time After introduction	Mark Held or Nearest	Subtract	Add or Subtract	Depth to Water, Below Top of	Between SWL	i	1
		(Removal) of Slug	Foot Mark (ft)	Add (ft)	Correction	Casing	and Depth to Water at	Comments	Bottom of
Introduce	>	Or chang	(14)	(11)	Factor (ft)	((t)	t>0(ft)		Product 3.63'
Introduce Slug)		10"				2.66'	0.00	Static Water Level (SWL)	
ř		20"					T		
*		30''				2.44'	0.22		_
						2.45	0.21		4
		40"				2.48	0.18		_
5		50''				. 2.50'	0.16		_
	•	60"				2.52'	0.14		
ŗ ·		70 ''				2.54"	0.17		
		80"				. 2:55	0.11		」 ・.
.e.		90'				256'	0.10		
	"סבו	2.0'				2.59'	0.07		
	,50"	2.5				2.60'	0.06		
₹	180	3.0				2.61'	6,05		· ·
distribution of the state of th	210"	3.5'				2.62'	0.04		
ē	240"	4.0'	·			2.63'	0.03		7
	270°	-4.5'					0.025		
	"ەەد	5.0'		_		2.64'	0.02	· · · · · · · · · · · · · · · · · · ·	7
•	360	6.0'				2.645'		•	1
	420"	7.0'				2.65	0.01		1
í	480	8.0'				2,655'	0.005		
	540"	9.0'				2.655'	0.005		4
ž	600"	10.0'				2.655'	0.005		
600						2.66	0.00		-
Remove Slug)	660 →	0"				2.66'	0.00		1
	·	30"				2.85'	0.19		4
		40"		·		2.83	0.17	· · · · · · · · · · · · · · · · · · ·	-{
		50"				2.82'			-
		60"					0.16		-
		70"				2.791	0.13		-
<u>k</u>	;	80"			<u> </u>	278."	0.12		4
-		D -				2.77"	0.11		_

BUONES & ACORE

Observation/Monitoring Well No.	A-24	Job No.
Inner Diameter in inches of portion of well iscreen or		Client Cherron
casing) in which water-level		Site
,		D&M investigators
Inner Diameter in inches of the screen or open portion of the hole		
1.020		Date 3/27/86
Diameter of drilled hole in inches	***************************************	Time
Sing used — diameter (in.)		Whether test is falling head
- length (in.)		(slug entering water column) or rising head (slug being pulled out of well)

				pulled or	ţ		
Time Afte Introduction (Removal of Slug	on or Nearest	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Balow Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments	
90"				2.76'	0.10	Static Water Level (SW	
2.00'				273'	0.07		
2.50	1			2.72'	0.06		
3.0	'	·		2.71'	0.05		
3,51				2.70'	0.04		
4.0'				. 2.691	0.03		
4.51				2.685'	0025		
5.0'			-	2.68'	0.07		
6.0'		1		2.68	0.02		
7.0'				2.675'	0.0/5		
8.0				2.67'	0.01		
9.00				2.67'	0.01		
11.0'				2.67'	001		
/3.01	,			2:67'	001		
15.0'				2.67	001	· · · · · · · · · · · · · · · · · · ·	
					0.01		
····							
							
······································				•			
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				<u>*</u>		:	
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						······································	
							

•	Observation/	Monitoring We	ш мо. В	-39	Job No.	. <u>00/-3</u>	-010
	inner Diamet	er in inches of			Client	Churkon	$\frac{-35q}{1} \rightarrow p$
		ich water-leve	1	4"		Mar Plan	
mią .	recovery odd	er in inches of		1	D&M in	vestigators D	Whave /
	screen or ope	n portion of the		4"		E.丁	Fillo
	Diameter of o	friiled hale in			Date	3/26/8	6
	inches	writed tible fit		Di	Time _	/ /	8:00 AM
	Slug used — d	iameter (in.)			Whether	test is fulling !	lead
∵ g	— le	ength (in.)	Smo	all	at tising	tering water col head (slug bein ut of well)	<u>. </u>
Section was also as a second section of the section of the se	Static t	tzo level	= 2.68"		SLUG NO	T FULLY	SVBMERGED
Palacetanoon	Time After Introduction (Removal) of Slug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Below Top of	Difference	
(Intestire -					2.68		Static Water Level (SWL)
502	-10"				2.57'	0.71	
	-20"				2.58'	0.10	
T	-30"				2.59'	0.09	
	4011				2:611	0.07	
7	5011				. 2.62'	0.06	
	60"				2.631	0.05	
90	" 1.5'				2.641	0.04	
120	2,0'				2:65'	0.03	
154	2:5'				2.66'	0.02	
180	3.0				2,665'	0.015	
1 -10	° 3.5'				2.67	0.01	
<u>~</u> f	U 4,0°				2.67'	0.01	
300	5.0'	1			2.67'	0,0\	
360	6.0'	•			2.67'	0.01	
420	5 7.0'				2.675'	0.005	
480					2.675	0.005	
541	9.0					0.005	
600	10.0'					0.005	
665	11.0				2.675'	0.005	<u> </u>
720	/2.0'				2.68'	0.00	· · · · · · · · · · · · · · · · · · ·
780	' /3.0°					0.00	
· c4/	140'				2.68'	0=00	
900	15.0'					0.00	
960	×			-			
	· · · · · · · · · · · · · · · · · · ·				2.68'	2.00	
Remove 1020 Slug)			<u> </u>			0.00	
. U	10"						
	20"					0.11	
<i>#</i> .	30"			-		0.10	
<u>*</u> ÷					277'	0.09	
	•	1		5	1		

Date
D&M Investigators D. Wayner / E. J. Fillo
Site Man Plant

		<u> </u>		or rising head (sing being				
Time After Introduction (Removal) of Slug		Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Balow Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments		
40*				2,76'	6.08	Static Water Level (S		
5011				2.74'	0.06			
60°				2.73'	0.05			
1.5'				2.72'	0.04			
201				2.71	0.03			
ي.5 ⁵	·	· ·		. 2.705'	0.025			
3.D3			·	2.705	0.025	7 		
3.5'				2.70°	0.02			
4.03				2.703	0.02			
5.0				2.70'	० ७३			
6.0'				2.70'	0.02			
7.01				2.70'	0.02			
9.03				2.695'	0.0+5			
11.0				2.695	0.015			
13.0'	·				0.015			
15.0'				2.695	0.015			
- 				2.013	0.073			
					· ·			
						· · · · · · · · · · · · · · · · · · ·		
								
								
				·				
· · · · · · · · · · · · · · · · · · ·								
	<u> </u>							
						·		
						·		
								
			•					
·								

·		Observation/	Moustound Me	и No	- 40		00//3-90		
Ī			er in inches of			Client	CreiRon		Warren
		portion of we casing) in whi recovery occi	ch water-leve	1	437	Site	Main Plan	· †	Warren George
~ ₽ -		-	er in Inches of	-		D&M In	vestigators Z	. Wagner	
poperty (1955)		screen or ope	n portion of th		4"	. <u>-</u>	. J. F.11)	
		Diameter of c	friiled hole In				3/27/80		
- passocrati		inches	- man : Man (1)		10.1	Time	1:0	0 PM	
		Slug used d	lameter (in.)			Whother	test is falling h	ead	
-TF		— le	ength (in.)	<u>Sm</u>	all	or rising	t of well)	Roth	
**************************************						herited or	Trot weth	NOTH	Top of wa
¥						1	Difference		of bicass
Barres		Time After Introduction	Mark Held or Nearest	Subtract or	Add or Subtract	Depth to Water, Below Top of	Between SWL		3
, including the second		(Removal) of Slug	Foot Mark	Add (ft)	Correction Factor (ft)	Casing	and Depth to Water at t>0 (ft)	Comments	1.06'
plessive	 >	0,2			140101 (15)	1.06	12000	Static Water Level (SWL)	
otestice Sing)		10"				0.73'	0.33		
		20"				0.75	0.31		- -{
N Fe		-3o''				0.76	0.30		
الله الله الله الله الله الله الله الله		-5/0 *				0.77"	0.29		
}		50"				.0.775'	0.285		
	,	60"				0.78'	0.28		
		70"		· · · · · · · · · · · · · · · · · · ·		0.79	0.27		-
* *		80°		·		0.80'	0.26		-
j.		90"				0.80'	0.26		
Espira de	\50 ₁₁	25'				0.81'	025		7
	:	20'							
<u></u>	150'	25'				0.83	0.23		-
	180	3.00				0.835			
.sū	210	3.51				0.85	0.21		
Para de la companya d	240	40'				0.862	0.20		
Ė	270	4.5'				0.86	0.19		7
7.	300	5.0°			·	0.87	0.18	•	_
	360	6.0'				0.881	OTT		7
	420					0.895°	0. H65		
The state of the s		-8.0'							
Į.	540	9.0'				0.91'	0.15		
10 15 37	660	<i>H</i> :0'					0.145		7
etun vicion	780	13.0				0.935	0.+35		
p	900	/5.0'					0.11		
}	080	18.0'				0.955	0.105		
	1260					0.96'	0,10		
}	1440	24.0"				0.97'	0.09		
لَّ	1620	27.02			,	0.975	0.085		
<u>a</u>	1960	32.0'				0.98'	0.08		
i .		1	,	· · ·					

	Obsurvation/i	Monitoring We	4 No. E	3-48	Job No.	. 00/13-	- <i>9</i> 00		
		er in inches of			Client	Chevror	707		
		ch water-leve	t	411	~	Main Pla			
	recovery occi	·		7					
	inner Diamete screen or oper hole	er in inches of n portion of th	the 2	y"	D&M Investigators D. Wagners / E.J. Fillo				
•	Diameter of d		0'	Date 3/27/86					
	Slug used di		· · · · · · · · · · · · · · · · · · ·	Whether test is falling head					
	— le	5m	oll	(slug entering water column) or rising head (slug being pulled out of well)					
	Time After Introduction (Removal) of Slug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Below Top of Casing ((t)	Difference Between SWL and Depth to Water at t>0 (ft)			
2270"	37.0				0.99'	0.07	Static Water Level (SWL)		
2520	42.0'				0.99'	0.07	Argue water Pavel (2MP)		
2820"	47.0'				0.99	0.07			
(gul	0"				0.99'	0.00			
	10"1				/.33'	0.34			
	20"				. 1.33	0.34			
•	40"				1.293	0,30			
	50"				1.28'	0.29	_		
	60"				. 1.275				
	70"				1.27	0.28			
į	80''				1. 26 '	0.27			
	90"				1.255				
"ن در	2.0'				1.235'	0245	· · · · · · · · · · · · · · · · · · ·		
,50	2.5'					0.23			
180	3.0'					0.22	· · · · · · · · · · · · · · · · · · ·		
210	3.5'				1.20	021			
240	4.0'				1.193	0.20			
ユフロ	4.5'			·	1.18	0.19			
300	5.0'				1.17	0.18			
360	6.0'				1.15°	016			
420	7.0				1.14"	0.15			
480	8.01			-	1.13°	0.14			
540	9.0'				1.12'	0-13			
660					1.10'	0.11+			
780	13.0				1.085'	0.095			
900	15.0'				1.08'	0.09			
1080						0.075			
1260	21.0'				1.06	0.07	<u> </u>		
•				,		0 9			
ļ									

		Obsurvation	Monitoring We	II No	-57		00/13-		1-
1		inner Diamete	or in inches of			Client _	CherKor	1	Lancier
		casing) in whi	ch water-level	l	41)	Site	Main Pla	ant	i
mg _		inner Diamete						. Wagner/	i
ļ		screen or oper	n portion of th	тів •	/)		E. J. F.,	110	٠,
4 .		Diameter of d	laith a sussus su			Date	3/27/86		
-		inches	timed tole it	-	<u>1" </u>	Time	3/27/86 2:3	oPM	
7		Slug used — d	lameter (in.)			Whether	test is falling h	ead	
		— le	ngth (in.)	Sma	11	or fising	ering water coll head (slug being	-	•
The state of the s					. "	pulled ou	t of well)	Both	Top of PVC
		Time After Introduction (Removal)	Mark Held or Nearest Foot Mark	Subtract or Add	Add or Subtract Correction	Depth to Water, Below Top of Casing	Difference Between SWL and Depth to Water at	Comments	Top of PVC Top of Water 1.71'
Tatesque		of Slug	(ເກ	(ft)	Factor (ft)	/.7/'	t > 0 (ft)		
Introduce Slug)		0		<u> </u>				Static Water Level (SWL)	_
) o		10"				1.35'	0.36		
- 72		20 "				1.39'	0.32		
With the same		30''		·		1,421	0.29		
, ž		4,0 "				1.44"	0.27		
. 1		50"		1810 V		. 1.46'	0.25		
	•	60"				1.48	0.23	·	7
		70 "				1.493	0.22		
		80''				1.51	0.20		
الم.		90"				1.52'	0.19		7
	120	2.0'				1.56'	0.15		
	50	2.5'				1.58	0.13		
- -	80"	3.0'				1.60	0.11		7
II II	200	ا £.ق			·	1.61	0.10		7
i_ .	2.40	4.0'	,			1.62'	0.09		1
	~>0,	4.5				1.63°	0.08		1
A Parisina	300	5.01				1.635	0.075		-
	360	6.0'			-	1.645'	0.065		
. Articles	420	7.0'				1.65	0.06		-
Ĵ .	480	8.0'				1.655'	0.055		-
Ţ	5-40	9.0'				1.655'	0.055		-
	660°	11.0'					0.05		-
	780	13.0'	<u> </u>			1.66			-
Ţ	900	15.00				1.68'	0.03		-
ظلت	,080					1.69	0.02		-
	1260	21.0				1.703	0.01	<u> </u>	-
,	1440			· · · · · · · · · · · · · · · · · · ·		1.70'			_
(Remove st	حـ (س	24.0'				1.70'	0.01		4
	0 /	10"				1.70'	0.01		<u>-</u> ·
1		10			•	2.01'	0.31		
- 1		120"				1.98'	0.28	·	
. 1		1 1			1				1

