SUPPLEMENTAL ECOLOGICAL EVALUATION REPORT

FORMER CHEVRON FACILITY
PERTH AMBOY, NEW JERSEY
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Acronym Glossary

AOCs	Areas of Concern
BEE	Baseline Ecological Evaluation
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CMS	Corrective Measurement Study
COPECs	Contaminants of Potential Environmental Concern
DAP	Diffuse Anthropogenic Pollutants
DOCC	Chevron's August 1994 *Description of Current Site Conditions*
EE	Ecological Evaluation
EETG	NJDEP Ecological Evaluation Technical Guidance
EPA	United States Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbon
ER-L	NJDEP Effects Range-Low (ESC for saline water sediment)
ER-M	NJDEP Effects Range-Medium (ESC for saline water sediment)
ESC	Ecological Screening Criteria NJDEP 2009
ESNR	Ecologically Sensitive Natural Resources
ft amsl	Feet Above Mean Sea Level
HWSA	Hazardous and Solid Waste Amendments
LNAPL	Light, non-aqueous phase liquid
LSSLs	NJDEP Lower Ecological Soil Screening Level
NFE	North Field Extension
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
PAHs	Polycyclic Aromatic Hydrocarbons
PID	Photoionization Detector
PCBs	Polychlorinated Biphenyls
ppt	Parts Per Thousand
RCRA	Resource Conservation and Recovery Act
RIR	Chevron's 2005 Remedial Investigation Report
RFI Report	Chevron's November 2003 *RCRA Facility Investigation Report*
SPM	Separate Phase Material as defined in the TRSR
SRFI Report	Chevron's 2008 *Supplemental RFI Report*
SWQC	NJDEP Surface Water Quality Criterion
SWMUs	Solid Waste Management Units
SVOCs	Semi volatile Organic Compounds
TAN	Total Ammonia Nitrogen
TAL/TCL +30	Target Analyte List/Target Compound List
TOC	Total Organic Carbon
TPHC	Total Petroleum Hydrocarbons
TRSR	NJDEP Technical Requirements for Site Remediation
USSLs	NJDEP Upper Ecological Soil Screening Level
VOCs	Volatile Organic Compounds

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SUPPLEMENTAL ECOLOGICAL EVALUATION REPORT

Former Chevron Facility – Perth Amboy, New Jersey

1.0 INTRODUCTION

TRC Environmental Corporation (TRC), on behalf of Chevron Environmental Management Company (Chevron), has prepared this Supplemental Ecological Evaluation Report (Supplemental EE) for the Former Chevron Facility (Facility) located in Perth Amboy, New Jersey (Figure 1). This report supplements the Baseline Ecological Evaluation (BEE) that was included in Chevron's November 2003 Resource Conservation and Recovery Act (RCRA) Facility Investigation Report (RFI Report) and the related information provided by Chevron in the February 2008 Supplemental RFI Report (SRFI Report). It also includes responses to the NJDEP's 2004 and 2009 RFI and SRFI report comment letters (Appendix A), in accordance with Chevron's October 11, 2010 response letter to the New Jersey DEP's October 2009 SRFI Report comments.

The Supplemental EE is being submitted pursuant to the Hazardous and Solid Waste Amendments (HSWA) Renewal Permit for the Facility issued by the United States Environmental Protection Agency (EPA) in 2013. While EPA is the lead regulatory agency for the oversight of RCRA corrective action at the Facility, NJDEP has provided technical review of the ecological evaluations for EPA. The Supplemental EE was prepared in accordance with the NJDEP's Technical Requirements for Site Remediation (TRSR) and Ecological Evaluation Technical Guidance (EETG). The scope for the November 2003 RFI was completed under the former BEE requirements. However, the BEE requirements have since been superseded by the most current TRSR, which now require an EE. It should be noted that the previous BEE work, and recent EE investigation included in this report, include sampling and analysis, which is beyond the scope of both the NJDEP's former BEE and current EE requirements.

1.1 Background

The original BEE included a focused evaluation of surface water and sediments in the tidally flowed water bodies adjacent to the facility. These included the Arthur Kill, Spa Spring and Woodbridge Creek. Most of the watershed in this area has been densely developed for industrial and commercial use over the past century. There is a concentration of industrial uses adjacent to the Arthur Kill, including port facilities and petroleum and chemical industries. In fact, the highly industrialized Arthur Kill waterway is periodically dredged to maintain commercial navigation and much of the shoreline is comprised of man-made structures (i.e., bulk head or rip rap). In the past, Woodbridge Creek was also dredged for industrial and commercial purposes. As indicated in the RFI Report, sediments in the local water bodies, including the Arthur Kill and Woodbridge Creek contain contaminants including diffuse anthropogenic pollutants (DAP) from historical point source and non-point discharges, which make identification of contaminant sources and/or defining impacts difficult.

This Supplemental EE includes re-evaluation of Contaminants of Potential Environmental Concern, a summary of recent sediment samples collected in Spa Spring Creek and Woodbridge Creek, and a report of sediment bathymetry completed at the confluence of Woodbridge Creek and the Arthur Kill.

1.2 Summary of Prior Investigation Report Findings and EPA/NJDEP Comments

The November 2003 RFI Report BEE concluded the following:

- Spa Spring Creek, Woodbridge Creek and the Arthur Kill are environmentally sensitive natural resources present adjacent to the site, and environmentally sensitive areas are not present on site.
- COPECs including Volatile Oraganic Compounds, Semi-volatile Organic Compounds and metals are present at the site in soil and ground water at concentrations elevated above the RFI Delineation Criteria.
- Moderately high concentrations of SVOCs and metals were detected above SSGs in sediment samples collected from all three water bodies adjacent to the site.
- Nickel, mercury and zinc were detected above the Surface Water Quality Criterion in relatively few surface water sample locations at low concentrations.
- Pathways for contaminant migration from SWMUs and AOCs to environmentally sensitive natural resources do not appear to be complete.
- All contaminated soil and ground water areas adjacent to the property boundaries along Woodbridge Creek, Spa Spring Creek and the Arthur Kill have been delineated and do not extend to the environmentally sensitive areas.
- There is no indication of ongoing discharges of hazardous substances from the site based on the soil and groundwater sample analysis, and light non-aqueous phase liquid (LNAPL) investigation.
- Many area-wide, off-site, background sources are likely contributors to the presence of elevated concentrations of VOCs, SVOCs and metals in sediments, and to the slightly elevated metal concentrations in surface water.
- Staining and/or petroleum odors were also observed in several potential background locations in Woodbridge Creek sediment samples obtained from sampling transects SED-09 and SED-10 (see Vibracore Logs in Appendix D).
- Based on the BEE, further ecological evaluation of SVOCs and metal COPECs in the Woodbridge Creek sediments is recommended.

The NJDEP's BEE comments from their December 23, 2004 letter are summarized as follows:

- Identify/clarify background sample locations for COPEC evaluation
- Re-evaluate COPECs to be retained in the EE (e.g., copper in sediments)
- Further evaluation of sediment cores where staining and petroleum odors were observed, including sediment sample total petroleum hydrocarbons (TPHC) analysis
- Provide any additional migration pathway information if available

The February 2008 SRFI Report included responses to the NJDEP's 2004 Letter, provided additional data evaluation (clarification of background samples and background data re-

evaluation), additional explanations and information, and noted the following items would be included in the Supplemental EE report:

- Re-evaluation of COPECs
- Further investigation of staining and petroleum odors using the latest version of NJDEP's TPHC method
- Review of historical information and 2005 Remedial Investigation Report (RIR), not included, see below;
- Identification of data gaps including TPHC investigation, re-evaluation of COPECs, and need for data from intertidal areas

The NJDEP's October 2009 letter:

- Approved Chevron's proposal to conduct further ecological evaluations as a separate task
- Acknowledged Chevron's data frequency analysis regarding COPECs as acceptable
- Reiterated concerns regarding details of the COPEC re-evaluation, including potential historical site conditions and potential for data gaps (e.g., copper analysis in ground water)
- Required further evaluation of sediments in Spa Spring Creek

As noted in Chevron's October 11, 2010 response to NJDEP's October 2009 comments, additional data collected as part of the Corrective Measures Study (CMS) were evaluated as part of this Supplemental EE, including ground water data collected through March 17, 2014 and soil data collected through April 14, 2014. In addition, the Supplemental EE includes a re-evaluation of COPECs using the current NJDEP Ecological Screening Criteria (ESCs), evaluation of TPHC, review of historical information and the 2005 RIR, and further review of Spa Spring Creek.

It should be noted that the NJDEP replaced the former TPHC methods and screening criteria with the current extractable petroleum hydrocarbons (EPH) guidance. The current EPH guidance was used for the evaluation of staining and petroleum odors associated with the Supplemental EE Report.

<u>North Field Extension (NFE)</u>

As discussed in the approved 2013 EPA Final HSWA Permit Renewal and Permit Modifications I (the RCRA Permit), Final Statement of Basis Section IV, the Northern Parcels, a 15.5-acre portion of the NFE that contains the only 5 SWMUs and 2 AOCs that were identified in the NFE, was acquired by a separate limited liability company. The liability company and its members are responsible for the site investigation and necessary corrective measures under a separate RCRA Administrative Order of Consent. The NFE, is separated from the main facility by Woodbridge Creek, and is not included in the RCRA Permit and is, therefore, not addressed in this Supplemental EE Report.

2.0 SITE INFORMATION SUMMARY

The following is a summary of site information provided in the RFI and SRFI reports; refer to those reports for more detail.

2.1 History of Ownership and Operation

The former Chevron Facility was situated on a 368-acre site in Perth Amboy and Woodbridge, Middlesex County, New Jersey (Figure 1). The former Facility received heavy crude oil from tankers and refined it into finished asphalt cement, and intermediate products.

In 1994, at the time of the issuance of the initial HSWA Permit, the Chevron permitted facility consisted of approximately 368 acres. The active facility was divided into a series of yards known as the Central Yard, East Yard, North Field/Main Yard (Main Yard), West Yard, and Amboy Field. Over the past 10 years, portions of the facility, the West Yard, and Amboy Field have been decommissioned and sold to others for the construction of commercial warehousing as part of the City of Perth Amboy's redevelopment efforts. In 2012, Chevron sold most of the remaining three yards, to Buckeye Perth Amboy Terminal, LLC. Chevron retains ownership of a small portion of the northern part of the Main Yard.