Observation/Monitoring Well No.	<u>C-54</u>	Job No
Inner Diameter in inches of portion of well (screen or casing) in which water-level		Client <u>Chevean</u>
Leconera occurred		Site Moin Plant
inner Diameter in inches of the screen or open portion of the hole	•	erotagitevni MåG
Diameter of drilled hole in inches	7'	Date <u>3/27/86</u> Time
Slug used — diameter (in.)		Whether lest is falling head
- length (in.)	·	(slug entering water column) or rising head (slug being pulled cut of weil)

	16	agu (iii)			or rising pulled ou	head (slug being it of well)	t .
	Time After Introduction (Removal) of Slug	Mark Held or Nearest Foot Mark ((t)	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Below Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments
	30''				1.96'	0.26	Static Water Level (SWL)
	40"				1.93'	0.>3	
	50"				1.90'	0.30	
	60"				1.87'	0.17	
	70"				1.85	0.15	
	80"		* * *		. 1.83'	0,13	
	90"		· · · · · · · · · · · · · · · · · · ·		1.82'	. 0.12	
20"	2.0'				1.78	0.08	
50!	2.5'				1.76	0.06	
80"	3.0'		···		1.74	0.04	······································
נוט" [3.5'				1. 73'	0.03	
40	4.0'				1.72	0.02	
ا ٥٦٠	4.5'				1.715	0.015	
300	5.0'				1.712	0.01	
30	5.5'				1.71		
	-				77.77	0,01	
Ì			 , . .				
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}	·						
}			 				
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}							
}			<u> </u>				
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	Observation	MOUTCOLFIS MG	и мо	00			909-032	
		er in inches of			Client _	ChevRor		
]		ich water-leve	i	4"	Site	Dan By (ROOK	
	recovery occi			<u> </u>	D&M Ins	restigators [hagner/	· ·
	Inner Diamet	er in inches of a portion of th			E	J. Fillo	Traglish /	
<u> </u>	hole	per tion of th		<u>""</u>		4/1/86		,
7	Diameter of o	drilled hole in	~	711			A (a)	. `
	inches				Time		Am	
•	Slug used — d				Whether (slug ent	test is failing hering water col	ead '	
à	le	ength (in.)	<u>Sma</u>	2//	or rising	ering water colinated (slug being at of well)	Both t	
÷	,				,		00110	
.								7
- 5 5	Time After Introduction	Mark Held	Subtract	Add or	Depth to Water,	Difference Between SWL		From too
rial-vide	(Removal)	or Nearest Foot Mark	or Add	Subtract Correction		and Depth to Water at	Comments	from top of PVC:
Tritoduce ->	of Slug	((t)	(ft)	Factor (ft)		t > 0 (ft)		
5 xq)	<u> </u>				4.721		Static Water Level (SWL)	4.72 3 PP
į	20"	<u> </u>		<u> </u>	4.3.4	0.38		4.73 - Hy
	30°°				4.34	0.38		7 775
7	400				4.35	6.37		
	5.0 3				 4.35 °	0.37		30 pts.
Ť	60°				. 4.36°	0.36		FALLING NE =
-	700					0.36		
با	80"				4.36			- product=
					4.365	0.355		0.01
-	90"		· · · · · · · · · · · · · · · · · · ·		4.379	0.35		
120					4.38	0.34		
150					4.39'	0.33		
180	3.00'				4.395	0.325		
210	3.50				4.405	0.315		
240	4.00				4415	0,305		1
!	5.00	·			4.430	0.29		-
36.						0.2	· · · · · · · · · · · · · · · · · · ·	┪
. 420							· · · · · · · · · · · · · · · · · · ·	4
					4.461	0.26		>
540					4, 48	0.24		_
660					4.50'	0.22		
780					4.52°	0,20		_
900					4.54	0.18		7
1080					4.56	0.16		7
1260	21.00				4.58°	0,14		1
1420					4.60'	0.12	· · · · · · · · · · · · · · · · · · ·	-
1500	27.00				4.612	0.11		1
1786			· 			0.10		-
1940	, 100 0 				4.62'	0.09		4
	· Jack (AL)				4.63'			-1
270	0 39.00°				4.64'	0.08	·	-
1					4.65'	0.07		
<i>₹06</i>	o 51.00°				4.66'	0.06		
- 41	57 002	1	-		4(7)	0.05		٦ .

• •	Observation	Monitoring Wei	u noD	0-68	Job No.	00113-	909-032			
		er in inches of				CheVKO				
		ich water-level	l.	4"	Site	DORRY C	Reek			1
f ™ 1 -	recovery occi	er in inches of			D&M In	vestigators). Wagner/			1
· · · · · · · · · · · · · · · · · · ·	screen or ope	n portion of the		4 11	· —	E.J. F). Wagner/	d niçê	أياسور كا	٠.
LI	Diameter of o	drilled hole in			Date	4/1/86				4
	inches	a and in other		7 ***	Time	' /			•	
	Slug used — d	liameter (in.)		·	/_l	test is falling h				
	le	ength (in.)	Sm	211	or rising	head slug being	tisting head	1 '	•	
					paned		75019 1000	•		
• • •						Difference			-	s.,
	Time After Introduction	Mark Held or Nearest	Subtract of	Add or Subtract	Depth to Water, Below Top of	Between SWL and Depth to	Comments	1 2	+ use +	n; s
	(Removal) of Slug	Foot Mark (ft)	Add (ft)	Correction Factor (ft)	Casing (ft)	Water at t > 0 (ft)		1	the "sta	عيد تاب
Renove Slug) ->	<u> </u>				4.67° *		Static Water Level (S	WL)	The sta	tic.
	20"				5.06'	0.39			•	
	30"				5.06	0.37				
The state of the s	40"				5.05'	0.38				
Li	5034				5.05	0.38				
F.f	603				. 5.045'	0,375	-		·	
	70"				5.047	0.37				•
	80° I				5.04'	0.37			•	
	90"				5.0353	0.365	· · · · · · · · · · · · · · · · · · ·		* .	
ن در لا	2.00				5.03'	0.36	· · · · · · · · · · · · · · · · · · ·		•	
180	3.00*				5.02'	0.35				
140	4-00'				5.005	0.335				
300	5.00				4.9953	0,325				
420					4.97°	0.30				
590	9.00	·			4.943	0.27				
7 >>0					4.92'	0.25			٠	
900	15.00				4.89'	0.22				
1280					4.877	0.20				
/260	21.00'				4.849	0.17	· · · · · · · · · · · · · · · · · · ·			
,44	24.00				4.82°	0.15	· · · · · · · · · · · · · · · · · · ·			
7 /60					4.79>	0.12				
7/60	36.002				4.76°	0.09				
- T - T - T - T - T - T - T - T - T - T					4.73	0.06	•		•	-
French Carron										
F 35										
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: -\$									÷	
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· · · · · · · · · · · · · · · · · · ·										-

SLUG TEST DATA FORM

•	Ob a manadon ii	Manitoring Wa	T	70	*** ** -	00113 00	0	
F.I		Monitoring Wel er in Inches of		10	JOD NO.	00113-90 Chevron	7-052	
	portion of we				Chour _	Drobe Co-	o l	•
	teconera occi			4 ''	D&M Inu	antimen D	ek Wagaze/	· · · · · · · · · · · · · · · · · · ·
parionanda pid		er in Inches of n portion of th	_		F	T. Fillo	Wagese/	•
renord	hole		_ 4	/ * /	Date	4/1/86		
. pass	Diameter of c inches	iriiled hole in	7	7 ' 1	Time	9. 4:116 4/1/86 8:40	o Am	
The state of the s	Slug used d	lameter (in.)				test is falling h		
v-a	le	ength (in.)	Snie	,//	(slug ent	aring water coin head (sing being t of well)	umal	State 4
The state of the s					pulled ou	t of well)	Both	From top o
1.1	(sec)					5/44	<u> </u>	State H20 From top a
The state of the s	Time After Introduction	Mark Held or Nearest	Subtract	Add or Subtract	Depth to Water, Below Top of	Difference Between SWL		3.59
	(Removal) of Slug	Foot Mark	Add (ft)	Correction Factor (ft)	Casing ((t)	and Depth to Water at t>0 (ft)	Comments	<u> </u>
Introduce >	0				3.59	15 0 11 0	Static Water Level (SWL)	-
in the state of th	20"				3.20'	0.39	20101 (0110)	-
	30"				3.20'	0.39		7
The state of the s	40"				3.20'	0.39		7
L.)	50"				3.20'	6.39		
[]	60''	·			. 3.20'	0.39		
Edward of the Control	70"				3.201	0,39	·	1
···	80"				3.20'	0.39		1 .
The state of the s	90"				- 3:20'	0.37		7.
/20	2.00			_	3.20'	0.39		-
750	2.50				3.20'	0.39		
210	3.50'				3.21'	حج3,0		1
240	4.00'				3.21	0.38		1
30.5	5.00		-		3.21	0.38		7
e.								7
Remove S.) >					3.21'	0.38		7
	20"				3.61'	0.40		7
*	30"				3.61'	0.40	•	
Piles graduate de la constante	40"				3.61'	0.40		7
	<i>50"</i>				3.61'	0.40		
Westerna secretary	60"				3.61'	0.40		
LĒ	70"				3.61'	0.40		
Casali	80"				3.61'	0:40		
Cheel Assessing.	90"		-		3.61'	0.40		
120	2.00'				3.61'	0.40		
,50	2.50'				3.61'	0.40		
• •	3.00'				3.61	0.40]
300	4.00'				3.61'	0.40] .
300	5.00'			•	3.61'	0.40		
- ‡		,						
<u>*</u> * * * * * * * * * * * * * * * * * *	1							7

					DATA FORM			
	Observation/	Monitoring We	u NoS	- 75	Job No.	00113-	909-032	
	portion of we	ch water-leve		4	Site	SRTF	909-032	- - -
	Inner Diamete screen or ope holo	er in inches of n portion of th		4"		estigators <u> </u>		
	Diameter of c inches	iriiled hole in		7 ''	Time	1010g	150 PM	***
	Sing used — d — le	lemeter (in.)	E	rege	(slug enti or rising	test is falling hering water coline to delight to fall the fall to fall the fall to fall the fall to fall the fall to fall the fa	imn)	- - `
	Time After Introduction (Removal) of Slug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add ((t)	Add or Subtract Correction Factor (ft)	Top of Steel Depth to Water, Below Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)		
7	0				10.31'		Static Water Level (SWL
	20"				8,44'	1.87		
	30"				8.451	1.86		
	40'				8.46	1.85		
	50 N				8.4651	1.845		
ļ	60"				. 8.471	1.84		
-1	(f ~ co				01101			

1 2	— le	ngth (in.)	Lo	rege_)	or rising	head (slug being t of well)	BOTA 1
Secundary in							
	Time After Introduction (Removal) of Slug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add ((t)	Add or Subtract Correction Factor (ft)	Top of Steel Depth to Water, Below Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments
Introduce slugg	0				10.31		Static Weter Level (SWL)
	20"				8,447	1.87	
	30"				8.451	1.86	
	40'				8.46	1.85	
	50°				8.465	1.845	
F "	6011				. 8.47'	1.84	
	70"				8.48'	1.83	
	80"					1. 825	
	90"				8.49	1.82	
120	2.00				8.505	1,805	
15-0	2,50				8.515'	1.795	
150	3.∞'				8.525	1.785	
ユ・0	3.501				8.535	1.775	
240	4.00				8. 5 45°	1.765	·
270	4.50'			1	8.550'	1.76	
	5.00			i	8.5601	1.75	
360	6.00'				8.570	1.74	
420	7:00'				8.580'	1.73	
450	8.00			-		ノフス	
5-40	9.00°				8.600°	1.71	
660	11.00				8.6157	1.695	
780	/3.00°				8.631	1.68	
1080	18.00				8 655'		
1800	30.00				8.710'	1.6	
3300	55.00°				8.820'	1.49	
<u>:</u>	115.00				9.02'	129	
7500	/25.00				9.06	1.25	
Γ		-					
Pemore Slag)>	0"				*9 9.06'	1.25]
6 ′	35"				10.93'	1.87	
kulmura ineroid					70,13	/. 6 /	
						·	·

			<u> </u>	DATA FORM		
Observationil	Monitoring Wei	и NoS	-75			-909-03 Z
portion of we	ch water-level		())	Client	Cherror S.R.T.	F.
	of in inches of	the	4"		J. Fillo	D. Wagner
Diameter of dinches	rilled hole in		7''	Date	4//	1/86 ←
Slug used di	ameter (in.)	(La	rge)	Whether (slug ent	test is falling hering water colinead (slug being to f well)	emn)
Time After introduction (Removai) of Slug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add (ft)	Add or Subtract Correction Factor (ft)	Depth to Water, Balow Top of Casing (ft)	Difference Between SWL and Depth to Water at t>0 (ft)	Comments
50,90				10.92	1.86	Static Water Level (SWI
60 30				10.90	1.84	Devet (34)
70"				10.88'	1.82	
8070				10.87	1.81	
90%		· · · · · · · · · · · · · · · · · · ·		10.86	1.80	
2.00				. 10.82'	1.76	
2.50°				10.78	1.72	
3.00				10.74	1.68	
3.50				10.71	1.65	
4.00'		,		10.68'	1.62	
5.00				10.61	1.55	
6.00		· · · · · · · · · · · · · · · · · · ·		10.56	1.50	
7.00				10.51	1.45	
9.00°				10.421	1.36	
11.00'				10.36°	1.30	
13.00'				10.30'	1.24	
/5.00'				10.26'	1.20	
<u> 18.∞</u> ,	·			10.20'	1.14	
21.00					1.11	
27.00'			<u></u>	10.12'	1.06	
<i>33.</i> ∞²					1.04	
39.00					1.03	
						-
ŀ	į.					
			<u>. </u>			