2.2 Site Location

The current Facility is situated on a 268-acre site in Perth Amboy and Woodbridge, Middlesex County, New Jersey (Figure 1). The site is bounded to the west by commercial and residential properties along Amboy Avenue. The site is bounded to the east by the Arthur Kill, which provides the Facility with docking berths for tanker ships. Woodbridge Creek flows from the northwest to southeast through the northern portion of the Facility. Spa Spring Creek flows along the northern property boundary and discharges into Woodbridge Creek (Figure 2).

Amboy Avenue runs north-south along the western boundary of the Facility and State Street runs north-south through the eastern portion of the Facility. Maurer Road crosses east-west through the central portion of the Facility and connects Amboy Avenue to State Street.

2.3 Industrial Land Use Adjacent to the Facility

The following industrial properties have historically, or currently border the former Facility area:

- Witco Chemical
- Bird and Sons Landfill
- Joline Properties
- American Smelting and Refining Company (ASARCO)
- Amerada Hess
- American Cyanamid
- Jadler Metals
- Texeira's Bakery
- Englert

- Russel Stanley Corporation
- CP Chemical Inc.
- Shell Oil Company
- Empire Polymer Corporation
- V&S Amboy Galvanizing

In addition, there are small businesses along State Street that border Chevron's Central Yard, including R&L Towing, T&I Transmissions, Sylvan Industrial Piping and Abe Golub Used Cars. Descriptions of these properties, including available information regarding potential environmental issues related to their operation, were documented in Chevron's report entitled *Description of Current Site Conditions* (DOCC) (ESE, August 1994).

2.4 Physiographic Setting

The Facility is located near the western boundary of the Atlantic Coastal Plain Physiographic Province of Central New Jersey. The Coastal Plain is characterized as relatively flat northeast-trending lowland with topographic elevations that rise gently from sea level at the coastline. The ground surface elevation at the northern, central, and eastern portions of the former Facility site varies from 0 to 84 feet above mean sea level (ft amsl). The surface topography has been shaped by pre-historic glaciation, stream erosion, and cut and fill grading activity conducted prior to and during site development. The site is bounded to the east by Arthur Kill, which provides the former Facility with docking berths for tanker ships. Woodbridge Creek flows from the northwest to southeast through the northern portion of the former Facility and has been classified by the State of New Jersey as an FW2-NT/SE3 surface water body, although salinity data collected from the creek indicates that the creek water is brackish [salinity is greater than 17 parts per thousand (ppt)]. Spa Spring Creek flows along the northern property boundary and discharges into Woodbridge Creek. Ground water at the facility is saline in some areas due to naturally occurring salt water intrusion. Prior to site development, the land areas adjacent to Woodbridge Creek and Arthur Kill were tidal marshlands with small, meandering tidal creeks, streams, and shallow swales that provided surface drainage. The tidal marshlands were filled and sheet piling was installed along portions of the site adjacent to Arthur Kill, Woodbridge Creek, and Spa Spring Creek to stabilize the fill zones and prevent sloughing into the adjacent creeks.

2.5 Site Geology

The general stratigraphy of the Facility consists of six major units which overlie the bedrock, including fill, organic clay and peat, glacial till and outwash, and Raritan Formation sand and clay. The surface and shallow soils are composed of fill over large portions of the site, which is generally less than ten feet thick, but can be up to 20 feet thick. In some areas, the fill appears to be derived from on-site glacial deposits, and consists largely of sand, with variable amounts of silt, clay and gravel. Non-indigenous material in some areas of the fill includes miscellaneous debris, ash, and construction/demolition type debris. Clay soils beneath the site include the Raritan Fire Clay ranging in thickness from 12 to 20 feet and the Woodbridge Clay, which is less than 50 feet thick. The Farrington Sand is 15 to 25 feet thick and is continuous beneath the site, except at the eastern section adjacent to the Arthur Kill, where it was apparently removed by erosion.

Bedrock was encountered in several deep borings on-site at 65 to 85 feet bgs. There is a layer of saprolite that overlies competent bedrock, which formed from very well-weathered and decomposed rock (either diabase or mudstone of the Lockatong Formation). The saprolite grades upward into the Raritan Fire Clay without a distinct contact. The saprolite appears to be laterally continuous across the site and is typically up to five feet thick.

2.6 Site Hydrogeology

The upper water bearing unit at the Facility is an unconfined shallow water bearing zone that is present within the fill layer. A middle water bearing zone is present within the glacial outwash deposits. The lower water bearing unit is the Farrington Sand, which has been used in the past in the Perth Amboy area as a local public water supply source, or drinking water source unit, but is no longer used for these purposes.

In the northern and eastern areas of the Facility, the upper water bearing zone in the fill is separated from the water bearing zones in the glacial outwash and Farrington Sand (where present) by the organic clay unit. In the southern and western areas of the Facility, the organic clay unit pinches out and the water bearing zone in the fill is underlain by the glacial till, or glaciolacustrine clays. The Farrington Sand is further isolated from groundwater within the fill by the Woodbridge Clay. The low permeability clays and silts that separate the permeable water bearing zones are discontinuous.

In general, groundwater is encountered at depths ranging from two feet bgs in the low lying areas of the Facility, to an approximate maximum depth of 10 feet bgs in the areas of higher elevation. Site data indicate that hydraulic communication between the permeable zones is limited where the intervening low permeability units are present. Groundwater flow direction also varies between the zones. Based on limited historical data, the groundwater in the Farrington Sand beneath the Facility generally flows to the east or southeast, which is similar to the regional flow pattern.

Potentiometric data from well pairs, consisting of one well screened across the water table and one well screened below the water table, indicate that there is an upward hydraulic gradient from the native clays and glacial units below the fill towards the water bearing unit in the fill. This upward gradient probably limits the downward migration of dissolved contaminants in the groundwater.

Tidally influenced groundwater level fluctuations and saltwater intrusion into the shallow water bearing zone have been observed and documented in the areas near Woodbridge Creek. Saltwater intrusion into the Farrington Sand has been documented in the area south of Woodbridge Creek at and near the Facility.

2.7 Adjacent Surface Water Bodies

Three surface water bodies border portions of the Facility along its northern boundary (Spa Spring Creek and Woodbridge Creek) and eastern boundary (Arthur Kill) (see Figure 2). In the vicinity of the Facility, Woodbridge Creek and Spa Spring Creek are tidal estuarine waters, with Woodbridge Creek having several prominent meanders along its course. Thus, water flow and elevation in the creeks are controlled by the diurnal tide cycle. Woodbridge Creek is bounded by

mudflats and tidally-flowed wetlands, as well as numerous industrial properties. At high tide, the Creek is approximately 100 feet wide as it flows past the Facility. Woodbridge Creek empties into the Arthur Kill several hundred feet north of the Facility's East Yard. Spa Spring Creek is a smaller, manmade channel that empties into Woodbridge Creek at the NFE area of the Facility.

The Arthur Kill itself is a tidal strait connecting the Kill van Kull and Newark Bay to the north with Raritan Bay and the Raritan River to the south. Tidal surges come from both ends, with an average flushing time of two weeks and an average semi-diurnal tidal range of 1.6 meters (5.3 feet). The major freshwater inputs are the major tributaries of the Arthur Kill: the Rahway River, the Elizabeth River, and the Fresh Kills, which contribute about 38 percent (122 cubic feet per second (ft^3/sec)), with the balance of 62 percent (200 ft^3/sec) coming from smaller tributaries, sewage treatment plants, combined sewer overflows, and industrial discharges. The salinity of the Arthur Kill varies from 17 to 27 ppt at the southern end to nearly freshwater in some of the tributary mouths. The Arthur Kill is surrounded by one of the most densely populated coastal areas in the world.

Vast modifications of the physical features of the Arthur Kill were made to serve the harbor area. The highly industrialized waterway is dredged to an average channel depth of nine meters (30 feet) and much of the shoreline is comprised of bulkheads or rip-rap. In addition to vegetated wetland areas, the vicinity contains extensive interspersed areas of man-made structures, including railroad yards, oil tank farms, bulkheads, docks, road systems, landfills, and numerous industrial and residential buildings, both occupied and abandoned.

Historically, the Facility has discharged treated wastewaters to outfalls located in Spa Spring Creek and Woodbridge Creek. The Facility's current NJPDES permitted wastewater discharge is located in Woodbridge Creek.

3.0 TECHNICAL OVERVIEW

This section provides a technical overview of the EE activities conducted since 2010 at the Perth Amboy Chevron Facility. The ecological areas (surface waters) that are the subject of this evaluation include Woodbridge Creek, Spa Spring Creek and the Arthur Kill.

3.1 Supplemental EE Objectives

The overall objectives of the Supplemental EE includes addressing the outstanding issues identified in the NJDEP's comments in their 2004 and 2009 letters in accordance with Chevrons's responses provided in the 2008 SRFI and October 2010 response letter (as summarized in Section 1.2). To meet these objectives, Chevron completed the following tasks:

1. Identified and addressed data gaps that were identified in NJDEP comment letters;
2. Performed a re-evaluation of soil, ground water, surface water and sediment COPECs, including review of the additional CMS data;
3. Conducted sampling and analysis to further evaluate background conditions and prior boring locations where evidence of product was observed (staining/petroleum odors); and reviewed available historical information for potential historical migration pathways; and
4. Completed a bathymetric survey of lower Woodbridge Creek to estimate the down-stream extent of the sediment.

3.2 Sampling Procedures

During the investigation, sediment samples were collected using a hand auger and a vibracore sampling device. The vibracore samples were collected by Aqua Survey, Inc. of Flemington, New Jersey (ASI) using a 27 foot pontoon boat with vibracore sampler attached. A vibracore barrel lined with a dedicated, clear plastic liners and fitted sediment trap were advanced into the creek sediment to achieve penetration to refusal. The vibracore barrels were then removed from the creek and the sediment filled liners removed from within the barrel and placed on the boat deck, sealed and properly labeled. During this process a TRC geologist oversaw the operation and monitored ambient air readings using a Multi-RAE 5-gas meter.