	Observation	Monitoring Wel	ц мо. <u> </u>	82		<u>00113-90</u>		
		er in inches of			Client _	Creveon		
1	portion of well casing) in while recovery occur	ch water-level		y **	· ·	<u> 5, 5, T, F</u>		
	Inner Diamete	or in inches of a portion of th			D&M inv	estigators D	. Wagner/	
<u> </u>	pole	a portion of th	• <u> </u>	/ 00		4/1/86		
7	Diameter of d	riiled hole in		7 ''	Time	11.100		
	Slug used di	iameter (in.)			Whether	test is falling h	ead	
	— le	ngth (in.)	5m	nall	or rising	ering water colu head (sing being at of well)	imn) Both	•
		•		-	paner of	TO MATH	Dolly	1
Bilder	Time After introduction (Removal)	Mark Held or Nearest Foot Mark	Subtract or Add	Add or Subtract Correction	Depth to Water, Below Top of Casing	Difference Between SWL and Depth to Water at	Comments	top of PVC = 1.66
Totroduce ->	of Slug	(ft)	(ft)	Pactor (ft)	((1))	t > 0 (ft)		pvc =
Introduce → Slug)	20"		· · · · · · · · · · · · · · · · · · ·		1.66	0.13	Static Water Level (SWL)	1.66'
.i. V ↑ .	<i>30</i> "				1.57°	0.09		7
	40"				1.60	0.06		product =
and the state of t	50"				1.62	0.04		0.01
7	60''		· ***			0.04		-
	70"				1,625	0.035		1
	80"				1.63	0.03		+
- P6-	90"		· · · · · · · · · · · · · · · · · · ·		1.63	0.03		1.
120	2.00				1 635'	0.025	·	-
1 ,50	250'				1.6357	0.025		1
180	3.00				1-635	0.025		7
710	3.50					0.02		
240	4.00				1.640'	0.02		1
270	4.50'	·		_	1.640'	0.02	·]
300°	5.00'				1.640'	0.02]
	6.00'		·		1.6407	0.02		
420	7.00°				1.6401	0.02		
540	9.00'		· · · · · · · · · · · · · · · · · · ·		1.640'			
1260	21.00				1.640?	0.02		
(Remove slug) >	0"				1.6407	0.02		
	<u>/5"</u>				1.8'	0.16		1
	20"				1.75'	0.11		_
Ţ	30"				1.71'	0.07	·	4
<u>.</u>	40"				1.691	0.05		4
-	50" 60"				1.68'	0.04	· · · · · · · · · · · · · · · · · · ·	4
	70"				1.66	0.02		
	80"	1		*	1.65	0.01		4
<u>*</u>	90"		- 		1.65'	0.01		-

	Obsomention	Monitoring We		- O 2	* V-	00113-	0.00
•		er in inches of		<u> </u>		Chevro	
	portion of we casing) in whi	ill (screen or ich water-leve) (1		5.R.	
	recovery occ				D&M In	vestigators I	. Wagner /
•	screen or ope hole	er in inches of a portion of th	the 2	f''	<u></u>	J. F.110	
	Diameter of clinches	drilled hole in	7) Ji	Date	4/1/8	36
	Slug used — d	iameter (in.)		<u></u>	Whether	test is falling h	ead
	le	ength (in.)	<u>.5n</u>	nall	or ristor	tering water coin head (sing being it of well)	•
	Time After introduction (Removal) of Siug	Mark Held or Nearest Foot Mark (ft)	Subtract or Add ((t)	Add or Subtract Correction Factor (ft)		Difference Between SWL and Depth to Water at t>0 (ft)	
120	2.00'				1.6451	0.005	Static Water Level (SWL)
150	2.50				1.645	0.005	
180	3.00		· · · · · · · · · · · · · · · · · · ·		1.645°	0.005	
210	3.50°			<u> </u>	1-645'	0.005	
240	4.00				1.64	0.00	
טדג	7/30	$\triangle A$	10		. L642	0,00	
300	5.0%	\sim			1.842	0.00	
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]							
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-							
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Laboratory Permeability and Hydrometer Test Data

PROJECT CHEUROW	JOB. NO. <u>001/3-950-032</u>
LOCATION OF PROJECT	BORING NO. A 2 / D SAMPLE NO.
DESCRIPTION OF SOIL Chayey SILTS	
CHECKED BA	

\propto	ATTEI Lim	RBERG ITS	NON-PLASTIC
X	MOIST DENS	URE &	
X	SIEVE	GRAIN SIZE	
X	HYDROMETER	ANALYSIS	
	RELATIVE	DENSITY	
	COMPA	CTION	
\times	PERMEA	BILITY	FLEX-WALL
	CONSOLI	DATION	
	VANE	SHEAR	
	SPECIFIC	GRAVITY	
	DIRECT	SHEAR	·
	UNCON COMPRE	FINED SSION	
	TRIAX COMPRE		
	·		,
		MIS. Tests	
		· .	

NATURAL MOISTURE

DISH	7-5	DENSITY
WT OF DISH + WET SOIL	405.21	NUMBER OF RINGS
WT OF DISH + DRY SOIL	282.37	WT OF RINGS + WET SOIL
WT OF MOISTURE	122.84	WT OF RINGS
WT OF DISH	7.96	WT OF WET SOIL
WT OF DRY SOIL	274.41	FIELD DENSITY
MOISTURE CONTENT	44.8	DRY DENSITY

HYGROSCOPIC MOISTURE

DISH	
WT OF DISH + WET SOIL	
WT OF DISH + DRY SOIL	
WT OF MOISTURE	
WT OF DISH	
WT OF DRY SOIL	
MOISTURE CONTENT	

	SOIL AIR-DRIE	D IN PAN NU	MBER)-5		
	U.S. STAND. SIEVE NO.	WT. OF SOIL RETAIN UNCORR.	WT. OF SOIL RETAIN CORR,	PERCENT RETAIN.	CUMULATIVE PERCENT RETAINED	PERCENT FINER
	LARGER					
	3" (76.2)		$\downarrow \downarrow$			
	15" (38.1)		\/_			
PAN NUMBER	3/4" (19.1)		<u> </u>			
	½" (12.7)		$\perp A$			
	ፈ '' (6.35)		+			
	NO. 4 (4.76)		/\			
	NO. 10 (2.00)		<u>/</u>			
•	PAN					
	TOTAL			<u> </u>		
					· ·	
	NO. 20 (0.84)		N /			
	NO. 40 (0.42)					
PAN NUMBER	NO. 60 (0.25)	0	1 X	0	0	100
D-13	NO. 100 (0.149)	0.62	1/\	0.95		99.05
	NO. 200 (0.074)	2.71	/	4.17	5,12	94.88
	PAN		61,67	94.88	100	
	TOTAL	65.0	<u> </u>	<u> </u>		

HYDROMETER ANALYSIS	BY L. SHUNOW DATE 1-15-87
DISPERSING AGENT CALGON	G _S OF SOILDS =
ZERO CORRECTION	
DEAKER NUMBER	

	DATE	TIME OF READING	ELAPSED TIME, MIN	TEMP.,	ACTUAL HYD. READING Ra	CORR. HYD. READING R _C	र FINER	HYD.CORR. ONLY FOR MENISCUS, R _C	L	<u>L</u>	K	D,mm
Ì	1-16-07	1025	ପ			,						
ı		1027	2		32		41.54					.031
Ì		1030	<u>-</u>		24		29.23					.022
Ì		1040	15		2/		24.62					,013
		1255	30		18		20.0					,009
		1135			15.5		16.15					007
		725	2.0		13		12.31					,003
	1-17-66	1025	1440		1025		8.46				<u> </u>	.00/
	·											

SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)

DATE

	· /2	
FLASK NUMBER	·	
WT. FLASK + WATER + SOIL = Wibws		
TEMPERATURE, °C		
WT. FLASK + WATER = Wbw		
WT. OF DRY SOIL = Ws		
$W_W = W_S + W_{bW} - W_{bWS}$		
$G_s = aW_s/W_w$		

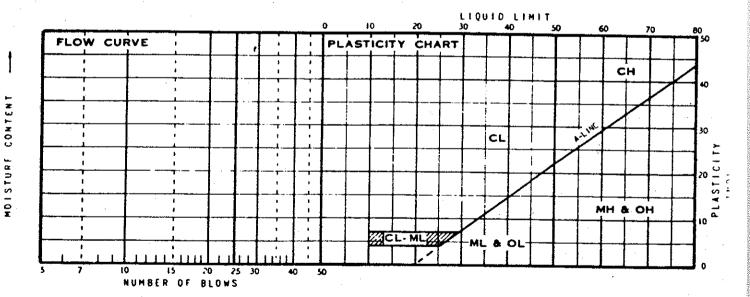
AVERAGE SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)=

PL	AST	10	LI	MI	T
7 6-	<i>-</i> ''	* ~		. , , ,	

PLASTIC LIMIT				
DETERMINATION	1	2	3	4
DISH				
WT OF DISH + WET SOIL				
WT OF DISH + DRY SOIL			1	
WT OF MOISTURE				
WT OF DISH				
WT OF DRY SOIL				
MOISTURE CONTENT			1	

LIQUID LIMIT

DETERMINATION	1	2	3	4
DISH				
NUMBER OF BLOWS				
WT OF DISH + WET SOIL				
WT OF DISH + DRY SOIL		1		
WT OF MOISTURE				
WT OF DISH				
WT OF DRY SOIL				
MOISTURE CONTENT	······································			



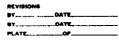
LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX

FIELD CLASSIFICATION _____

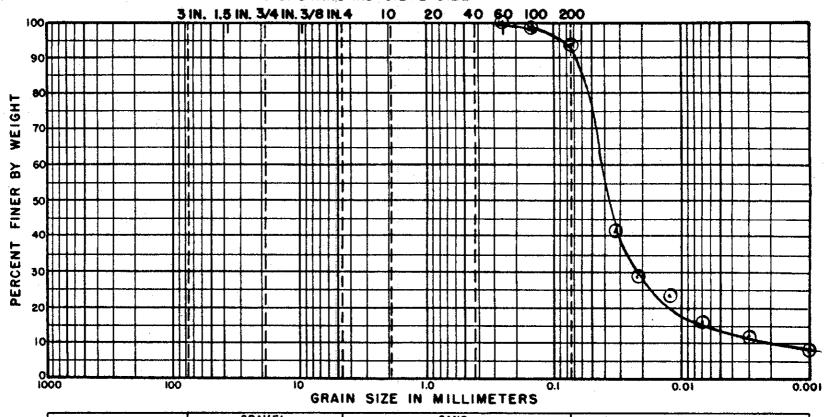
LABORATORY CLASSIFICATION _____

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2	ŀ
40	8

MEDDILS -	750 -	25	
<u></u>	PATI	7-15-	C:







1	COBBLES	GRAVEL			SAND				CUT OR OLAY		
	COBBLES	COARSE	FINE	COARSE	MEDIUM	F	INE		SILT	OR CLAY	
	DEPTH	Cı	ASSIFICAT	TION	NAT. WC	LL	PL	PI			
A215	195-21.5										

PROJECT CHEVRON	JOB. NO. <u>00113 - 950</u>
LOCATION OF PROJECT	BORING NO. P 487 SAMPLE NO.
DESCRIPTION OF SOIL SILTY CLAY	DEPTH OF SAMPLE 30-32'

	ATTE		
	LIM	ITS	
\times	MOIST DENS	URE &	
X	SIEVE	GRAIN SIZE	
X	HYDROMETER	ANALYSIS	•
	RELATIVE	DENSITY	
	COMPA	CTION	
X	PERMEA		
	CONSOL		
	VANE		
	SPECIFIC	GRAVITY	
·	DIRECT	SHEAR	
	UNCON COMPRE	IFINED SSION	
	TRIA) COMPRE		
	,		
		MIS. TESTS	

FLEX WALL

NATURAL	MO]	IST	URE
---------	-----	-----	-----

DISH	H	DENSITY		
WE OF DISH + WET SOIL	132.42	NUMBER OF RINGS		
WT OF DISH + DRY SOIL	96.0	WT OF RINGS + WET SOIL		
WIT OF MOISTURE	36.42	WT OF RINGS		
WIT OF DISH	27.84	WT OF WET SOIL		
WT OF DRY SOIL	68.16	FIELD DENSITY		
MOISTURE CONTENT	53.4	DRY DENSITY		

HYGROSCOPIC MOISTURE

DISH	
WT OF DISH + WET SOIL	
WT OF DISH + DRY SOIL	
WT OF HOISTURE	
WT OF DISH	
WT OF DRY SOIL	
MOISTURE CONTENT	

SOIL AIR-DRIED IN PAN NUMBER 12-16

	SOIL AIR-BRIED IN LAN HOUDER						
·	U.S. STAND. SIEVE NO.	WT. OF SOIL RETAIN UNCORR.	WT. OF SOIL RETAIN CORR.	PERCENT RETAIN.	CUMULATIVE PERCENT RETAINED	PERCENT FINER	
, , ,	LARGER						
	3" (76.2)						
	1½" (38.1)						
PAN NUMBER	3/4" (19.1)		LV				
	½" (12.7)		$\perp \Lambda$				
	<u> </u> ተ" (6.35)		/ \				
	NO. 4 (4.76)						
	NO. 10 (2.00)		/.				
· ·	PAN						
	TOTAL	130.94				$\geq \leq$	
							

	NUMBER_
کے کے	-16_

NO. 20 (0.84)					
NO. 40 (0.42)					
NO. 60 (0.25)	O	I X	0	0	100
NO. 100 (0.149)	0.17] / \	0.26	0.26	99,74
NO. 200 (0.074)		$V \setminus$	0.15	0.41	99.59
PAN		64.73	99.58		
TOTAL	65.0			\geq	1><

HYDROMETER ANALYSIS	BY LSHANNON DATE 12-14-86
HYDROMETER NO. 152 H	G _S OF SOILDS =8=
DISPERSING AGENT CHLGON	AMOUNT 125 ML WT. OF SOIL, Ws 65,0
ZERO CORRECTION	MENISCUS CORRECTION
BEAKER NUMBER	JAR NUMBER <u>5</u>

DATE	TIME OF READING	ELAPSED TIME, MIN	I LEMP	ACTUAL HYD. READING Ra	CORR. HYD. READING R _C	ै FINER	HYD.CORR. ONLY FOR MENISCUS, R _C	L	L t	К	D,mm
12-15-86	1307	0								<u> </u>	
	1309	2		55		79,92					.027
	13/2	حی		48		46,15		<u> </u>		ļ	.018
	1322	15		41		55,38			ļ		.011
	1337	30		35		46.15					,02G
	1407	60		30		38.46					,006
1	1517	250		23.5		281					223
12-16-86	1	1440		17.5		19:23					700
_											

SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)

BY

DATE

FLASK NUMBER		
WT. FLASK + WATER + SOIL = Wibws		
TEMPERATURE, °C		
WT. FLASK + WATER = Wbw		
WT. OF DRY SOIL = Ws	·	
$W_W = W_S + W_{DW} - W_{DWS}$		
$G_S = aW_S/W_W$		

AVERAGE SPECIFIC GRAVITY OF SOIL SOLIDS (G5)=

LIMITS MATERIAL IN PAN NUMBER

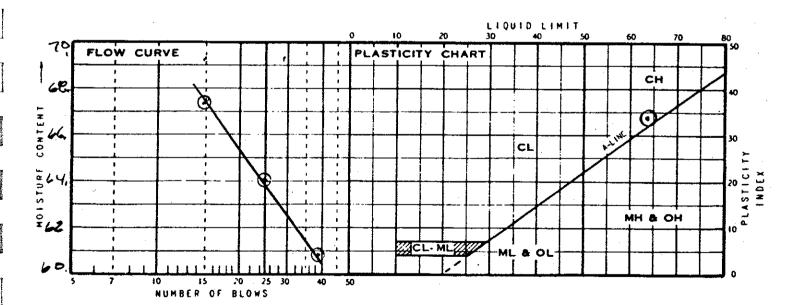
BY L-S. DATE 1-8-87

-			
DI ACI	T T C	IIMIT	
LI WOL		LIMIT	

PLASTIC LIMIT				
DETERMINATION	1	2	3	4
DISH	772	34	510	
WT OF DISH + WET SOIL	41.53	42.20	41.69	
WT OF DISH + DRY SOIL	39.81	40,30	40.06	l 1
WT OF MOISTURE	172	1,90	1.63	
WT OF DISH	34.24	34.08	34.4.	
WT OF DRY SOIL	5.57	6.22	5161	
MOISTURE CONTENT	25.9	305	291	

LIQUID LIMIT

DETERMINATION	1	2	3	4
DISH	A-12	233	F	
NUMBER OF BLOWS	33	25	15	
WT OF DISH + WET SOIL	52.33	40.02	48.90	
WT OF DISH + DRY SOIL	46.20	32.53	40.65	
WT OF MOISTURE	6,13	7,49	6.23	
WT OF DISH	36,14	20.82	28.45	
WT OF DRY SOIL	10.06	1171	12.22	
MOISTURE CONTENT	60.9	64.0-	67.3	· · · · · · · · · · · · · · · · · · ·



LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY	INDEX
64.0	30.0	34,0	

LABORATORY CLASSIFICATION CIF

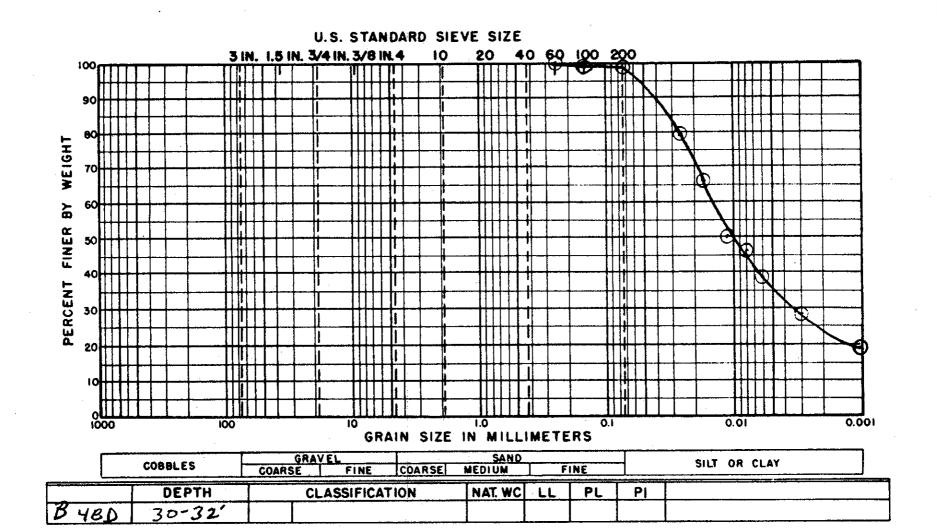
Dames & Moore

PRED BY DATE 12 -17-56

REVISIONS

BY. DAYE

PLATE OF



PROJECT CHEVRON	JOB. NO. 00//3-950-032
LOCATION OF PROJECT	BORING NO. C.50 D SAMPLE NO.
DESCRIPTION OF SOIL CLAYEY SILT	DEPTH OF SAMPLE 7.5-9'
AUCEUED DV	

X	ATTEI LIM	RBERG ITS	
X	MOIST DENS	URE &	ŀ
X	SIEVE	GRAIN SIZE	
X	HYDROMETER	ANALYSIS	
	RELATIVE	DENSITY	·
	COMPA	CTION	
X	PERMEA	BILITY	FLEX WALL
	CONSOLI	DATION	
	VANE	SHEAR	
	SPECIFIC	GRAVITY	
	DIRECT	SHEAR	
	UNCON COMPRE	FINED SSION	
	TRIAX COMPRE		 · ·
·			
		MIS. TESTS	

NATURAL MOISTURE

DISH	ACE	DENSITY	
WT OF DISH + WET SOIL	96,46	NUMBER OF RINGS	
WT OF DISH + DRY SOIL	66.92	WT OF RINGS + WET SOIL	
WT OF MOISTURE	29.54	WT OF RINGS	
WT OF DISH	38.34	WT OF WET SOIL	
WT OF DRY SOIL	2858	FIELD DENSITY	
MOISTURE CONTENT	103.4	DRY DENSITY	

HYGROSCOPIC MOISTURE

DISH	
WT OF DISH + WET SOIL	
WT OF DISH + DRY SOIL	
WT OF HOISTURE	
WT OF DISH	,
WT OF DRY SOIL	
MOISTURE CONTENT	

		SOIL AIR-DRIE	D IN PAN NU	IMBER 12	-12		
		U.S. STAND. SIEVE NO.	WT. OF SOIL RETAIN UNCORR.	WT. OF SOIL RETAIN CORR.	PERCENT RETAIN.	CUMULATIVE PERCENT RETAINED	PERCENT FINER
!		LARGER		/			
		3" (76.2)					
		11" (38.1)					
PAN NUMBER		3/4" (19.1)		V			
		½" (12.7)		$\perp \Delta$			
		ት" (6.35)					
		NO. 4 (4.76)	<u> </u>				
	L	NO. 10 (2.00)		<u> </u>			
		PAN	\mathcal{N}				
		TOTAL	79.70			$\searrow \swarrow$	$>\!\!<$
	<u> </u>	NO. 20 (0.84)					
		NO. 40 (0.42)					
PAN NUMBER		NO. 60 (0.25)	· · · · · · · · · · · · · · · · · · ·	ΙX			
1)-26		NO. 100 (0.149)	0] / \	0	٥	2-10
		NO. 200 (0.074)	0.28	$V \setminus$	0.43	0,43	99.57

PAN TOTAL 64.72 9957

HYDROMETER ANALYSIS	BY L. SHAWNON DATE 1-15-87
HYDROMETER NO. 152H	G _S OF SOILDS =
DISPERSING AGENT CALGON	AMOUNT 125 ML WT. OF SOIL, Ws 65.0
ZERO CORRECTION	MENISCUS CORRECTION
BEAKER NUMBER FOURTEEN	JAR NUMBER

DATE	TIME OF READING	ELAPSED TIME, MIN	itmr.,	ACTUAL HYD. READING R _a	CORR. HYD. READING R _C	ै FINER	HYD.CORR. ONLY FOR MENISCUS, R _C	L	L]t	ĸ	D ,mm
1- 3-87	1029	0									
	1031	2		42		50,92					.030
	1034	5		38.5		5454					,020
	1044	15		32.5		42.31				<u> </u>	0/2
	1059	33		28		35,38		:			,009
	1129	دور		24		29,23					,00%
	1039	250		17		18,4					.003
1-17.87	1029	1440		13		12.31					,001
										<u> </u>	<u> </u>

SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)

DATE

FLASK NUMBER	
WT. FLASK + WATER + SOIL = Wibws	
TEMPERATURE, °C	
WT. FLASK + WATER = Wbw	
WT. OF DRY SOIL = W _S	
$W_W = W_S + W_{DW} - W_{DWS}$	
$G_S = aW_S/W_W$	

AVERAGE SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)=

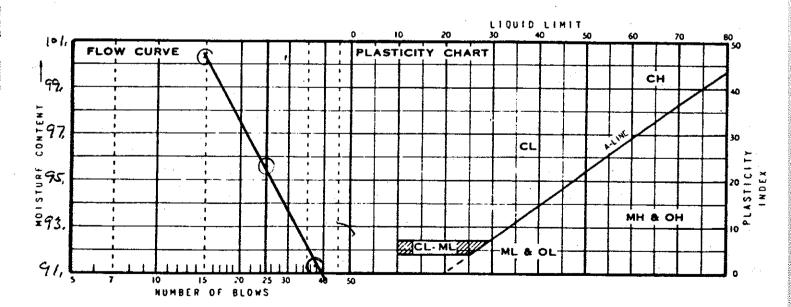
PLASTIC LIMIT

LIMITS MATERIAL IN PAN NUMBER BY L-SHANDON DATE 1-14-87

DETERMINATION	1	2	3	4
DISH	777	23	ANT	
WT OF DISH + WET SOIL	43.15	45.05	41,98	
WT OF DISH + DRY SOIL	40.19	41.90	39.70	
WT OF MOISTURE	2.96	3,15	2.28	
WT OF DISH	33.40	34.66	34.62	
WT OF DRY SOIL	6.79	7.24	5,08	
MOISTURE CONTENT	43.6	43.5	44.9	

LIQUID LIMIT

DETERMINATION	I	2	3	4
DISH	Mon	710	A-32	
NUMBER OF BLOWS	-38	25	15	
WT OF DISH + WET SOIL	49.76	49.33	53,60	
WT OF DISH + DRY SOIL	42.24	42.10	44,74	
WT OF MOISTURE	7,54	7.23	8.86	
WT OF DISH	33.96	34.54	35.90	
WT OF DRY SOIL	8.28	7.56	B.84	
MOISTURE CONTENT	91.1	95,6	100,2	



LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
95	44	51

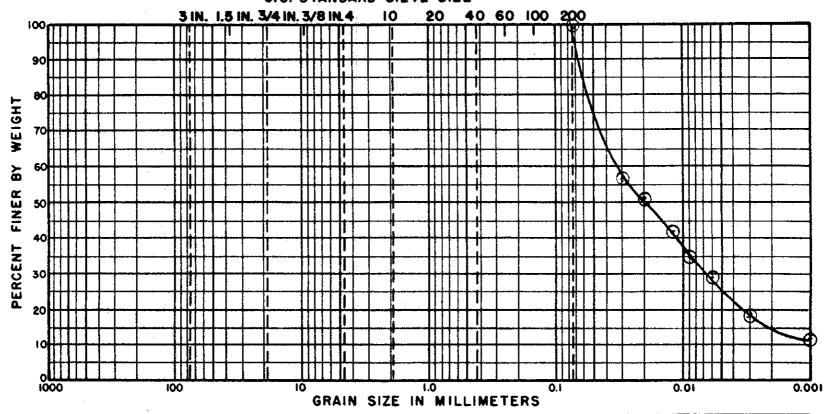
FIELD CLASSIFICATION LABORATORY CLASSIFICATION ____ 1.00113-950 072

v L.S. DATE / - 20-87

REVISIONS

BY DATE





	, , , , , , , , , , , , , , , , , , , ,									
20201 50		GRAVEL			SAND	•			UT OR CLAY	1
	COBBLES	COARSE -	FINE	COARSE	MEDIUM	FI	NE	3	ILT OR CLAY	
1	NEDTU	- CLAS	CICICATI	ON	NAT WC		DI.	ادةا		

OFPTH CLASSIFICATION NAT. WC LL PL PI

PROJECT CHEURON	JOB. NO. <u>00/13-950</u>
LOCATION OF PROJECT	BORING NO.C GSD SAMPLE NO.
DESCRIPTION OF SOIL SILTY CLAY	DEPTH OF SAMPLE 25-27
AUCAVED DV	

X	ATTEI . LIM	RBERG ITS]	
X	MOIST Deans	URE &			
X	SIEVE	GRAIN SIZE			
X	HYDROMETER	ANALYSIS			
	RELATIVE	DENSITY			
	COMPA	CTION			
X	PERMEA	→	FLEX	WALL	
	CONSOLI				
	VANE SHEAR				
	SPECIFIC GRAVITY				
	DIRECT	\(\frac{1}{2}\)			
	UNCON COMPRE	·			
	TRIAX COMPRE				
		MIS. TESTS			