Once the sediment cores were collected they were brought to the East Yard of the Facility by accessing of the Atlantic Response floating pier. Each core was screened at 6-inch intervals for volatile organic vapors with a photoionization detector (PID), recovery was measured and lithology was recorded. Boring Logs are included as Appendix B.

3.3 Remediation Standards and Criteria

According to the TRSR and EETG, COPECs include substances that exhibit the ability to biomagnify or bioaccumulate, or that are present at concentrations that exceed NJDEP ESC and/or SWQC. The soil and sediment ESCs are benchmark guidance values for ecological evaluation that were derived from numerous scientific studies and, with the exception of some ESCs that are based on the SWQC, are not remediation standards. ESC's are generally applied to samples obtained from within ESNR areas, but may also be used to screen data from non-ESNR locations. The SWQC are Remediation Standards that are applicable to surface water and are also used to evaluate ground water via monitoring wells located adjacent to surface water.

The applicable ESCs for COPECs identified for the Site are the NJDEP's 2009 ESCs from the EETG, including:

- Saline Estuary Sediment Criteria (Effects Range Low [ER-L], Effects Range Medium [ER-M]) (NJDEP-SRP Webpage; 2009);
- The NJDEP's 2009 ESC given as a range by NJDEP from low to high values, described in this report as Lower Ecological Soil Screening Levels (LSSLs); and Upper Ecological Soil Screening Levels (USSLs).
- SWQC and surrogate ESCs for Saline Estuary Aquatic Life Protection (acute and chronic) and Freshwater Aquatic Life Protection (SWQC; NJAC7:9B), as applicable based on site-specific salinity
- NJDEP EPH Guidance

Numerical ESCs for individual parameters and chemical constituents are included on the attached Tables II through XI.

The NJDEP's EPH guidance established 1,700 ppm EPH in soil and/or sediment as a conservative ecological ESC and 17,000 ppm as a screening level for the presence of free or residual product (defined in the TRSR as separate phase material [SPM]). For this investigation, EPH sediment concentrations that exceed 1,700 ppm are evaluated further based on individual petroleum constituent concentrations (i.e., VOCs and SVOCs). Also, EPH sediment concentrations that exceed 17,000 ppm may be further evaluated for SPM using lines of evidence as noted in the TRSR and sample grain-size distribution as indicated in the EPH guidance supporting documentation.

The ground water data from samples collected from monitoring wells adjacent to Woodbridge Creek and Arthur Kill were compared to the ESCs and aquatic life protection SWQC. The SWQC are adopted as remediation standards in the NJDEP regulations (NJAC7:26D) that include numeric standards for both protection of human health and aquatic life (*i.e.*, ecological receptors). The ESC are numeric guidance values that are screening levels, but may be adopted as remediation standards and/or used to identify contaminants in soil, sediment, surface water and adjacent ground water that require further evaluation.

The laboratory reported total ammonia nitrogen (TAN). However, the SWQC are based on the fraction of un-ionized ammonia. Therefore, the laboratory TAN sample results were converted to un-ionized ammonia concentrations from a site-specific pH and temperature data per the USEPA 1999 Update of Ambient Water Quality Criteria for Ammonia (EPA-822-R-99-014; December 1999). Site-specific SWQC were calculated based on pH and temperature in the surface water per the SWQC requirements.

The ESC and SWQC used in this report are included in Tables II through IX.

3.4 Data Reliability and Influencing Factors

The analytical methods used for the Supplemental EE were described in the laboratory analytical reports. Supplemental EE samples and analytical parameters are summarized in Table 1, and

analytical results are included on Tables II through IX. A calculator for nitrogen ammonia is included as Appendix C. The analytical results are included on the electronic copy of the ERIR on the compact disks included as Appendix D.

Laboratory analysis of sediment samples obtained during March 2014 was performed in accordance with the TRSR. Laboratory sample analysis was completed by Accutest Laboratories of Dayton, New Jersey (Accutest), a New Jersey-certified laboratory.

A quality assurance review was performed for the laboratory analytical reports for the samples analyzed as part of the Supplemental EE. The method-specified calibrations and quality control performance criteria were met for the data generated during this investigation, except as indicated in the conformance/non-conformance summaries provided in the laboratory reports.

Based on a review of the laboratory reports, TRC did not further qualify or reject any data points. Therefore, these data are considered to be valid and useful for the intended data quality objectives and their intended purpose.

No significant events or seasonal variations are known to have influenced the sampling procedures or the results of the sampling programs presented in this Supplemental EE. However, it should be noted that in October 2012, Woodbridge Creek and the surrounding areas were significantly impacted by flooding due in part to an unusually large storm surge during Super Storm Sandy. While the effects of Sandy did not impact sampling procedures or data quality, it may have had some effect on the sample results included in this report due to potential environmental impacts from storm-related discharges of petroleum and/or related hazardous substances from facilities in the vicinity (e.g., Motiva Enterprises Diesel Spill).

4.0 SUPPLEMENTAL ECOLOGICAL EVALUATION

In response to NJDEP comments, Chevron collected additional sediment samples to 1) address areas where sediment core logs from the field activities conducted in 2002 for the RFI indicated possible free product; 2) further characterize background conditions; 3) update COPEC tables with most recent data, including CMS soil and ground water data; and 4) to define the physical down-stream sediment limit within the lower reach of Woodbridge Creek. This section presents the findings of the activities conducted during February and March 2014 sampling event.

Sediment sampling was performed in surface water bodies including Spa Spring and Woodbridge Creeks. Sediment sampling in Woodbridge Creek was conducted using barge-mounted drilling equipment, specifically Vibracore equipment. The barge and Vibracore drilling equipment was operated by Aqua Survey, Inc. (ASI) personnel. Sampling equipment was decontaminated between each location. Samples collected for laboratory analysis were transferred from the sampling tool to laboratory-supplied containers using dedicated, disposable scoops. Recovered cores were visually characterized, screened using a calibrated PID, and sampled at selected intervals and, depending on the location, the interval with the highest field-detectable evidence of contamination. Sediment sampling conducted in Spa Spring Creek was conducted using a hand driven sample corer. Sediment core logs are included as Appendix B.

4.1 Background Sediment Investigation

Due to the numerous surrounding industries upstream of the convergence of Spa Spring Creek and Woodbridge Creek, and the tidal nature of the Woodbridge Creek, and the location of the Arthur Kill, background sediment samples were organized into four groups; upgradient background samples from Woodbridge Creek, upgradient background samples in Spa Spring Creek, downgradient background samples collected from Woodbridge Creek and upgradient samples collected in the Arthur Kill.

4.1.1 Upstream Background Samples – Spa Spring Creek

During March 2014, Chevron collected 4 offsite background sample locations upgradient of the site, along Spa Spring Creek (Figure 3). Two samples of the background sample locations (SED-20-A and SED-20-C) were collected upgradient of a surface water drainage discharge pipe on opposite sides of the creek bank and two samples (SED -21-A and SED-21-C) were collected downgradient of the discharge pipe on opposite sides of the creek bank. The discharge pipe originates from a property located west of the Main Yard/North Field property line. The samples were collected in approximately 6 inches of water. The sediment layer in this area extended to approximately 6 inches below the sediment water interface. One sample was collected from each location from 0.0 to 0.5 feet below the sediment surface interface and analyzed for EPH, Target Analyte List/Target Compound List with a forward library search (TAL/TCL+30), total organic carbon (TOC) and grain size analysis by Accutest.

Location Name	Sample ID	Parameter analyzed for:
SED-20-A	SED-20-A/0-0.5	TAL/TCL+30, EPH, Grain size, TOC, pH
SED-20-B	SED-20-B/0-0.5	TAL/TCL+30, EPH, Grain size, TOC, pH
SED-21-A	SED-21-A/0-0.5	TAL/TCL+30, EPH, Grain size, TOC, pH
SED-21-B	SED-21-B/0-0.5	TAL/TCL+30, EPH, Grain size, TOC, pH

Sample results are presented on Tables II through IX and summarized on Figures 3 through 5. Sample results were also included as part of the COPEC tables provided in Section 4.4.1 of this report.

4.1.2 Downstream Samples – Woodbridge Creek

During March 2014, Chevron collected two sediment samples from the Woodbridge Creek downstream of the site (Figure 2). The samples were collected near the mouth of the creek as it enters into the Arthur Kill. One sample was collected toward the HESS property on the southern shore and one sample was collected in the middle of the creek. No sediment sample was collected from the northern side of the creek (Motiva Enterprises side), as the area is now covered with rip-rap, and was not able to be penetrated by the vibracore sediment sampling equipment.

Location Name	Sample ID	Parameter analyzed for:
SED-19-B	SED-19-B/6-6.5	TAL/TCL+30, EPH, Grain size, TOC, pH
SED-19-C	SED-19-C/7.5-8	TAL/TCL+30, EPH, Grain size, TOC, pH

Sample results are presented on Tables II through IX and summarized on Figures 3 through 5. Sample results were also included as part of the COPEC tables provided in this report.

4.2 Resampled Locations

In accordance with the October 11, 2010 *Chevron's Response to USEPA/NJDEP Comments on their Review of the Supplemental RCRA Facility Investigation Report* (February 2008) for the Chevron Perth Amboy Refinery, Chevron revisited former sampling location where elevated PID readings and possible product were observed during the original sediment investigation conducted in December 2002 and resample these areas using the NJDEPs EPH sampling method. Based on a review of the existing sediment core logs (Appendix B), TRC collected samples in March 2014 from the following locations:

Location	Sample	Reason For Re-Sampling	Parameter analyzed for:

Name	ID/Depth		
SED-02-A	SED-02-A/6-6.5	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-02-B	SED-02-B/3.5-4.0	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-03-B	SED-03-B/1.5-2.0 SED-03-B/4.5-5	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-03-C	SED-03-C/1.5-2.0 SED-03-C/6.0-6.5	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-04-C	SED-04-C/1.5-2.0	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-06-B	SED-06-B/4.0-4.5	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-09-A	SED-09-A/3.0-3.5	Elevated PID and Staining	EPH, Grain size, TOC, pH
SED-09-C	SED-09-C/4.5-5.0	Elevated PID and Staining	EPH, Grain size, TOC, pH

Sample results are presented on Tables II through IX and summarized on Figures 3 through 5. Please note that the revisited location of samples SB-02-A and SB-02-B were adjusted due to the presence of major subsurface utilities, including Kinder Morgan, Buckeye and Colonial Pipelines.