NATURAL MOISTURE

DISH A-23		DENSITY			
WT OF DISH + WET SOIL	89.56	NUMBER OF RINGS			
WT OF DISH + DRY SOIL	63.92	WT OF RINGS + WET SOIL			
WT OF MOISTURE	25,64	WT OF RINGS			
WT OF DISH	27.76	WT OF WET SOIL			
WT OF DRY SOIL	36.16	FIELD DENSITY			
MOISTURE CONTENT	709	DRY DENSITY			

HYGROSCOPIC MOISTURE

DISH	
WT OF DISH + WET SOIL	
WT OF DISH + DRY SOIL	
WT OF MOISTURE	
WT OF DISH	
WT OF DRY SOIL	
MOISTURE CONTENT	

SOIL AIR-DRIED IN PAN NUMBER _________

		COTE THE DATE					
		U.S. STAND. SIEVE NO.	WT. OF SOIL RETAIN UNCORR.	WT. OF SOIL RETAIN CORR,	PERCENT RETAIN.	CUMULATIVE PERCENT RETAINED	PERCENT FINER
		LARGER					
		3" (76.2)					
		111 (38.1)			•		
PAN NUMBER _		3/4" (19.1)		V			
· · · · · · · · · · · · · · · · · · ·		½" (12.7)	,	Λ			
		ፈ ጣ (6.35)					
•		NO. 4 (4.76)		/ \			
		NO. 10 (2.00)		\			
e.		PAN	$\searrow \swarrow$				
		TOTAL	36.49			$\triangleright \!$	><
	1						

PAN	NUMBER	
,4	E-B	

NO. 20 (0.84)					
NO. 40 (0.42)					
NO. 60 (0.25)	D	X	0	0	100
NO. 100 (0.149)	0.11		0.17	0,17	99.83
NO. 200 (0.074)	0.18		0.28	0,45	99.55
 PAN	\mathcal{M}	64.71	99,55		
TOTAL	65.0			\mathbb{X}	\searrow

HYDROMETER ANALYSIS	BY L. SIFITUNDIO DATE 12-14-EL
HYDROMETER NO. 152 H	G _S OF SOILDS =a=
DISPERSING AGENT CALGOD	AMOUNT 125 NIL WT. OF SOIL, W. 65.0
ZERO CORRECTION	MENISCUS CORRECTION
BEAKER NUMBER FOURTEEN	JAR NUMBER

DATE	TIME OF READING	ELAPSED TIME, MIN	IEMP.	ACTUAL HYD. READING R _a	CORR. HYD. READING R _C	% FINER	HYD.CORR. ONLY FOR MENISCUS, R _C	L	ا ا	К	D,mm
12-15-86	1311	0	0	D							
	13/3	2		52		72.31					,028
	1316	<u>5</u>		47		64.62					,018
	1326	15		40		53.65					.011
	1341	30		34		44,62					.005
	1411	60		28.5		36.46					,006
	1621	250		20		3					,೦೦
12-16	1311	1440		14		13.65					,001

SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)

DATE

FLASK NUMBER	
WT. FLASK + WATER + SOIL = Wibws	
TEMPERATURE, °C	
WT. FLASK + WATER ^b = W _{bw}	
WT. OF DRY SOIL = W _s	
$W_W = W_S + W_{bW} - W_{bWS}$	
C = 31 /U	

AVERAGE SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)=

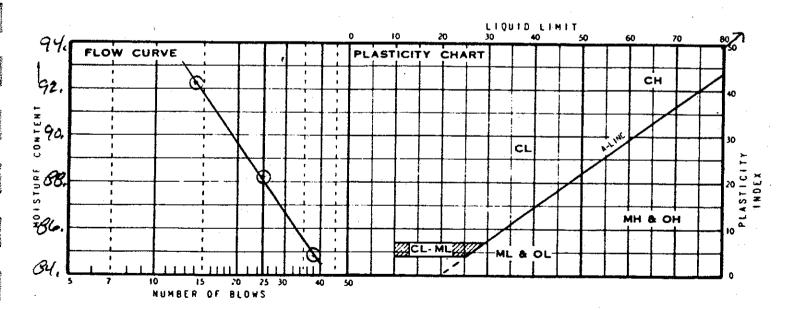
PI	AST	TC.	1	IMI	T
	\mathbf{r}	IV	٠.	*:17	•

		 			•• —	
					\sim	1
ov.	4-1			-/-	0-	~ I
Dī		 	UAI	Ł/	<u> </u>	

DETERMINATION	1	2	3	4
DISH	MON	/	207	
WT OF DISH + WET SOIL	40.90	41.08	41.28	
WT OF DISH + DRY SOIL	39,13	39.20	39,45	
WT OF MOISTURE	1.77	1,88	1.83	
WT OF DISH	33.96	33.32	34.10	
WT OF DRY SOIL	5:17	5,88	5.35	
MOISTURE CONTENT	34.2	32.0	34.2	

LIQUID LIMIT

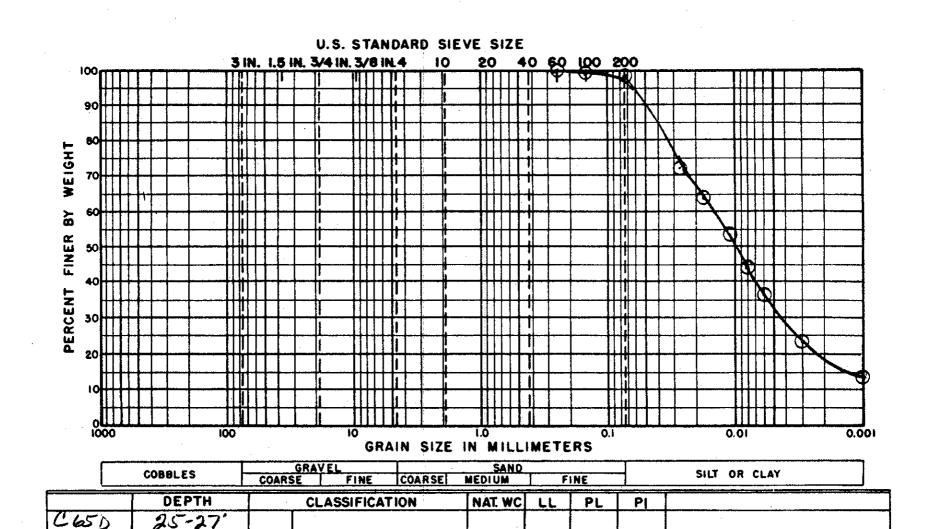
DETERMINATION	1	2	3	4
DISH		7	G	
NUMBER OF BLOWS	38	25	14	
WT OF DISH + WET SOIL	43.46	41.68	43.95	
WT OF DISH + DRY SOIL	36.48	35.17	36.10	
WT OF MOISTURE	6,98	6.51	7.65	
WT OF DISH	28.26	27.79	27.59	
WT OF DRY SOIL	8,22	7.38	8.51	
MOISTURE CONTENT	84.9	88.2	92.2	



LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
86	35	53

FIELD CLASSIFICATION ____

LABORATORY CLASSIFICATION CH



GRADATION CURVE

PROJECT CHEVRON	JOB. NO. <u>100/13 - 03 2</u>
LOCATION OF PROJECT	BORING NO SAMPLE NO. 5104
DESCRIPTION OF SOIL GRAY SILTY CLAY	
CHECKED BA	

X	AȚTE LIM		
X	·	URE &	
X	SIEVE		
X	HYDROMETER	SIZE ANALYSIS	
	RELATIVE	DENSITY	
	СОМРА		
\times	PERMEA		
	CONSOLI		
	VANE	SHEAR	
	SPECIFIC	GRAVITY	
	DIRECT	SHEAR	
	UNCON COMPRE	FINED SSION	
	TRIAX COMPRE		

FLEX-WALL

NATURAL MOISTURE

DISH	A-16	DENSITY		
WT OF DISH + WET SOIL	119.39	NUMBER OF RINGS		
WT OF DISH + DRY SOIL	80.48	WT. OF RINGS + WET SOIL		
WT OF MOISTURE	38.91	WT OF RINGS		
WT OF DISH	35,67	WT OF WET SOIL		
WT OF DRY SOIL	44.81	FIELD DENSITY		
MOISTURE CONTENT	86.3	DRY DENSITY		

HYGROSCOPIC MOISTURE

DISH	
WT OF DISH + WET SOIL	
WT OF DISH + DRY SOIL	
WT OF HOISTURE	
WT OF DISH	
WT OF DRY SOIL	
MOISTURE CONTENT	

SOIL AIR-DRIED IN PAN NUMBER D-26

		U.S. STAND. SIEVE NO.	WT. OF SOIL RETAIN UNCORR.	WT. OF SOIL RETAIN CORR.	PERCENT RETAIN.	CUMULATIVE PERCENT RETAINED	PERCENT FINER
	abla	LARGER					
		3" (76.2)					
		15" (38.1)		$\perp \setminus \angle$			
PAN NUMBER		3/4" (19.1)		V			
: _		½" (12.7)		$\perp \Delta$			
		፤ " (6.35)					
		NO. 4 (4.76)					
		NO. 10 (2.00)		/			
		PAN					
-		TOTAL	177.34				$\geq \leq$

PAN	NUMBER	
	D-B	•

_						
	NO. 20 (0.84)					
	NO. 40 (0.42)		$[\ \]$	·		
	NO. 60 (0.25)	0	X.	0	0	100
	NO. 100 (0.149)	0.98		1.51	1.51	98.49
	NO. 200 (0.074)	0.90		1.38	2.89	97.11
	PAN		63,12	97.11		
	TOTAL	65,0			\sim	

	ZERO CORRECTION BEAKER NUMBER ELEVEN					_ G _s OF _ AMOUN _ MENIS						
1					ACTUAL	CORR.		HYD.CORR. ONLY FOR MENISCUS,				

DATE	TIME OF READING	ELAPSED TIME, MIN	TEMP., °C	ACTUAL HYD. READING R _a	CORR. HYD. READING R _C	% FINER	HYD.CORR. ONLY FOR MENISCUS, R _C	Ļ	<u>.</u> t	K	D,mm
1-13-87	1028	D	20.0								
	1030	2		43		58,46					030
	1033	5		36		50,77					.020
	1043	15		30,5		39,23				ļ	.012
	1958	30		28		35.3E				ļ	,009
	1128	60		22		26.15					.006
-	1038	250		15		15.38					.003
1-14-67	1028	1440				9.23				<u> </u>	,001
					-			· · ·	<u> </u>	 	

SPECIFIC GRAVITY OF SOIL SOLIDS (Gs)

DATE _____

FLASK NUMBER		
WT. FLASK + WATER + SOIL = Wibws	<u> </u>	
TEMPERATURE, °C		
WT. FLASK + WATER = Wbw		
WT. OF DRY SOIL = Ws		
$W_W = W_S + W_{bW} - W_{bWS}$		
$G_S = aW_S/W_W$		

AVERAGE SPECIFIC GRAVITY OF SOIL SOLIDS (Gs) = _____

LIMITS MATERIAL IN PAN NUMBER

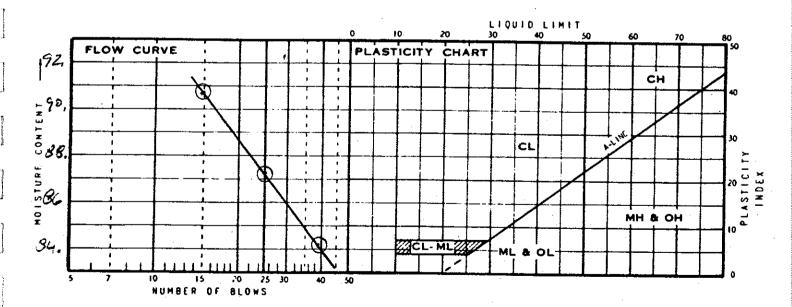
PLASTIC L	IMI	T
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BY	L.5,	D	ΔT	F /·	- 2	-B	ラ
D 1		υ	A I	ــــــــــــــــــــــــــــــــــــــ	<u> </u>		_

DETERMINATION	1	2	3	4
DISH	23	774	752	
WT OF DISH + WET SOIL	42.21	40.59	41.71	
WT OF DISH + DRY SOIL	40,14	30.61	39.69	
WT OF MOISTURE	2.07	1.98	2.02	
WT OF DISH	34.72	33.40	34.4B	
WT OF DRY SOIL	5,42	5.21	5,21	
MOISTURE CONTENT	38.2	30.0	3 <i>8</i> . <i>B</i>	

LIQUID LIMIT

DETERMINATION	1	2	3	4
DISH	710	718	MON	
NUMBER OF BLOWS	39	25	15	
WT OF DISH + WET SOIL	51,92	51.72	50.60	
WT OF DISH + DRY SOIL	43.98	43.16	42.63	
WT OF MOISTURE	7.94	B.56	7.92	
WT OF DISH	34.54	33.34	33.96	
WT OF DRY SOIL	9.44	7.82	8.72	
MOISTURE CONTENT	84.1	87.2	97.8	



LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
87	3 <i>B</i>	49

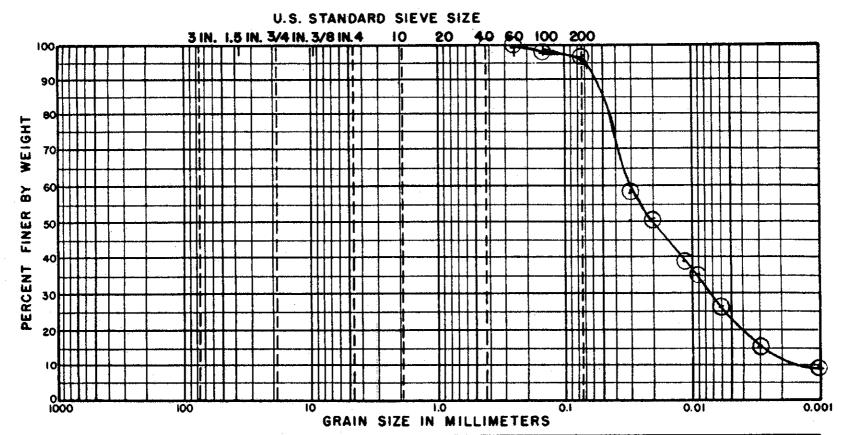
LABORATORY CLASSIFICATION CH

REVISIONS

BY _ ..., DATE

BY. DATE.

5/04 @ 15-17'



	CORR. 55		GRAVEL		SAND				SILT OR CLAY		
<u> </u>	COBBLES	COARSE FINE		NE COAR	COARSE MEDIUM		FINE		311.1	UR CLAT	
	DEPTH	T	CLASSIF	ICATION	NAT, WC	LL	PL	PI			

GRADATION CURVE

APPENDIX H

Laboratory Reports - Ballfields

Sample I.D. and Locations Chevron/Gulf Philadelphia Refinery "Ballfields"

Sample I.D. Sample Location Composite of Samples 1, 2 and 3 Collected from Boring BF88

S BF89 Composite of Samples 1, 2 and 3
Collected from Boring BF89

S BF90 Composite of Samples 1, 2 and 3
Collected from Boring BF90

S BFBG

Background Sample Collected from a

depth of 6 inches to 1 foot

(Western Ballfield) at Second

Base

S BFTP5 through S BFTP10 Collected from Test Pits BFTP5 through BFTP10

ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-1L) - All Parameters Present, Samples Linked by Order

DATE: 04/01/ PAGE:

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

DAMES AND MOORE

DMCHEV

See Below

ETC Sample No.

Company

Facility

Sample Point

Date

Sample Points, Sampling Dates, and ETC Sample No!s "路" 3F89 # freing BFEG **第51章 138** 152 BEJP6 S BFTP7 L3585 L3587 Parameters L3586 L3588 L3591 L3583 Units L3592 L3584 PP Volatile Compounds Benzene ug/kg 36 36 36 36 49.3 Ethylbenzene ug/kg Methylene chloride ug/kg PP Acid Compounds 2.4-Dimethylphenol ug/kg PP Base/Neutral Compounds Acenaphthene ug/kg 110 Acenaphthylene ug/kg Anthracene 260 83 ug/kg 260 Benzo(a)anthracene ug/kg Benzo(a)pyrene ug/kg Benzo(ghi)perylene ug/kg bis(2-Ethylhexyl)phthalate ug/kg Chrysene 63 73 ug/kg 385 79.7 1.2-Dichlorobenzene ug/kg Fluoranthene ug/kg 99.3 95.3 Fluorene ug/kg 160 Indeno(1,2,3-c,d)pyrene ug/kg Naphthalene ug/kg Phenanthrene ug/kg Pyrene 63 ug/kg 81.6 85.5 1.2.4-Trichlorobenzene ug/kg GW Met., Pest. & Herb. Arsenic ug/kg Barium ug/kg Cadmium ug/kg Chromium ug/kg 4650000B97000 Lead ug/kg B19000

Footnotes: BMDL=Below Method Detection Limit ND=Parameter not detected '-'=Parameter not tested <= DETECTION WAIT CONCENTRATION = COMPOUND NOT DETECTED IN THAT SRIPLE

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-1L) - All Parameters Present, Samples Linked by Order

PAGE: 04/01/8

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

DAMES AND MOORE

DMCHEV

See Below

ETC Sample No.

Company

Facility

Sample Point

Date

				Sample Point	s, Sampling Dat	es, and ETC Sa	mple No/s	ta – Adis	
Parameters	Units	S BF88 860226 L3585	S BF89 860219 L3587	S BF90 860219 L3586	860304 L3588	S BFTP10 860304 L3591	S BFTP5 860304 L3583	S BFTP6 860304 L3592	860304 L3584
Iron Manganese Sodium Miscellaneous Parameters	ug/kg ug/kg ug/kg		17800000 318000 100000		24800000 441000 80000	29800000 417000 1610000	215000	34700000 1370000 490000	6120000 506000 30 0 000
Aluminum Antimony Benzo(b)fluoranthene Beryllium Boron Calcium Cobalt Copper Cyanide, Total Magnesium Molybdenum Nickel Petroleum Hydrocarbons (IR) Tin Titanium Vanadium Zinc	ug/kg yg/kg ug/kkg ug/kkg ug/kkg mg/kkg mg/kkg mg/kkg mg/kkg ug/kkg ug/kkg ug/kkg	32000	<10000 1040 400 21000 8000 22000 < 7360000 < 900 22000 880 < 3000	10000 330 1000 20000 8000 46000 46000 900 19000 10000	<pre> 8000 330 720 10000 1490000 6000 18000 2510000 10000 10000 5 5000 431000 44000</pre>	10000 2200 880 20000 4000000 10000 47000	k 8000 k 330 400 7000 1200000 22000	*10000 *19000 34000 32500000 100000 551000 15 12900000 132000 108000 20000	\$ 8000 2360 890 20000 32000 416000 9 321000 6000 218000 60000 10000 448000

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-1L) - All Parameters Present, Samples Linked by Order

DATE: 04/01/80 PAGE: 3

Chain of Custody Data Required for ETC Data Management Summary Report

See Below

DAMES AND MOORE

DMCHEV

See Below

ETC Sample No.

Company

Facility

Sample Point

Date

	And the second s			Sample Point	s, Sampling Dai	es, and etc sa	mple No:e	xilli Mayaya	
Pärameters	Units	5 BFTP8 860304 L3589	\$60304 L3590						
PP Volatile Compounds									
Benzene Ethylbenzene Methylene chloride	ug/kg ug/kg ug/kg	× 22 × 36 × 14	< 22 < 36 354						
PP Acid Compounds									
2,4-Dimethylphenol	ug/kg	k 88	k 450					İ	
PP Base/Neutral Compounds									
Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(ghi)perylene bis(2-Ethylhexyl)phthalate Chrysene 1,2-Dichlorobenzene Fluoranthene Fluorene Indeno(1,2,3-c,d)pyrene Naphthalene Phenanthrene Pyrene 1,2,4-Trichlorobenzene	ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg	 62 110 62 250 81 130 81 191 71 68 150 568 180 62 62 	2880 856 2940 3770 2260 1860 1700 4380 316 13900 2050 1660 13300 14000 8750						
GW Met., Pest., & Herb.						: -			
Arsenic Barium Cadmium Chromium Lead	ug/kg ug/kg ug/kg ug/kg ug/kg	7000 71000 400 22000 30000	110000 106000 700 42000 1860000						
Barium Cadmium Chromium	ug/kg ug/kg ug/kg ug/kg	71000 4 400 22000 30000	106000 700 42000 1860000						

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DATA MANAGEMENT SUMMARY REPORT (DM-1L) - All Parameters Present, Samples Linked by Order

DATE: 04/01/ PAGE: 4

Chain of Custody Data Required for ETC Data Management Summary Report

See Below DAMES AND MOORE DMCHEV

See Below

ETC Sample No. Company Facility Sample Point Date

		Sample Points, Sampling Dates, and ETC Sample No.'s								
Parameters	Units	5 BF 1P8 860304 L3589	860304 L3590							
iron Manganese Sodium	ug/kg ug/kg ug/kg	21800000 252000 80000	83400000 510000 100000							
Miscellaneous Parameters					j					
Aluminum Antimony Benzo(b)fluoranthene Beryllium Boron Calcium Cobalt Copper Cyanide, Total Magnesium Molybdenum Nickel Petroleum Hydrocarbons (IR) Tin Titanium Vanadium Zinc	ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg ug/kg	\$ 320 1100 10000 550000 8000 18000 \$ 1900000 13000 \$ 4000 280000	10000 7100 400 31000 51000000 6000 85000							
	·						·			

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3585 DAMES AND MOCRE DMCHEV S BF88 860226 0800 1

Elapsed
ETC Sample No. Company Facility Sample Point Date Time Rours

		A			V. (4.00)	Data		v. gydr	, A	Minana Wi	Ident	lfiers		
	Compou	nd Name		Scan Numbe		Retenti Time (Min)		M.W.		CAS Numb		Empirical Formula	Estimated Concen- ug/kg	
T Unknown		Water	77 - X A A A A A A A A A A A A A A A A A A	15	14.65	3.38	alaanin ka a Ta'alaa						588	
2 Unknown*				54		4,08	W.C.W.	M. (a. 1972)	170.0 				8800	
compound also pre	sent in the Blank.			*****	1.000000			W. WWW.Ph.						
1 973	Y WANTA A	00000000			1000		h izw <mark>w</mark>	Waliota (Ž.		100		# PORT OF	
i sa essa.									1	Ottomic Control of Con	\$1.5 <u>\$</u>			
	#	www.			10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			g: 1444 - 147	V.///	1980 (1980) 1980 (1980)	1 3 HV 1	r yaway ya sayay	. 14 (A. 311 1	
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March 28, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3585

DAMES AND MOORE

DMCHEV

S 8F88

860226 0800

ETC Sample No. Company

Facility

Sample Point

Date Time

Elapsed Hours

						Data	yang rajira∰i	Iden	tifiers			
	Compoun	d Name		Scan Numbe		Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concenug/kg		
1 3-Hexen-2-0r	10		4 10	132	÷.::	5.87	98	763939	C6H100	2929		
2 Unknown	·* :	19.00 1	· 拉斯	288	V(A)	8.10	- ·	. _v =		35508		
3 Decame *		100	: · · · :	422	7.75	10.02	142	124185	C10H22	439		
4 Unknown				634		13.05	-	- ,		556		
5 Unknown			3.11	642	m.	3.16	1 (m. 7)			1575		
6 Unknown	-	:		705		14.06		-,	-	582	ļ	
7 Unknown ≭		J.	5477 A	1087		3 19.52	_	- 25	din € " ×	543		
8 Unknown *		5.37		1304	٠.	22.63	_	_		1370		
9 9-Tricosene	* •	uni)q	3. 4	2009		32.72	322	27519024	C23H46	619		
	7. P.	127	N Willem	n angan				15. The 15. Th	1	#4MM 11		
	1.0		A- : A	0.50574		Approximation.	:	A	Majar Assa	1 9 92 (10 to 10		
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Compound also present in t	he Blank.	\$	31.1 · M			672 C. B. B. B.	8. J	1.154		An Last of B		
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March 9, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports L3587 DAMES AND MOORE DMCHEV S BF89 860219 ETC Sample No. Сотралу Elapsed Facility Sample Point Date Time Hours

		Data		Iden	tifiers			
Compound Name	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen, ug/kg		
Unknown *	770	31.07				926		
Carbon Dioxide	47	1.38			2.7.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		<u> </u> 	
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Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3587 DAMES AND MOORE DMCHEV SBF89 860219

Elapsed
EIC Sample No. Company Facility Sample: Point Date Time Hours

		Data		Ident	ifiers		XVX 2 - Va	. 1.12
Compound Name	Scan N umber	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/l		
4-Methyl-3-Penten-2-One	25	3.51	98	141797	C6H100	325	(925) 18 (1)	
Unknown	49	3.93		100 100 100 100 100 100 100 100 100 100	**************************************	787	estronomo de la companiona de la companiona de la companiona de la companiona de la companiona de la companion La companiona de la compa	
Unknown *	59	4.1F				7940	100 A 100 A	
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March 28, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3587. DAMES AND MODRE DMCHEV S BF89 860219

Elapsed ETC Sample No. Company Facility Sample Point Date Time Hours

	- · ·	-5-5			Data		Iden	tifiers			
,	Compoun	d Name		Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/kg		
1 3-Hexen-2-0r	18	. y .	. Walio Cown	<u>.</u>	5.82	98	763939	C6H100	1732		
2 Unknown	, (m. + 1)	· 22	idaki bay	222	7.14/	-	-	-	25368		
3 Unknown	. 40		1874 TE	640	13.11	-	-	-	418		
4 Unknown *	124.13	, Th	With 15	1086	19.52	-	-	-	1190		
5 Unknown	: .	÷ÿ.		1161	20.61	- .	en 🐾 en e	.	1161		
6 1,4,6-Trimet	hyl Naph	thalen	e 100	× 1181	20.90	170	2131422	C13H14	380		
7 Unknown	∰v.1			1202	21.20	Name of the			812		
8 Unknown		(# j		1303	22.66	·	Kali 🛉		1157		
9 2,6,10,14-Te	tramethy	1-Pent	adecane	1319	22.90	268	1921706	C19H40	1152		-
10 Unknown	77.M.C.	дў:	AWI MWS	2686	42.82	# 40 - 0	±.		13118		
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March 9, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3586 DAMES AND MODRE DMCHEV S BF90 860217

ETC Sample No. Company Facility Sample Point Date Time Hours

	V			Data	r fyr	Ident	ifiers		· · · · · · · · · · · · · · · · · · ·
	Compound Na	ıme	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/kg	
l Carbon di	oxide	10 to 10 to	7.7	1.37	44		C02	_	
Unknown	• 1	13.	44,000	2/3)	1	ing and the second of the seco		548	
3 Unknown			₩ 770 ° .	31:07	1	1244) 1 -	-	992	
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Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3586 DAMES AND MOORE DMCHEV \$ BF90 860219

Elapsed

ETC Sample No; Company Facility Sample Point Date Time Hours

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	Ć	ompou:	nd Nam	9	Scan Numbe		Retent Time (Min		M.W.		CAS Number	Empirical Formula	Estimated Concen. ug/kg	·	
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2 Unkn	own	The state of the s	**************************************	Control May May 1 to 1 to 1 to 1 to 1 to 1 to 1 to 1 t	830	4-1	17.89		#895.	-5/	· Vallanda —	r <u>rew</u>	·······549		
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March 28, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3586 DAMES AND MOORE

DMCHEV

860219

ETC Sample No.