4.3 Contaminant of Potential Ecological Concern

The following sections include a re-evaluation of COPEC based on the existing site data, including the available CMS data and the recent supplemental data from sediment sampling as noted above. The data used for identification of COPECs included evaluation of site soil and ground water data from soil borings and wells located within 200 feet of each surface water body. The ground water data were compared to the NJDEP's ESCs and aquatic life protection SWQC to identify COPECs that have a potential to impact adjacent surface water bodies. Only COPECs that exceeded the SWQC in at least one or more of the samples were included. The sediment and surface water data used to identify COPECs in those media are based on data from sediment and surface water samples obtained from within the water bodies.

4.3.1 Spa Spring Creek

COPEC's were identified for Spa Spring Creek using site ground water and soil analytical results from samples collected within 200 feet of the creek, based on a review of background data and derived from review of site soil and ground water data. The sediment data COPEC review also incorporates the data collected from transects SED-11, SED-20 and SED-21 (located in the creek east of the Pennsylvania Rail Road crossing), which were considered background sample locations.

Spa Spring Creek – Adjacent Soil

Summary statistics for the COPECs identified in on-site soil samples within 200-feet of Spa Spring Creek are provided below:

	ESC				Background					Site Data Summary					Frequency					
Parameter (mg/kg)	**LSSL**	**USSL**	**ER-L**	**ER-M**	**Literature Background Average**	**Literature 90th percentile**	**n of Background**	**Background Average Concentration**	**Background Max**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>LSSL**	**#>USSL**	**#>ER-L**	**#>ER-M**	**#>Literature Background Average**	**#>Literature 90th percentile**
bis(2-Ethylhexyl)phthalate	0.925	--	0.18216	2.64651	--	--	5	0.21	0.476	81	11	0.04	0	0.7	0	NA	4	0	NA	NA
Acenaphthene	20	--	0.016	0.5	--	--	5	0.05	0.235	72	6	0.12	0	4.7	0	NA	6	4	NA	NA
Acenaphthylene	682	--	0.044	0.64	--	--	5	0	0	72	1	0.04	0	2.7	0	NA	1	1	NA	NA
Anthracene	1480	--	0.085	1.1	--	--	5	0.09	0.277	85	19	0.99	0	13	0	NA	17	11	NA	NA
Benzo(a)pyrene	1.52	--	0.43	1.6	--	--	5	0.24	0.465	83	24	0.83	0	8.89	11	NA	16	11	NA	NA
Benzo(a)anthracene	5.21	--	0.261	1.6	--	--	5	0.23	0.475	84	23	1.00	0	12	7	NA	16	13	NA	NA
Benzo(ghi)perylene	119	--	0.17	--	--	--	5	0.18	0.317	72	15	0.22	0	4.6	0	NA	8	NA	NA	NA
Chrysene	4.73	--	0.384	2.8	--	--	5	0.32	0.601	84	28	1.26	0	15	8	NA	16	13	NA	NA
Dibenz(a,h)anthracene	18.4	--	0.063	0.26	--	--	5	0.04	0.0816	83	6	0.02	0	0.75	0	NA	5	2	NA	NA
Fluorene	122	--	0.019	0.54	--	--	5	0.05	0.208	72	11	0.24	0	9.1	0	NA	10	5	NA	NA
Indeno(1,2,3-cd)pyrene	109	--	0.2	--	--	--	5	0.17	0.32	72	8	0.08	0	3	0	NA	4	NA	NA	NA
Phenanthrene	45.7	--	0.24	1.5	--	--	5	0.40	1.15	85	32	4.85	0	63	4	NA	22	17	NA	NA
Total PAHs	--	--	4	45	--	--	5	3.46	7.9876	79	31	26.0	0	696.1	NA	NA	14	6	NA	NA
Aluminum	50	--	--	18000	6800	10800	5	10718	27100	67	67	20132	944	59582.5	67	NA	NA	34	57	48
Arsenic	9.9	46	8.2	70	5.2	13.6	5	7.92	11.3	77	73	12.5	0	63.5	36	2	42	0	53	20
Barium	283	2000	--	48	28.3	65.8	5	25.5	71.1	72	72	86.6	8.78	203	0	0	NA	60	68	35
Cadmium	0.36	140	1.2	9.6	*0.5*	*0.5*	5	0.32	1.6	72	18	0.26	0	2.6	15	0	5	0	14	14
Chromium	0.4	1	81	370	11.8	34.7	5	25.1	37.7	72	72	36.8	5.5	139.835	72	72	3	0	69	34
Cobalt	0.14	230	--	10	*5*	*5*	5	14.4	18.8	72	67	9.81	0	37.5	67	0	NA	34	57	57
Copper	5.4	100	34	270	9.3	33.3	5	31.5	41.4	67	65	86.3	0	1240	64	15	28	4	60	28
Lead	0.0537	1700	47	218	37.6	144	5	34.8	42.4	75	72	103	0	903	72	0	33	10	34	15
Manganese	220	4300	--	260	62.4	206	5	237	423	67	67	237	29.9	718	31	0	NA	24	62	32
Mercury	0.0005	0.3	0.15	0.71	*0.1*	0.21	5	0	0	70	37	0.42	0	9.2	37	15	22	8	25	19
Nickel	13.6	280	21	52	*4*	12.3	5	24.0	32.9	72	71	31.6	0	155	54	0	44	10	70	57
Selenium	0.0276	4.1	--	1	*1*	*1*	5	0	0	72	29	1.12	0	8.23	29	7	NA	21	21	21
Silver	2	560	1	3.7	*1*	*1*	5	0.70	1.2	67	5	0.07	0	2.4	1	0	2	0	2	2
Vanadium	2	280	--	57	16	35.5	5	33.3	54.9	72	68	82.7	0	766	68	3	NA	32	65	49
Zinc	6.62	160	150	410	39.9	106	5	252	664	67	66	126	0	636.592	66	13	14	3	54	22

The data for soil samples collected within 200 feet of Spa Spring indicate that the COPECs include Polycyclic Aromatic Hydrocarbons (PAHs) and metals.

Spa Spring Creek - Adjacent Ground Water

Summary statistics of the COPECs identified in on-site ground water samples from within 200-feet of Spa Spring Creek are provided below:

	ESC		Site Data Summary					Frequency	
Parameter (µg/l)	**SW Saline Chronic**	**SW Saline Acute**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>SW Saline Chronic**	**#>SW Saline Acute**
Copper (U)	3.1	4.8	56	36	5.05	0	37.8	30	25
Nickel (U)	22	64	56	40	57.3	0	714	25	15
Zinc (U)	81	90	54	32	31.2	0	361	4	4

(U) = Unfiltered Ground water sample
(F) = Groundwater sample filtered through 0.45 micron high capacity water filter

The data collected from the monitoring wells around Spa Spring Creek indicate that ground water COPECs detected above the SWQC in the vicinty of Spa Spring Creek were limited to copper, nickel and zinc. It should be noted that the results for copper, lead, nickel and zinc are from unfiltered samples and no filtered data are available. The SWQC for these constituents are based on dissolved concentrations. In addition, metal concentrations in ground water are normally attributed to particulates in the water. Therefore, identification of the total copper,nickel and zinc as COPECs is considered conservative.

Spa Spring Creek - Sediment

Summary statistics for the COPECs identified in sediments are provided below.

	ESC		Background			Site Data Summary					Frequency			
Parameter (mg/kg)	**ER-L**	**ER-M**	**n of Background**	**Background Average Concentration**	**Background Max**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>ER-L**	**#>ER-M**	**#>Background Average Concentration**	**#>Background Max**
bis(2-Ethylhexyl)phthalate	0.1822	2.6465	5	0.21	0.476	5	2	0.27	0	0.86	2	0	2	2
Acenaphthene	0.016	0.5	5	0.05	0.235	5	3	0.0066	0	0.017	1	0	0	0
Acenaphthylene	0.044	0.64	5	0	0	5	2	0.02	0	0.083	1	0	2	2
Anthracene	0.085	1.1	5	0.09	0.277	5	3	0.04	0	0.13	1	0	1	0
Benzo(a)pyrene	0.43	1.6	5	0.24	0.465	5	4	0.14	0	0.45	1	0	1	0
Benzo(a)anthracene	0.261	1.6	5	0.23	0.475	5	3	0.09	0	0.29	1	0	1	0
Benzo(ghi)perylene	0.17	--	5	0.18	0.317	5	4	0.20	0	0.74	2	NA	2	1
Chrysene	0.384	2.8	5	0.32	0.601	5	5	0.14	0.017	0.39	1	0	1	0
Dibenz(a,h)anthracene	0.063	0.26	5	0.04	0.0816	5	3	0.04	0	0.15	1	0	2	1
Fluorene	0.019	0.54	5	0.05	0.208	5	3	0.01	0	0.031	1	0	0	0
Indeno(1,2,3-cd)pyrene	0.2	--	5	0.17	0.32	5	4	0.12	0	0.37	1	NA	2	1
Phenanthrene	0.24	1.5	5	0.40	1.15	5	5	0.11	0.018	0.31	1	0	0	0
Total PAHs	4	45	5	3.46	7.9876	5	5	1.63	0.135	4.891	1	0	1	0
Aluminum	--	18000	5	10718	27100	5	5	15934	7270	24300	NA	2	4	0
Arsenic	8.2	70	5	7.92	11.3	5	5	40.1	6.2	164	4	1	4	1
Barium	--	48	5	25.5	71.1	5	5	79.3	43.4	165	NA	4	5	2
Cadmium	1.2	9.6	5	0.32	1.6	5	4	1.14	0	2.5	2	0	4	1
Chromium	81	370	5	25.1	37.7	5	5	46.0	15	133	1	0	3	1
Cobalt	--	10	5	14.4	18.8	5	5	17.7	5.1	36.7	NA	4	3	1
Copper	34	270	5	31.5	41.4	5	5	126	8.2	494	2	1	3	2
Lead	47	218	5	34.8	42.4	5	5	147	7.7	656	1	1	2	1
Manganese	--	260	5	237	423	5	5	457	141	1230	NA	3	3	2
Mercury	0.15	0.71	5	0	0	5	1	0.52	0	2.6	1	1	1	1
Nickel	21	52	5	24.0	32.9	5	5	48.7	17	85.1	4	2	4	3
Selenium	--	1	5	0	0	5	1	2.60	0	13	NA	1	1	1
Silver	1	3.7	5	0.70	1.2	5	1	0.42	0	2.1	1	0	1	1
Vanadium	--	57	5	33.3	54.9	5	5	54.2	30	109	NA	1	4	1
Zinc	150	410	5	252	664	5	5	398	58.4	1140	2	2	2	1

The data from the samples collected from the sediment of Spa Spring Creek indicate that sediment COPECs detected above the ER-L and ER-M include PAHs and metals.