Company

Facility

Sample Point

Date Time

Elapsed Hours

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	Q ² 1	- A.		ym s y sij.	Data				Iden	tifiers	
	Compou	nd Name		Scan Number	Retention Time (Min)		M.W.		CAS Number	Empirical Formula	Estimated Concen. ug/kg
1 3-Hexen-2-0n	i ė i 🤻	4		128	5.80	<i>*</i>	4:y- 98 1		76 3 939	C6H100	440
2 Unknown	1.021			227	7.22		e e e		1944 . 14	1	43820
3 Decane *	More			423	(4.10.02 L	vid:	142		124185	C10H22	628
4 Unknown	160		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1. F062	⊕ 19.17		**************************************		er title 3.	ant 💄 pwi	822
5 Unknown	1#	::\.\.		1087	19.53		-		-	-	1107
6 Unknown ≭	•	4	-WT W	1304	22.66				_	-	5613
7 2,6,10,14-Te	trameth	yl-Pen:	adecane	∰ #317 ₩	22.84		268		1921706	C19H40	509
8 Unknown *		· /	7.84.0.00	1467	25.01		₩.		· •	_	656
9 Unknown	7	11	(AWW) A	T 1732	28.86				. -	-	472
10 Unknown	1.1.0.440. 1.1.0.440. 1.1.0.440.		A CONTRACTOR OF THE CONTRACTOR	1926	31.68	÷ .	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	134			496
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March 11, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3583 DAMES & MODRE DMCHEV S BFTP5 860304

Elapsed
ETC Sample No. Company Facility Sample Point Date Time Hours

		Data		Ident	ifiers		ing the age	
Compound Name	Scan Number	Retention Time (Min)	M.W	CAS Number	Empirical Formula	Estimated Concen. ug/kg	¥xyr .	
l Carbon dioxide≭	8	1,41	44		C02		AAAAA JOS JOS JOS JOS JOS JOS JOS JOS JOS JOS	
2 Alkene	571	23,32			C _n H _{2n+2}	207		
3 Alkane	603	24.57			C _n H _{2n+2}	921	ywy rayn y sa 900 c s	
4 Alkane	669	27.14			C _n H _{2n+2}	188		
	A A A A A A A A A A A A A A A A A A A				(William Control		
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Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3583 DAMES AND MOORE DMCHEV S BFTP5 860304

Elapsed
ETC Sample No. Company Facility Sample Point Date Time Hours

				Data		Ident	ifiers	,		7.0
	Compound Nar	ne	Scan Number	Retention Time (Min)	MW	CAS Number	Empirical Formula	Estimated Concen ug/kg		
1 1,1,1,-Tric	hloroethane*	**************************************	32	2.79	132	71556	C2H3Cl3	1190		
2 Benzene			40	2.94	78	71432	C ₆ H ₆	472	. à	
3 Cyclohexene	* 1984-1989 198 8		50	3,12	82	<u> </u>	C6H10	11500		
4 Tetrachloro	ethene*		138	4.70	164	127184	C2C14	463		
5 Unknown#	* - **********************************		178	5.42				37900	٠	
		5-W			TAMA MATANA					
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March 24, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports L3583 DAMES AND MOORE DMCHEV S BFTP5 860304 ETC Samole No.

Company

Facility. Sample Point Date

Hours

Data Identifiers Compound Name Retention Estimated Scan Time CAS Empirical Concen. Number (Min) MW Number Formula ug/kg I Trichloroethylene * 45 2.92 130 79016 C2HCl3 796 2 dimethyl-Pentene 102 3.94 C7H14 707 3 Unknown * 4.81 46100 4 Alkane®* 281 771 to 200 CnH2n+2 538 5 methyl-Naphthalene 605 12.86 142 1000 per - CITHIO 434 6 Alkene 963 19.22 C_nH_{2n} 613 7 Unknown 1272 24.70 468 8 dioctyl ester-Hexanedioic acid 1459 28.02 370 123795 C22H4204 779 9 Alkene 28 98 C_nH_{2n} 405 2.00 - 17 1777 15 High 19 * (March 1970) Windows Figure

VA 67 36 1936

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3592 DAMES AND MOURE DMCHE V SBFTP6 860304

ETC Sample No. Company Facility Sample Point Date Time Hours

				Data		Iđen	tifiers			
	Compound	Name	Scan Number	Retention Time (Min)	М.М.	CAS Number	Empirical Formula	Estimated Concen. ug/kg		
1 Carbon dioxi			7 7 V	1.24	44	AWAYA CO SWALL	CO ₂			
2 Unknown		With the control of t	499	20.31	₩₩61,₩89¥ 9,₩905		# 4	***		
3 Cyclopentene	:,1,3-dimetH	iyl-,trans-	7 (517 17 ()	21.01	98	1759586	C7H14	13900 12800		
			577	23.33	200 (100 (100 (100 (100 (100 (100 (100 (C _n H _{2n+2}	33800		
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5 Alkane	* * * * ******			25.12		*****	CnH2n+2	107000		
Unknown			648	26.09			7 ± 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	53000	e e e e e e e e e e e e e e e e e e e	
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	A SAME		Waller T. Lorenz (C. C. Company of C. C. Company of C. C. Company of C. C. C. C. C. C. C. C. C. C. C. C. C.		1777 - 73,1777 1,1877 1777 - 73,1777 1,1877					
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ETC TESTING and CERTIFICATION

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3592 DAMES AND MOORE

DMCHEV

S BFTP6

860304

Elepsed

ETC Sample No.

Company

Facility

Sample Point

Date

Hours

			Data	Aug.	Ident	ifiers			
Compound Name		Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen- ug/kg	·	
1 Unknown		486	10.95		Ari Pari	en yes	72100		
2 Unknown		538	11.88	- W		- 4 .5(1.5) (1.5)	FE N72900		
3 Unknown - XAA data (A) (A)	· Carrier State of the Carrier	576	12.57		gan Timb	P#HALIPATERIA	54800		
4 2-Methylnaphthalene	elynye weliyan ili era bi Seweliya elek	#1640 TH	13.72	142	91576	CilHio	194000		
5 I-Methylnaphthalene		657	14.03	例 142 集。	90120	CijHio	80500		
6 I-Ethylmaphthalene		736	15.45	156	1127760	C12H12	61000		
7 1,7-Dimethylnaphthalene		748	15.67	156	575371	C12H12	119000		
8 1,4-Dimethylnaphthalene	A AND STATE	762	15.92	156	571584	C12H12	121000		•
9 1,3-Dimethylnaphthalene	773740 40 4040	766	15.99	156 74.	575417	C12H12	60500		
10 1,2-Dimethylnaphthalene		780	16.25	156	573988	C12H12	66600		
t e e e e e e e e e e e e e e e e e e e	THE WAY CHANGE OF THE	V	m an white	opina i u sinta presidente. Prima prima	Market States	week to the way			
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Andreas and the second	i	ex years your	AND TANKS	1		mm 17.	y		
		· ·			TY W				

March 24, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3592 DAMES AND MOORE DMCHEV S BFTP6 850304

ETC Sample No. Company Facility Sample Point Date Time Hours

Compound Name	Data			Identifiers		1.7 - 6.	
	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/kg	
l dihydro-methyl-lH-Indene Isomer	455	10.19	132		CIANA		
2 dihydro-dimethyl-lH-Indene Isomer	507	W F12122	146	ł	C10H12	128000	
s methyl-Naphthalene Isomer	615	TO IS ON THE			C11H14	128000	ĺ
4 methyl-Naphthalene Isomer	632	10 T2 128 11 11	491 142		CITHIO	378000	
5 ethyl-Naphthalene Isomer	712	14 78	₩ 156		CITHIO	205000	
6 dimethyl Naphthalene Isomer		15.03			C12H12	181000	
7 dimethyl Naphthalene Isomer					C12H12	356000	
8 dimethyl Naphthalene Isomer	750	15.31	f	Market Ten State	C12H12	446000	
9 trimethyl Naphthalene Isomer	5 7 3 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	15.62	156	W.A. * W.	C12H12	184000	
O trimethyl Naphthalene Isomer	WW. OAT. W. W.	10.69	170	yv.w. <u>u. zowe</u> .	C13H14	191000	
I trimethyl Naphthalene Isomer	045	17.16	170	·	C13H14	170000	
	2.00 - 1.00 - 1.00			All of the second	C13H14	209000	
Samuel Color Manager Manager Manager Manager Manager Manager Manager Manager Manager Manager Manager Manager M		18.00	· •			130000	
				Milyr of own (70000	
					15 - 500 - 500 - 500 - 500 - 500 - 500 - 500	[
	The straight of the	We will strain to be		de la vigo	e in Mark	Paradi Hayana	
	t samta araketa ya	e er gyeruk	XI subjective programme in the	AVVI m all a		A STATE OF THE STA	
	mana yang barang ba		· · · · · · · · · · · · · · · · · · ·	547 547	**************************************	William Wily.	
<u> </u>	The war of the	i	· · · ·				

March 13, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3584 DAMES AND MOORE DMCHEV S BFTP7 860304

Elapsed ETC Sample No. Company Facility Sample Point Date Time Hours

		Data		Ident	ifiers		
Compound Name	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/kg	
l Carbon diokide* - 🔆 - egg. 4- egg	9	1.48	44.	-	C02	<u>.</u>	
2 Alkenë	569	₹° 23.27	14 (45) - 17.	· ·	C _n H _{2n}	23000	
3 Unknown TV Age Age to equa	630	25.65	s ri - ii.		-	3080	
.4 Alkene .1 With the control	651	26.47	_		C _n H _{2n}	16500	,
5 Alkene A A A A A A A A A A A A A A A A A A	- [\$ 6 67 ~ [/]	27.09	in izind esp	William Art N	C _n H _{2n}	17200	İ
6 1,1,2-Trimethyl-cyclohexane	685	27:79	126	7094260	CgH ₁₈	39100	
7 Unknown	//s. 706 s //	28.61		l Imiloj • i	#**.	15100	
8 Alkene	726	29.39			C _n H _{2n}	14600	
9 Unknown	750	30.33		•		35000	:
10 Alkane	808	32.59		, at 10 - 10 - 10	CnH2n+2	99000	
11 Alkane	926	37.19		remanda ya	CnH2n+2	2 6 500	
12 Ethyl-methyl benzene	974	39.06	120	tet dia _{na}	C9H12	78100	
						Maria Maria	
*Compound also present in the Blank,			e Walaya	Min de j			
	numpun mengelek serial di			· : · · · · · · · · · · · · · · · · · ·	y y	34.34	
			k Walington		14.4 × 1	Dec 199	
	# * · · · · · · · · · · · · · · · · · ·	t en søret er Fra f					
	By we have	r in ima	s mil er			<i></i>	

E I V IESTING AND CERTIFICATION

March 23, 1986

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3584 DAMES AND MODRE DMCHEV S BFTP7 860304

Elapsed Facility Sample Point Date Time Hours

- 11 ³				Data		Ident	ifiers			
	Compoun	d Name	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/kg	-	
1 Unknown*		Constitution of the consti	170	5.27	ettive itt. vert i virge ettiv ett. Te			270000		
2 Unknown*	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	***************************************	487	10.96	MANA 10 10 10 10 10 10 10 10 10 10 10 10 10		Mario de Composito	5,72.75 76 00		
3 Unknown*	M. Marin Marin		497	77 H. 14	Comment of the second		\$ - 00 - 000000	29800		
4 Unknown*			510	11.38				55200		
5 Unknown*			535	11.83	***			38100		
6 Unknown*	To the state of th		576	12.56	AMOUNT TOWNS TO SERVE	period of the	D w in digita	19900		
7 Unknown*			591	12.83	and with		a• Não	19500		
8 2-Methylmaph	nthalene	1000 NOV. N	639,7	13.70	142 🚉	91576	C11H10	46900		
9 2-Ethenylana	aphthalene	9	722	15.19	154	827543	C12H10	35800		
10 1,4-Dimethyl	lnaphthále	эпа	761	15.90	156	571584	C12H12	20100		
Compound also present in	the Blank.		Man (1945)	7 990 1 817 90081 7 1 2 8 8 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	William Committee Committee Committee Committee Committee Committee Committee Committee Committee Committee Co		Wat No	i Wasani		
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-1.W -2.W	. V			Al. 1 M.	The second of th		And Mark			
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March 24, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3584 DAMES AND MOORE DMCHEV S BFTP7 860304

ETC Sample No. Company Facility Sample Point Date Time Hours

	4.72	1	A Miller			1 2	Data	Ċ,		Ident	ifiers		*************************************	····
		Compound	i Name			Scan Number	Retention Time (Min)		M.W.	CAS Number	Empirical Formula	Estimated Concen ug/kg	for forth)	
1	Unknown *	en y	·Ç. ·			142	4.63	۶.	5 4	- 34 c	- 2	33600		
2	Unknown	* - 2	11. 11.	- MANITON AND	(Y 1)	465	10.39	ļ.,,	iya r	e e 🚅 🥶 e	od 🕳 - January	7000	•	
3	Unknown	A. A. A.	THE Y	y propinsi san		480	10.64		* \$* ∳	roma (A. Ware)	i Qua ≡ ant y ny	15800		
4	Unknown	***	ALTE W		WY.i	546	11.82	30	₹ 2	. <u>-</u> 1 m	n gy segi:	7970		
5	dihydro-dime	thyl-IH-I	ndene			562	12.10		146	owan = * owif i.	C11H14	8250	· : ·	<u> </u>
6	methyl=Napht	halene Is	omer			611	12.98		142	*** • *** ·	C11H10	18000		
7	methyl=Napht	halene Is	omer	**************************************	W.Z	629	13.30	1.7	142	Min 🚨 🎳 🦠	C11H10	8190		
8	dimethyl-Nap	hthalene	Isome	f Tibel (#	ij uz	722	14.96	ş.,	156	• ~i.	C12H12	9050		
9	dimethyl-Nap	hthalene	Isome		W. 47	737	15.23		156	₩.h.	C12H12	12700		
10	dimethyl-Nap	hthalene	Isome		WATE	755	15.55	XIII.	156		C12H12	7780		
11	trimethýl Na	phthalene	Isom	er	W.Y	869	17.59	100	170 ⊜		C13H14	7190	•	ļ
4 Cor	npound also present (h	the Blank.	7.37	17 May 20 00 00 00 00 00 00 00 00 00 00 00 00		1 17 1 1				1 VP	da survirus Sta			
	* C#S			3.400000 1140 1140 1.400000 1140	e ye	Awa Marin	William William		gwy yy).				4 1	
		· 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	WWW. 12		<u> </u>	V - NAME - 11	$\frac{\operatorname{MALE}_{\mathcal{A}}(x_{i})}{\operatorname{MALE}_{\mathcal{A}}(x_{i})} = \sum_{k=1}^{n} \frac{\operatorname{MALE}_{\mathcal{A}}(x_{i})}{\operatorname{MALE}_{\mathcal{A}}(x_{i})} = \sum_{k=1}^{n$		ar vet	W.W. 1995	W. Lang			·
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	th typh	¥.,	Mari	rajem ir sai			Section 1999	M1.	a, ay		· : ".	.])	