In addition, none of the four background samples collected from Spa Spring Creek had EPH concetrations greater than the ESC of 1,700 ppm. As discussed above, no further action is required for these samples.

Spa Spring Creek - Surface Water

Summary statistics for the COPECs identified in surface water are provided below:

	ESC		Site Data Summary					Frequency	
Parameter (µg/l)	**SW Saline Chronic**	**SW Saline Acute**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>SW Saline Chronic**	**#>SW Saline Acute**
Copper (U)	3.1	4.8	3	2	3.00	0	5.4	2	1
Nickel (U)	22	64	3	3	35.2	30.9	37.7	3	0
Zinc (U)	81	90	3	3	122	103	134	3	3

(U) = Unfiltered Ground water sample
(F) = Groundwater sample filtered through 0.45 micron high capacity water filter

The data collected from Spa Spring Creek indicate that surface water COPECs detected above the SWQC in the vicinty of Spa Spring Creek were limited to copper, nickel and zinc. Of these compounds only nickel was detected in the shallow monitoring wells along the property boundary. It is important to note that although no background surface water samples were collected in Spa Spring Creek, nickel was detected at elevated concentrations in background sediment samples SED-20-A and SED-20-C.

It should be noted that the results for copper, nickel and zinc are from unfiltered samples and no filtered data are available. The SWQC for these constituents are based on dissolved concentrations. In addition, metal concentrations in surface water are normally attributed to suspended particulates in the water. Therefore, identification of the total copper, nickel and zinc as COPECs is considered conservative.

4.3.2 Woodbridge Creek

COPEC's were identified for Woodbridge Creek using site ground water and soil analytical results from samples collected within 200 feet of the creek. COPECs were identified in sediment and surface water using the existing surface water sample data, and existing and recent sediment data, based on a review of background data and COPECs identified from review of site soil and ground water data.

Woodbridge Creek – Adjacent Soil

Summary statistics for the COPECs identified in on-site soil samples within 200-feet of Woodbridge Creek are provided below:

	ESC				Background		Site Data Summary					Frequency					
Parameter (mg/kg)	**LSSL**	**USSL**	**ER-L**	**ER-M**	**Literature Background Average**	**Literature 90th percentile**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>LSSL**	**#>USSL**	**#>ER-L**	**#>ER-M**	**#>Literature Background Average**	**#>Literature 90th percentile**
1,2-Dichlorobenzene	2.96	--	--	0.013	--	--	199	1	0.0016	0	0.32	0	NA	NA	1	NA	NA
1,4-Dichlorobenzene	0.546	20	--	0.11	--	--	199	1	0.0007	0	0.134	0	0	NA	1	NA	NA
Benzene	0.255	--	0.34	--	--	--	168	49	110	0	6200	40	NA	34	NA	NA	NA
Ethylbenzene	5.16	--	1.4	--	--	--	170	55	9.92	0	440	18	NA	24	NA	NA	NA
Toluene	200	--	2.5	--	--	--	167	39	19.6	0	920	6	NA	12	NA	NA	NA
Xylenes (total)	10	--	0.12	--	--	--	170	70	63.0	0	2200	22	NA	65	NA	NA	NA
2,4-Dimethyl phenol	0.01	--	--	--	--	--	131	6	0.18	0	17	6	NA	NA	NA	NA	NA
Phenol	30	120	--	0.13	--	--	131	3	0.07	0	8.2	0	0	NA	2	NA	NA
bis(2-Ethylhexyl)phthalate	0.925	--	0.1822	2.6465	--	--	135	31	0.32	0	13	7	NA	21	3	NA	NA
Butyl benzyl phthalate	0.239	--	--	0.063	--	--	135	1	0.0089	0	1.2	1	NA	NA	1	NA	NA
Acenaphthene	20	--	0.016	0.5	--	--	133	35	0.61	0	24	1	NA	32	15	NA	NA
Acenaphthylene	682	--	0.044	0.64	--	--	133	19	0.24	0	18	0	NA	14	6	NA	NA
Anthracene	1480	--	0.085	1.1	--	--	141	45	0.69	0	30	0	NA	35	11	NA	NA
Benzo(a)pyrene	1.52	--	0.43	1.6	--	--	158	56	0.44	0	12.7	9	NA	16	9	NA	NA
Benzo(a)anthracene	5.21	--	0.261	1.6	--	--	158	59	0.57	0	17	4	NA	31	13	NA	NA
Benzo(b)fluoranthene	59.8	--	--	1.8	--	--	158	58	0.39	0	10	0	NA	NA	11	NA	NA
Benzo(ghi)perylene	119	--	0.17	--	--	--	134	42	0.33	0	6.4	0	NA	28	NA	NA	NA
Benzo(k)fluoranthene	148	--	0.24	--	--	--	141	31	0.08	0	3.6	0	NA	10	NA	NA	NA
Chrysene	4.73	--	0.384	2.8	--	--	158	67	1.00	0	21	10	NA	37	13	NA	NA
Dibenz(a,h)anthracene	18.4	--	0.063	0.26	--	--	157	20	0.03	0	2.1	0	NA	14	5	NA	NA
Fluoranthene	122	--	0.6	5.1	--	--	141	66	0.94	0	28	0	NA	27	9	NA	NA
Fluorene	122	--	0.019	0.54	--	--	133	37	1.30	0	58	0	NA	35	19	NA	NA
Indeno(1,2,3-cd)pyrene	109	--	0.2	--	--	--	133	25	0.07	0	2.2	0	NA	11	NA	NA	NA
2-Methylnaphthalene	3.24	--	0.07	0.67	--	--	135	42	3.97	0	190	18	NA	35	26	NA	NA
Naphthalene	0.0994	--	0.16	2.1	--	--	155	51	8.01	0	450	38	NA	35	21	NA	NA
Phenanthrene	45.7	--	0.24	1.5	--	--	141	72	4.21	0	170	5	NA	46	29	NA	NA
Pyrene	78.5	--	0.665	2.6	--	--	142	78	2.12	0	46	0	NA	38	16	NA	NA
Total PAHs	--	--	4	45	--	--	150	91	21.7	0	830.5	NA	NA	44	13	NA	NA
4,4'-DDD	0.758	--	0.002	0.02	0.0227	--	13	3	0.0010	0	0.0072	0	NA	2	0	0	NA
4,4'-DDT	0.0035	--	0.001	0.007	0.0789	--	13	3	0.0004	0	0.0022	0	NA	2	0	0	NA
DDT (Total)	0.021	0.093	0.0016	0.046	--	--	13	4	0.0014	0	0.0073	0	0	4	0	NA	NA
Aroclor 1248	--	--	0.03	--	--	--	13	1	0.01	0	0.15	NA	NA	1	NA	NA	NA
Total PCBs	0.0003	40	0.023	0.18	--	--	13	1	0.01	0	0.15	1	0	1	0	NA	NA
Aluminum	50	--	--	18000	6800	10800	142	142	24985	3590	125000	142	NA	NA	74	132	108
Antimony	0.27	78	--	9.3	*6*	*6*	139	32	1.43	0	89.1	32	1	NA	4	9	9
Arsenic	9.9	46	8.2	70	5.2	13.6	166	166	22.6	2.38	422	94	15	108	8	132	59
Barium	283	2000	--	48	28.3	65.8	144	144	82.9	10.9	419	2	0	NA	107	138	72
Cadmium	0.36	140	1.2	9.6	*0.5*	*0.5*	135	64	0.51	0	6.87	53	0	22	0	47	47
Chromium	0.4	1	81	370	11.8	34.7	160	160	36.1	6.06	115	160	160	5	0	156	71
Cobalt	0.14	230	--	10	*5*	*5*	144	144	12.1	1.8	82.6	144	0	NA	72	127	127
Copper	5.4	100	34	270	9.3	33.3	148	147	218	0	3690	140	54	80	28	136	80
Lead	0.0537	1700	47	218	37.6	144	279	279	4038	3.5	142000	279	30	163	94	182	111
Manganese	220	4300	--	260	62.4	206	142	142	284	27.2	2240	72	0	NA	62	134	74
Mercury	0.0005	0.3	0.15	0.71	*0.1*	0.21	140	104	0.67	0	9.22	104	41	64	22	69	58
Nickel	13.6	280	21	52	*4*	12.3	160	160	70.5	5.63	1110	136	13	111	29	160	141
Selenium	0.0276	4.1	--	1	*1*	*1*	139	48	0.94	0	12.4	48	8	NA	37	37	37
Silver	2	560	1	3.7	*1*	*1*	137	45	0.26	0	3.6	2	0	12	0	12	12
Vanadium	2	280	--	57	16	35.5	144	144	304	12.5	4380	144	21	NA	76	142	114
Zinc	6.62	160	150	410	39.9	106	142	142	265	14.1	6320	142	36	39	11	118	56

The data for soil samples collected within 200 feet of Woodbridge Creek indicate that the COPECs include VOCs (mostly Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) compounds), SVOCs (mostly PAHs), and metals. Please note that Polychlorinated Biphenyls (PCBs) were detected in less than 10% of the soil samples collected on-site, and is not considered a COPEC.

Woodbridge Creek – Adjacent Ground Water

Summary statistics of the COPECs identified in on-site ground water samples from within 200-feet of Woodbridge Creek are provided below:

	ESC		Background			Site Data Summary					Frequency			
Parameter (µg/l)	**SW Saline Chronic**	**SW Saline Acute**	**n of Background**	**Background Average Concentration**	**Background Max**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>SW Saline Chronic**	**#>SW Saline Acute**	**#>Background Average Concentration**	**#>Background Max**
Copper (U)	3.1	4.8	9	14.3	22.1	108	71	6.68	0	139	50	37	11	7
Nickel (U)	22	64	9	28.0	51.5	108	77	55.9	0	1330	26	13	20	15
Zinc (U)	81	90	9	55.0	92.2	107	46	106	0	3080	13	13	19	13

(U) = Unfiltered Ground water sample
(F) = Groundwater sample filtered through 0.45 micron high capacity water filter

The data collected from the monitoring wells around Woodbridge Creek indicate that ground water COPECs detected above the SWQC in the vicinty of Spa Spring Creek were limited to ammonium copper, nickel, and zinc.

It should be noted that the results for copper, lead, nickel, silver and zinc are from unfiltered samples and no filtered data are available. The SWQC for these constituents are based on dissolved concentrations. In addition, metal concentrations in ground water are normally attributed to particulates in the water. Therefore, identification of the total copper, lead, nickel, silver and zinc results as COPECs is considered conservative.

Nitrogen ammonia was not detected above the SWQC in any of the surface water samples collected from Woodbridge Creek as shown below. Therefore, Nitrogen ammonia will not be retained as a COPEC.

Phosphorus (yellow) was detected in 15 of the 33 wells in which it was analyzed, only one of which was within 200 ft of Woodbridge Creek. Concetrations of phosphorus (yellow) ranged from ND to 6,900 ppm. It will be retained as a COPEC.

Woodbridge Creek - Sediment

Summary statistics for the COPECs identified in sediments are provided below:

	ESC		Background			Site Data Summary					Frequency			
Parameter (mg/kg)	**ER-L**	**ER-M**	**n of Background**	**Background Average Concentration**	**Background Max**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>ER-L**	**#>ER-M**	**#>Background Average Concentration**	**#>Background Max**
1,2,4-Trichlorobenzene	--	0.0048	3	0	0	27	1	0.0078	0	0.21	NA	1	1	1
1,2-Dichlorobenzene	--	0.013	3	0	0	27	1	0.0029	0	0.0781	NA	1	1	1
1,4-Dichlorobenzene	--	0.11	3	0	0	27	2	0.05	0	0.971	NA	2	2	2
Benzene	0.34	--	3	0	0	27	6	1.56	0	20	5	NA	6	6
Ethylbenzene	1.4	--	3	0	0	27	6	0.76	0	6.6	4	NA	6	6
Toluene	2.5	--	3	0	0	27	5	0.19	0	2.9	1	NA	5	5
Xylenes (total)	0.12	--	3	0	0	27	7	3.81	0	29	7	NA	7	7
bis(2-Ethylhexyl)phthalate	0.1822	2.6465	3	2.22	5.2	27	25	7.95	0	50	23	14	15	9
Butyl benzyl phthalate	--	0.063	3	0	0	27	1	0.0093	0	0.25	NA	1	1	1
Acenaphthene	0.016	0.5	3	0.02	0.052	27	24	0.36	0	2.8	21	5	21	16
Acenaphthylene	0.044	0.64	3	0.02	0.027	27	25	0.17	0	1.2	20	2	22	20
Anthracene	0.085	1.1	3	0.09	0.19	27	27	0.71	0.003	3.55	23	6	22	20
Benzo(a)pyrene	0.43	1.6	3	0.35	0.65	27	27	2.01	0.01	10.6	20	8	22	18
Benzo(a)anthracene	0.261	1.6	3	0.33	0.63	27	27	1.45	0.0081	7.03	23	8	22	16
Benzo(b)fluoranthene	--	1.8	3	0.55	1.1	25	25	1.93	0.017	6.94	NA	8	21	16
Benzo(ghi)perylene	0.17	--	3	0.16	0.21	27	27	2.23	0.011	14	24	NA	24	23
Benzo(k)fluoranthene	0.24	--	3	0.18	0.34	27	27	0.47	0.0056	1.3	18	NA	22	17
Chrysene	0.384	2.8	3	0.46	1	27	27	2.24	0.011	11.7	22	5	22	16
Dibenz(a,h)anthracene	0.063	0.26	3	0.05	0.073	27	27	0.53	0.0018	3.1	22	11	24	20
Fluoranthene	0.6	5.1	3	0.54	1.1	27	27	1.99	0.021	6.63	23	1	23	15
Fluorene	0.019	0.54	3	0.03	0.074	27	25	0.66	0	5.8	21	6	19	12
Indeno(1,2,3-cd)pyrene	0.2	--	3	0.15	0.22	27	27	0.87	0.0076	3.6	20	NA	23	20
2-Methylnaphthalene	0.07	0.67	3	0.07	0.22	27	26	3.60	0	39	10	7	10	7
Naphthalene	0.16	2.1	3	0.07	0.22	28	25	3.87	0	80	9	7	14	8
Phenanthrene	0.24	1.5	3	0.34	0.77	27	27	3.14	0.011	19.2	19	10	16	12
Pyrene	0.665	2.6	3	0.70	1.4	27	27	3.63	0.027	13.1	24	12	24	19
Total PAHs	4	45	3	4.11	8.276	27	27	26.9	0.1473	115.862	23	5	23	18
4,4'-DDD	0.002	0.02	NS	NA	NA	2	2	0.94	0.0558	1.83	2	2	NA	NA
4,4'-DDE	0.0022	0.027	NS	NA	NA	2	2	0.20	0.104	0.302	2	2	NA	NA
Chlordane (alpha and gamma)	0.007	--	NS	NA	NA	2	1	0.0096	0	0.0191	1	NA	NA	NA
DDT (Total)	0.0016	0.046	NS	NA	NA	2	2	1.15	0.1598	2.132	2	2	NA	NA
Heptachlor	--	0.0003	NS	NA	NA	2	1	0.0052	0	0.0103	NA	1	NA	NA
Heptachlor epoxide	0.005	--	NS	NA	NA	2	1	0.02	0	0.0427	1	NA	NA	NA
Aroclor 1248	0.03	--	NS	NA	NA	2	2	3.27	2.57	3.96	2	NA	NA	NA
Aroclor 1254	0.06	--	NS	NA	NA	2	2	3.46	2.91	4.01	2	NA	NA	NA
Total PCBs	0.023	0.18	NS	NA	NA	2	2	6.73	6.58	6.87	2	2	NA	NA
Aluminum	--	18000	3	4003	4320	26	26	15207	5860	30400	NA	13	26	26
Antimony	--	9.3	3	2.63	7.9	26	8	1.10	0	9.5	NA	1	4	1
Arsenic	8.2	70	3	5.03	5.3	26	26	30.6	5.8	91.7	23	1	26	26
Barium	--	48	3	13.7	18	26	26	99.1	17.1	272	NA	18	26	25
Cadmium	1.2	9.6	3	0.34	0.52	26	26	4.20	0.68	13	19	4	26	26
Chromium	81	370	3	14.1	18	26	26	70.7	20.5	166	9	0	26	26

	ESC		Background			Site Data Summary					Frequency			
Parameter (mg/kg)	**ER-L**	**ER-M**	**n of Background**	**Background Average Concentration**	**Background Max**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>ER-L**	**#>ER-M**	**#>Background Average Concentration**	**#>Background Max**
Cobalt	--	10	3	7.40	8.3	26	25	16.0	0	85.9	NA	16	21	21
Copper	34	270	3	67.5	85.7	26	26	766	17.7	8030	25	19	24	24
Lead	47	218	3	65.8	110	26	26	195	13.5	817	24	9	21	16
Manganese	--	260	3	73.1	75.9	26	26	218	77.1	429	NA	9	26	26
Mercury	0.15	0.71	3	0	0	26	26	1.77	0.03	7.1	22	14	26	26
Nickel	21	52	3	31.2	33.7	26	26	192	28.6	2480	26	18	24	24
Selenium	--	1	3	0	0	26	25	19.8	0	154	NA	25	25	25
Silver	1	3.7	3	0.06	0.17	26	24	1.90	0	5.4	15	6	24	24
Vanadium	--	57	3	35.3	75.2	26	26	53.0	22.6	100	NA	12	18	3
Zinc	150	410	3	363	457	26	26	477	88.9	2970	24	11	12	10

The data from the samples collected from the sediment of Woodbridge Creek indicate that sediment COPECs detected above the ER-L and ER-M include EPH, VOCs (mostly BTEX compounds), SVOCs (mostly PAHs), pesticides, PCBs and metals. PCBs are not retained as a COPEC because they are detected in less than 10% of the soil samples collected on the entire site and are therefore not considered a contaminant of concern at the site.

Summary statistics of the analytical results for EPH detected in sediment:

Parameter (mg/kg)	**ESC**	**SPM Screening Level**	**n**	**# Detected**	**Frequency of # Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>ESC**	**Frequency of #>ESC**	**#>SPM**	**Frequency of #>SPM**
EPH	1700	17000	12	12	100%	16270	1640	59300	11	92%	3	25%

Eleven of the 12 EPH samples collected from Woodbridge Creek had concentrations greater than the ESC. These samples were evaluated further based upon individual petroleum constituent concentrations. Of the 11 samples that exceeded the ESC, only three samples had concentrations greater than 17,000 ppm (SED-02-A/6.0-6.5, SED-03-C/1.5-2.0 and SED-09-C/4.5-5.0).

Woodbridge Creek - Surface Water

Summary statistics for the COPECs identified in surface water are provided below:

	ESC		Site Data Summary					Frequency	
Parameter (µg/l)	**SW Saline Chronic**	**SW Saline Acute**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>SW Saline Chronic**	**#>SW Saline Acute**
Copper (U)	3.1	4.8	9	9	14.3	3.6	22.1	9	8
Nickel (U)	22	64	9	9	28.0	3.2	51.5	6	0
Zinc (U)	81	90	9	9	55.0	14.6	92.2	1	1

(U) = Unfiltered Ground water sample

(F) = Groundwater sample filtered through 0.45 micron high capacity water filter

The data collected from the surface water around Woodbridge Creek indicate that surface water COPECs detected above the SWQC in the vicinty of Spa Spring Creek were limited to copper, nickel and Zinc.