March 13, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

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		Data		Iden	ifiers			
Compound Name	Scan Number	Retention Time (Min)	M.V.	CAS Number	Empirical Formula			
I Carbon dioxide#	8	1 , 42	44		C02			
* Compound also present in the Blanky								
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W V CSTING ENG CENTIFICATION			Andrea Proposed Control Contro		100 - 100 W.	CHANGE AND THE THE THE THE THE THE THE THE THE THE		

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3589

DAMES AND MOORE

DMCHEV

S BFTP8

1.00

Elapsed

ETC Sample No.

Company

Facility

Sample Point

Date

Hours

		NICOLO 10 10 10 10 10 10 10 10 10 10 10 10 10		
	Data	Ident	ifiers	·
Compound Name	Scan Retention Time Number (Min)	CAS M.W. Number	Empirical Estin Formula ug,	en.
1 Dichloromethane	2.37	75092	CH2CI2	32800
2 1, F, 1, -Trichloroethane*	30 7 1 2 2 82 4 1	132 71556	С2Н3С13	856
3 Cyclohexene*	3,13	110838	C6H10	7330
4 4,4-Dimethyl-2-penten	126 4.55	26232984	C7H14	649
5 Tetrachloroethene*	135 4.71	164 127184	C2C14	364
6 Unknown*	M 2181		A	59400
			11 8 W	T.
Compound also present in the Blank,		w awa wa anganiwa .	enter vije re	
			t 1.7 %	
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		STATES		
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Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3589 DAMES AND MOORE ETC Sample No. Company DMCHEV S BFTP8

860304

Facility Sample Point Bate

Time Hours

		Data		Identifiers	
Compound Name	Scan Number	Retention Time (Min)	M.V.	CAS Empirical Number Formula	Estimated Concen. ug/kg
I Trichloroethylene * *	46 (*)	2.95	130	79016 C ₂ HC13	A.22 435
2 4-methyl-3-Penten-2-one	104	3.98	98	7141797 C6H100	/3/75 1380.
3 Unknown * White All I Was the A	(A) (B) 33 (A)	4.85	M9. (M 9 010a) -		VIII 42800 X
4 dihydro-methyl-1H-Indena Isomer	444	10.02	:ÿ: 132 (·)	- C10H12	399
5 dihydro-methyl-lH-Indene Isomer	456	10.23	132	- C10H12	### 652 · ·
6 dihydro-dimethyl-1H-Indene Isomer	508	11.16	146	- C11H14	(31 A1 3 465 1
7 methyl-Naphthalene Isomer	611	12.99	#. 142	C11H10	1000
8 methyl-Naphthalene Isomer	629	13.31	142	CitHio	1419
9 dimethyl Naphthalene Isomer	722	14.96	W 156 (b)	C12H12	456
10 dimethyl Naphthalene Isomer	737	15.23	156	C12H12	489
11 Alkane	1458	28.03	7 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	C _n H _{2n+2}	% 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
* Compound also present in the Blank.	Yerrinaan hariwaya		AWA TOWN TWO TO		
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March 13, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3590 DAMES AND MOORE DMCHEV S BFT99 860304

Elapsed
ETC Sample No. Company Facility Sample Point Date Time Hours

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		Compound Nam	e	Scan Number	Retention Time (Min)	M W	CAS Number	Empirical Formula	Estimated Concen. ug/kg		
1	Carbon dioxi	de*		9	1 .45	. 44		C02	A WAS CONTROL - TO A S.		
2	Unknown			491	20.21		80 / 1 - 1 - 1 - 1 - 1 - 1	** ** ********************************	166000		
1 1,47 2,7	A Way Comment			**************************************			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	**************************************			· . · · · · · · · · · · · · · · · · · ·
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TABLE 1: QUALITATIVE RESULTS

March 23, 1986

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3590 DAMES AND MOORE DMCHEV S BFTP9 860304

ETC Sample No.

Facility. Sample Point

Elapsed

Hours

		Data	Ident	ifiers	
Compound Name	Scan Number	Retention Time (Min) M.L	CAS Number	Empirical Formula	Estimated Concen. ug/kg
ł Cyclohexene*	43	3.07 82	2 110838	C6H10	11300
2 4,4-Dimethyl-2-penten	128	4,59 98	25232984	C7H14	A 12890 -
3 Unknown	149	- (24.97)			<u> 111 (11 (11 (11 (11 (11 (11 (11 (11 (1</u>
4 Unknown*	175	5,43			124000
	**************************************			400.000	MAZE TO THE TOTAL STATE OF THE
* Compound also present in the Blank.					(4) A P C M C M C M C M C M C M C M C M C M C
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March 24, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3590 DAMES AND MOORE DMCHEV S BFTP9 860304

ETC Sample No. Company Facility Sample Point Date Time Hours

		Data		Ident	ifiers	A second		
Compound Name	Scan Number	Retention Time (Min)	M.V.	CAS Number	Empirical Formula	Estimated Concen. ug/kg		
I Unknown *	142	4.65		\$1.5 - 3.50	7. ÷ 2.5MA+	53700		
2 methyl-Naphthalene	611	12.97	142		C11H10	5050		
3 dimethyl-Naphthalene	722	14.94	156		C ₁₂ H ₁₂	2240	·:	
4 Dibenzofuran	828	16.83	168	132649	C12H80			
5 methyl-Dibenzofuran	933	18.69	182		C13H100			
6 Unknown	1019	20.22	MARKET AND AND AND AND AND AND AND AND AND AND		e en ewe	2950		
7 Unknown	1196	23.38	VALA VIVA II AMARIAN III		ria de la companya de la companya de la companya de la companya de la companya de la companya de la companya d	2960		
	450	N						
* Compound also present in the Blank,			ST AN MAY	A STATE			j	
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					All Miller Community			
		Samuel Committee			A A A A A A A A A A A A A A A A A A A	With the control of t		• •
		1			7 77 7			

March 15, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3591 DAMES AND MOURE DMCHEV S BFTP10 860304

Elapsed

ETC Sample No. Company Facility Sample Point Date Time Hours

THE STATE OF THE S		Data		Ident	ifiers		
Compound Name	Scan Number	Retention Time (Min)	M.W.	CAS Number	Émpirical Formula	Estimated Concen- ug/kg	
Carbon dioxide*	4	1.37%	44	-	C02		
2 Pentane	345	14.64	72	109660	C5H12	226	1 Na
3 Alkane	488	20.21		An - €2 **	CnH2n+2	229	#
4 Alkene	% (* 1683) * *	27.81	1444 - 2 <u>-</u> 11	.jita ≢tu ga	C _n H _{2n}	240	
5 Alkene	807957	32.65		7 W C + 1 & C + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +	C _n H _{2n}	523	.eve
ti ti ki ki ki ki ki ki ki ki ki ki ki ki ki	Temperatura de la compansión de la compa	ange et ann	- 1380 W. 1991	or the second			
*Compound also present in the Blank.		to the state of		ANNOUS DE LES		1 1 1 W	1
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			148 - 1419	795a Ph. 1	1		71,3007 P
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	# X 1930/1-1011	100		·	ansk gre	e maner	me a
	TOWN TO S	W			100	##11354 <u>/</u> 1	-27.48g
					m v - janusjojs	W 4774W.	- #1 t m
					P 12 1	5 11 15	
		ett vill gever	1.000 1.000 1.000			Y. C. C.	

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3591

DAMES AND MOORE

DMCHEV

S BFTP10 860304

Elapsed

ETC Sample No.

Company

Facility

Sample Point

Date Hours Data Identifiers Compound Name Retention Estimated Scan Time CAS Empirical Concen M W ug/kg Number (Min) Number Formula 1 Cyclohexene* 3.05 15900 44 82 110838 C6H10 2 Unknown* 5.19 #1. * * (Med) 33400 . N. 1800000.1 Compound also present in the Blank. AWARI NELEZ 11.77 NOTE OF SERVICE 134749331646 61 JULY Tripo No. 1 Jawa M n verigina (m. 1947) 400 3. VIA References a 4000 40.77 er Magic

March 24, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3591 DAMES AND MOORE DMCHEV S BFTP10 860304 ETC Sample No. Company. Facility. Sample Point Date Time Hours

1		The second secon		Data		Ident	ifiers			
	Compound	J Name	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estimated Concen. ug/kg		
1 Unknown *			137	4.56				8870		
2 bis(methyl-	-ethyl)-Ben	zene Isomer	455	10.21	162		C12H18	3880		
3 bis(methyl	-ethyl)-Ben	zene Isomer	478	10.62	162	Comment of the commen	C12H18	4950	Maria II	
4 methyl-Napi	nthalene		610	12.96	142		C11H10	4880	Minter of	
5 methyl-Napl	nthalene		628	13.28	142		CITHIO	2600		
6 dimethyl-Na	aphthalene		721	14.94	156	**************************************	C12H12	2860	- 1.2.22 22	
7 dimethyl-Na	aphthalene		735	15.19	156		C12H12	2750		
8 Alkane	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		766	15.74	156		CnH2n+2	2300		
9 Alkane	, V		977	19.50	156		C _n H _{2n+2}	2880	2 9900 S	
* Compound also presen	t in the Blank.					- MANAGAN TO COMPANY TO COMPANY AND COMPANY AND COMPANY TO COMPANY	A TOTAL TO THE STATE OF THE STA	via British and Agentages and		
1210742	The second secon					Coded - Styles amore an	Control of the Contro	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	CANAL MAN	
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March 28, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3588 ETC Sample No. DAMES AND MOORE Company

Facility Sample Point

S BFBG 860304 Date

Time ... Hours

.:		· · · · · · · · · · · · · · · · · · ·				Data			Ident	ifiers	WWW. Waster		
		C	ompoun	d Name	Scan Number	Retention Time (Min)	M.V.		CAS Number	Empirical Formula	Estimated Concen. ug/kg		
Ţ	2-Propan	one			160	7.27	58		67641	C3H60	420	.d.,	
2	dioxymet	hane			223	9.72	76		109875	C3H802	337		
3	Unknown	77 W.	**************************************		557	22.74			<u>.</u>	**************************************	150		1
4	Unknown	***.**	: XX 1 (V.).		676	27.28				A CONTROL OF THE CON	5660	₩. 4. 1	+.
5	Alkene		1000 A 100 A		858	34.34	7			CnH _{2n}	483	(A) (1) (1)	
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Tentatively Identified Organic Compounds - GC/MS Analysis Data - Acid Fraction (QR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3588

DAMES AND MOORE

DMCHEV

S BF BG

860304

Elapsed

ETC Sample No.

Company

Facility

Sample Point

Date

Hours

		Data		Identifiers			
Compound Name:	Scan Number	Retention Time (Min)	M.W.	CAS Empirical Number Formula	Estimated Concen. ug/kg		
1 Unknown	.22	2.61			16400		
2 1,1,1,-Trichloroethane*	34	2.82	132	71556 C2H3Cl3	830		
3 Cyclohexene*	#	3,14	82		8220		
4 4-Methyl-3-penten-2-one	132	4,59	98	141797 C6H100	1960		
5 Tetrachloroethene*	140	4.73	164	127184 C2C14	1997) 3 96		
6 Unknown*	199	5.79			知识 133000		
7 Unknown	250	6.71			- 400 1010		
		Market Committee			# 1		
6 Compound also present in the Blank.				ran i Marakan <mark>wa</mark> nturi			
	gwan sann, est a	gradin din gwar .	4 7% HAW				
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	Wagana wan in a said						
	**************************************		***************************************		A22 0.4		
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		1977 William	Tara construction of the c		(#.%) I		
			wer in a reserve				
				Programme A Company			
	(A 🕷 1.5	A War					

March 24, 1986

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

L3588 ETC Sample No. DAMES AND MOORE

DMCHEV

Facility

S BFBG Sample Point

860304

Hours

	Data			Identifiers			
Compound Name	Scan Number	Retention Time (Min)	M.W.	CAS Empirical Number Formula	Estimated Concen. ug/kg		
1 Unknown *	152	4.82		₩ÿ + 01 91 97	110300		
2 ethyl-dimethyl-Benzene	386	8.98	134	C10H14	Q# 3 1700 ·		
3 Unknown	450	10.12			1900 ·		
4 Unknown	₩ 460	10.30			1790		
5 Unknown	511	11.21			1230		
6 Unknown	548	11.86			全共产。1150		
7 methyl-Naphthalene	613	13.02	142	C11H10	3650		
8 methyl-Naphthalene	630	13.32	142	127 . ÷ 27 . ← C11H10	1480 L		
9 dimethyl-Naphthalene	722	14.96	156	C ₁₂ H ₁₂	1440		
10 dimethyl-Naphthalene 💥 💮 💮	737	15.23	156 (c) /	C12H12	1540		
11 Unknown	1457	28.02			3140		
Compound also present in the Blank			TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TO		West of the second of the seco		
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