It should be noted that the results for copper, nickel, and zinc are from unfiltered samples and no filtered data are available. The SWQC for these constituents are based on dissolved concentrations. In addition, metal concentrations in ground water are normally attributed to suspended particulates in the water. Therefore, identification of the total copper, nickel and zinc results as COPECs is considered conservative.

4.3.3 Arthur Kill

COPEC's were identified for the Arthur Kill using site ground water and soil analytical results from samples collected within 200 feet of the waterway. COPECs were identified in sediment using the existing surface water sample data, and existing and recent sediment data, based on a review of background data and COPECs identified from review of site soil and ground water data.

Sediment samples collected from SED-16-C and SED-17-C were considered background samples for the creation of the tables.

Arthur Kill Soil

Summary statistics for the COPECs identified in on-site soil samples within 200-feet of the Arthur Kill are provided below:

	ESC				Background		Site Data Summary					Frequency					
Parameter (mg/kg)	**LSSL**	**USSL**	**ER-L**	**ER-M**	**Literature Background Average**	**Literature 90th percentile**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>LSSL**	**#>USSL**	**#>ER-L**	**#>ER-M**	**#>Literature Background Average**	**#>Literature 90th percentile**
bis(2-Ethylhexyl)phthalate	0.925	--	0.1822	2.6465	--	--	150	44	11.7	0	1300	25	NA	38	18	NA	NA
Acenaphthene	20	--	0.016	0.5	--	--	125	67	1.93	0	110	1	NA	67	39	NA	NA
Acenaphthylene	682	--	0.044	0.64	--	--	125	39	0.24	0	3.8	0	NA	30	15	NA	NA
Anthracene	1480	--	0.085	1.1	--	--	156	74	2.25	0	170	0	NA	62	28	NA	NA
Benzo(a)pyrene	1.52	--	0.43	1.6	--	--	156	79	1.56	0	100	19	NA	45	18	NA	NA
Benzo(a)anthracene	5.21	--	0.261	1.6	--	--	156	84	1.74	0	120	10	NA	55	22	NA	NA
Benzo(ghi)perylene	119	--	0.17	--	--	--	125	63	1.11	0	46	0	NA	42	NA	NA	NA
Benzo(k)fluoranthene	148	--	0.24	--	--	--	156	50	0.42	0	42	0	NA	23	NA	NA	NA
Chrysene	4.73	--	0.384	2.8	--	--	156	94	2.12	0	110	15	NA	58	19	NA	NA
Dibenz(a,h)anthracene	18.4	--	0.063	0.26	--	--	156	38	0.19	0	11	0	NA	28	18	NA	NA
Fluoranthene	122	--	0.6	5.1	--	--	156	99	4.01	0	390	1	NA	50	11	NA	NA
Fluorene	122	--	0.019	0.54	--	--	125	70	3.51	0	160	1	NA	69	44	NA	NA
Indeno(1,2,3-cd)pyrene	109	--	0.2	--	--	--	125	53	0.70	0	54	0	NA	29	NA	NA	NA
2-Methylnaphthalene	3.24	--	0.07	0.67	--	--	132	77	65.6	0	1400	38	NA	74	54	NA	NA
Phenanthrene	45.7	--	0.24	1.5	--	--	156	106	9.93	0	630	2	NA	86	58	NA	NA
Pyrene	78.5	--	0.665	2.6	--	--	156	102	4.16	0	280	1	NA	63	32	NA	NA
Total PAHs	--	--	4	45	--	--	191	143	135	0	3069.73	NA	NA	89	50	NA	NA
Aluminum	50	--	--	18000	6800	10800	101	101	12230	0.176	33100	100	NA	NA	27	67	53
Arsenic	9.9	46	8.2	70	5.2	13.6	132	119	21.9	0	256	74	16	84	7	99	66
Barium	283	2000	--	48	28.3	65.8	116	112	71.1	0	429	2	0	NA	82	94	54
Cadmium	0.36	140	1.2	9.6	*0.5*	*0.5*	116	67	0.97	0	20.6	53	0	27	1	47	47
Chromium	0.4	1	81	370	11.8	34.7	115	109	30.0	0	168	109	109	6	0	87	36
Cobalt	0.14	230	--	10	*5*	*5*	116	109	8.57	0	38.4	109	0	NA	34	82	82
Copper	5.4	100	34	270	9.3	33.3	101	100	333	0	3850	85	52	63	30	82	64
Lead	0.0537	1700	47	218	37.6	144	189	178	16056	0	752000	178	43	117	73	119	87
Manganese	220	4300	--	260	62.4	206	101	101	333	0.0026	2470	50	0	NA	42	80	50
Mercury	0.0005	0.3	0.15	0.71	*0.1*	0.21	115	75	0.34	0	12.2	75	27	39	11	48	32
Nickel	13.6	280	21	52	*4*	12.3	116	108	31.3	0	217	90	0	59	15	101	94
Selenium	0.0276	4.1	--	1	*1*	*1*	116	49	1.19	0	8.21	49	6	NA	44	44	44
Silver	2	560	1	3.7	*1*	*1*	101	69	0.81	0	5.18	14	0	30	1	30	30
Vanadium	2	280	--	57	16	35.5	116	112	44.4	0	484	111	2	NA	23	93	53
Zinc	6.62	160	150	410	39.9	106	101	101	164	0.0126	1020	97	32	34	7	72	43

The data for soil samples collected with 200 feet of the western bank of the Arthur Kill indicate that the COPECs include BTEX compounds, SVOCs (including PAHs) and metals.

Arthur Kill Ground Water

Summary statistics of the COPECs identified in on-site ground water samples from within 200-feet of the Arthur Kill are provided below:

	ESC		Site Data Summary					Frequency	
Parameter (µg/l)	**SW Saline Chronic**	**SW Saline Acute**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>SW Saline Chronic**	**#>SW Saline Acute**
Arsenic (U)	36	69	54	33	73.8	0	497	19	17
Arsenic (F)	36	69	1	1	382	382	382	1	1
Cadmium (U)	8.8	40	47	20	2.62	0	19.2	7	0
Copper (U)	3.1	4.8	47	21	4.73	0	53.1	18	14
Lead (U)	24	210	63	21	17.2	0	247	8	2
Nickel (U)	22	64	47	26	338	0	3920	16	11
Zinc (U)	81	90	43	24	336	0	3880	14	14
Nitrogen, Ammonium	*	*	41	26	0.04	0	1.6332	1	4

(U) = Unfiltered Ground water sample
(F) = Groundwater sample filtered through 0.45 micron high capacity water filter
* Calculated value that varies per sample see Appendix C

The data collected from the monitoring wells within 200 feet of the western bank of the Arthur Kill indicate that ground water COPECs detected above the SWQC in the vicinty of Spa Spring Creek were limited to ammonium nitrogen and metals including arsenic, cadmium, copper, lead, nickel and Zinc.

Other than one arsenic sample, the results for metals, including cadmium, copper, lead, nickel, and zinc are from unfiltered samples and no filtered data are available. The SWQC for these constituents are based on dissolved concentrations. In addition, metal concentrations in ground water are normally attributed to particulates in the water. Therefore, identification of the total arsenic, cadmium, copper, lead, nickel and zinc results as COPECs is considered conservative.

Arthur Kill Sediment

Summary statistics for the COPECs identified in sediments are provided below:

	ESC		Background			Site Data Summary					Frequency			
Parameter (mg/kg)	**ER-L**	**ER-M**	**n of Background**	**Background Average Concentration**	**Background Max**	**n**	**# Detected**	**Avg. Conc.**	**Min. Conc.**	**Max. Conc.**	**#>ER-L**	**#>ER-M**	**#>Background Average Concentration**	**#>Background Max**
bis(2-Ethylhexyl)phthalate	0.1822	2.6465	2	10.5	21	4	4	4.20	3.7	4.7	4	4	0	0
Acenaphthene	0.016	0.5	2	1.96	3.9	4	4	0.16	0.04	0.46	4	0	0	0
Acenaphthylene	0.044	0.64	2	0.37	0.59	4	4	0.14	0.12	0.15	4	0	0	0
Anthracene	0.085	1.1	2	1.33	2.4	4	4	0.29	0.27	0.31	4	0	0	0
Benzo(a)pyrene	0.43	1.6	2	1.93	3.2	4	4	0.69	0.61	0.85	4	0	0	0
Benzo(a)anthracene	0.261	1.6	2	2.07	3.7	4	4	0.59	0.52	0.65	4	0	0	0
Benzo(ghi)perylene	0.17	--	2	1.02	1.7	4	4	0.40	0.26	0.63	4	NA	0	0
Benzo(k)fluoranthene	0.24	--	2	0.77	1.2	4	4	0.37	0.33	0.44	4	NA	0	0
Chrysene	0.384	2.8	2	2.25	3.8	4	4	0.73	0.62	0.94	4	0	0	0
Dibenz(a,h)anthracene	0.063	0.26	2	0.28	0.47	4	4	0.11	0.084	0.15	4	0	0	0
Fluoranthene	0.6	5.1	2	3.70	6.4	4	4	0.95	0.18	1.3	3	0	0	0
Fluorene	0.019	0.54	2	0.63	1.2	4	4	0.10	0.053	0.21	4	0	0	0
Indeno(1,2,3-cd)pyrene	0.2	--	2	0.98	1.6	4	4	0.42	0.3	0.64	4	NA	0	0
2-Methylnaphthalene	0.07	0.67	2	0.37	0.67	4	4	0.07	0.064	0.085	1	0	0	0
Phenanthrene	0.24	1.5	2	1.20	2.2	4	4	0.32	0.28	0.36	4	0	0	0
Pyrene	0.665	2.6	2	4.30	7.3	4	4	1.14	0.24	1.6	3	0	0	0
Total PAHs	4	45	2	25.9	44.83	4	4	7.41	4.431	9.167	4	0	0	0
Aluminum	--	18000	2	24850	25300	4	4	26800	25500	30000	NA	4	4	4
Arsenic	8.2	70	2	76.9	107	4	4	30.6	28.3	35.8	4	0	0	0
Barium	--	48	2	224	245	4	4	157	142	192	NA	4	0	0
Cadmium	1.2	9.6	2	4.10	5.9	4	4	2.40	2.2	2.6	4	0	0	0
Chromium	81	370	2	169	198	4	4	123	116	134	4	0	0	0
Cobalt	--	10	2	14.9	15.4	4	4	14.7	14	15.5	NA	4	2	1
Copper	34	270	2	500	587	4	4	274	257	302	4	2	0	0
Lead	47	218	2	307	322	4	4	209	198	230	4	1	0	0
Manganese	--	260	2	472	540	4	4	693	604	766	NA	4	4	4
Mercury	0.15	0.71	2	4.80	7	4	4	2.63	2.4	3.2	4	4	0	0
Nickel	21	52	2	62.0	64.3	4	4	48.4	46.6	52.3	4	1	0	0
Selenium	--	1	2	5.40	8	4	3	1.70	0	3.4	NA	3	0	0
Silver	1	3.7	2	5.15	7.9	4	4	4.58	4.2	5.2	4	4	1	0
Vanadium	--	57	2	69.8	80.9	4	4	70.5	67	77.4	NA	4	2	0
Zinc	150	410	2	511	617	4	4	382	376	393	4	0	0	0

The data from the samples collected from the sediment of the Arthur Kill indicate that sediment COPECs detected above the ER-L and ER-M include SVOCs (mostly PAHs) and metals. None of the SVOCs that exceeded the ER-L and/or ER-M were detected above the background average concentration. Of the metals aluminum, cobalt, managanese, silver and vanadium were greater than the background average. Of these only aluminum, manganese and cobalt are above the background maxium concentration.

4.4 Bathymetric Survey

On March 21, 2014, a bathymetric survey was completed in the lower reach of Woodbridge Creek at the confluence of the Arthur Kill. The survey was completed by Aqua Survey using boat-mounted equipment that provided sediment surface elevations relative to mean sea level. The sediment elevations established by the bathymetric survey indicate that the surface profile of the sediment in this area is generally featureless until the bottom abruptly drops over 30 feet to the bottom of the Arthur Kill. The bathymetric survey proceeded east to the edge of Staten Island in New York, and shows the width of the Arthur Kill channel as a flat bottom that rises abruptly close to Staten Island. This profile is consistent with a profile surveyed for the Arthur Kill and described in the *Subsurface Investigation and Foundation Evaluation for the Linden Cogeneration Transmission Cable*, November 1990 (Ebasco Services, Inc.). The bathymetric profile indicates that the eastern extent of the Woodbridge Creek sediments likely terminate at or near the channel scarp of the Arthur Kill where they were subject to tidal erosion force and historical dredging activities (Figure 6).

5.0 CONCLUSIONS

As part of the Supplemental EE, Chevron completed the re-evaluations of COPECs, the collection of additional sediment samples in Spa Spring Creek and Woodbridge Creek including analysis for EPH. In addition a bathymetric survey was completed in the lower Woodbridge Creek. The following conclusions are based on the Supplemental EE action discussed above:

- Spa Spring Creek, Woodbridge Creek and Arthur Kill are environmentally sensitive natural resources present adjacent to the site, and environmentally sensitive areas are not present on-site;
- Pathways for contaminant migration from SWMUs and AOCs to environmentally sensitive natural resources do not appear to be complete.
- COPECs including VOCs, SVOCs, pesticides and metals are present in sediment and surface water at concentrations above the ESC;
- Copper, nickel and zinc were detected above the SWQC in surface water sample locations at low concentrations in unfiltered samples;
- Staining and/or petroleum odors were observed in several sediment vibracores during the December 2002 sampling event. Stained soils were also observed in background and near site samples collected in 2014. These samples were analyzed/reanalyzed for EPH, and concentrations ranged from 1,640 ppm to 59,300 ppm.
- Based on the bathymetry, the Woodbridge Creek sediments terminate at the confluence of Woodbridge Creek and Arthur Kill.

As discussed in the November 2003 RFI and Section 1.2 of this report, background sources are a likely contributor to the presence of COPECs in sediment and in surface water in Woodbridge Creek and Spa Spring Creek.

6.0 REFERENCES

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ROUX, 2005. North Field Extension Site. Prepared for Chevron. March 1, 2005.

Ebasco Services, Inc, 1990. Subsurface Investigation and Foundation Evaluation for the Linden Cogeneration Transmission Cable, November 1990.

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TABLES

Table I
Sample Summary
Former Chevron Facility - Perth Amboy, New Jersey

Sample Designation	Matrix	Sample Depth (ft. bgs)	Sample Date	Analytical Parameters	Analytical Method
Sediment Samples					
SED-02-A	Sediment	6.0-6.5	03/21/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-02-B	Sediment	3.5-4.0	03/21/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-03-B	Sediment	1.5-2.0	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
	Sediment	4.5-5.0	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-03-C	Sediment	1.5-2.0	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
	Sediment	6.0-6.5	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-04-C	Sediment	1.5-2.0	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-06-B	Sediment	4.0-4.5	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-09-A	Sediment	3.0-3.5	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-09-C	Sediment	4.5-5.0	03/20/14	Grain Size, TOC, pH, EPH Fractionated	BNJEPH, SW846 3546, ATSM D422-63, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-19-B	Sediment	6.0-6.5	03/21/14	TAL/TCL +30, Grain Size, TOC, pH, EPH Fractionated	SW846 8260B, SW846 5035, SW846 8270D, SW846 3550C, SW846 8081B, SW846 3546, SW846 8082A, BNJEPH, SW846 6010C, SW846 7471B, ASTM D422-63, SW846 9012 M/LACHAT, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-19-C	Sediment	7.5-8.0	03/21/14	TAL/TCL +30, Grain Size, TOC, pH, EPH Fractionated	SW846 8260B, SW846 5035, SW846 8270D, SW846 3550C, SW846 8081B, SW846 3546, SW846 8082A, BNJEPH, SW846 6010C, SW846 7471B, ASTM D422-63, SW846 9012 M/LACHAT, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-20-A	Sediment	7.0-7.5	02/28/14	TAL/TCL +30, Grain Size, TOC, pH, EPH Fractionated	SW846 8260B, SW846 5035, SW846 8270D, SW846 3550C, SW846 8081B, SW846 3546, SW846 8082A, BNJEPH, SW846 6010C, SW846 7471B, ASTM D422-63, SW846 9012 M/LACHAT, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-20-C	Sediment	7.0-7.5	02/28/14	TAL/TCL +30, Grain Size, TOC, pH, EPH Fractionated	SW846 8260B, SW846 5035, SW846 8270D, SW846 3550C, SW846 8081B, SW846 3546, SW846 8082A, BNJEPH, SW846 6010C, SW846 7471B, ASTM D422-63, SW846 9012 M/LACHAT, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-21-A	Sediment	8.5-9.0	02/28/14	TAL/TCL +30, Grain Size, TOC, pH, EPH Fractionated	SW846 8260B, SW846 5035, SW846 8270D, SW846 3550C, SW846 8081B, SW846 3546, SW846 8082A, BNJEPH, SW846 6010C, SW846 7471B, ASTM D422-63, SW846 9012 M/LACHAT, LLOYD KAHN 1988 MOD, SW846 9045C,D
SED-21-C	Sediment	6.5-7.0	02/28/14	TAL/TCL +30, Grain Size, TOC, pH, EPH Fractionated	SW846 8260B, SW846 5035, SW846 8270D, SW846 3550C, SW846 8081B, SW846 3546, SW846 8082A, BNJEPH, SW846 6010C, SW846 7471B, ASTM D422-63, SW846 9012 M/LACHAT, LLOYD KAHN 1988 MOD, SW846 9045C,D

EPH = Extractable Petroleum Hydrocarbons
TCL+30 = Target Compound List with Library Search
TAL = Target Analyte List
TOC = Total Organic Carbon

Table II
Summary of Total Fractionated Extractable Petroleum Hydrocarbons (EPH) in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

	TRC Sample No.:	SED-02-A/6-6.5	SED-02-B/3.5-4	SED-03-B/1.5-2	SED-03-B/4.5-5	SED-03-C/1.5-2	SED-03-C/6-6.5	SED-04-C/1.5-2	SED-06-B/4-4.5
	Date Sampled:	03/21/14	03/21/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14
	Depth Sampled (ft):	6.0-6.5	3.5-4.0	1.5-2.0	4.5-5.0	1.5-2.0	6.0-6.5	1.5-2.0	4.0-4.5
	Lab Sample No.:	JB62621-2	JB62621-1	JB62513-7	JB62513-8	JB62513-5	JB62513-6	JB62513-4	JB62513-3
	Laboratory:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Equivalent Carbon Range									
Aliphatics	EC9-EC12	1620	1120	125	138	2070	622	64.6	165
	EC12-EC16	6810	2780	490	551	5320	1770	212	498
	EC16-EC21	15600	1930	1480	491	9250	1940	328	581
	EC21-EC40	21300	3210	3280	593	12600	3310	617	1240
Aromatics	EC10-EC12	ND (23)	ND (2.3)	ND (0.93)	20.2	ND (6.9)	175	ND (0.96)	ND (0.88)
	EC12-EC16	1030	397	96.4	102	949	623	ND (1.4)	38
	EC16-EC21	7880	1240	869	315	5090	1890	172	260
	EC21-EC36	5050	1420	1060	220	4950	1700	241	422
Total Concentration		***59300***	*12100*	*7390*	*2430*	***40200***	*12000*	1640	*3200*
Ecological Screening Criterion (ESC)		1700	1700	1700	1700	1700	1700	1700	1700
EPH Product Limit		17000	17000	17000	17000	17000	17000	17000	17000
Above/Below Allowable EPH SRC (i.e., PASS or FAIL)		Above (FAIL)	Above (FAIL)	Above (FAIL)	Above (FAIL)	Above (FAIL)	Above (FAIL)	Below (PASS)	Above (FAIL)

EPH = Extractable Petroleum Hydrocarbons

ND = Not Detected

NA = Not Analyzed

Italics = Above ESC

Bold = Above EPH Product Limit

Table II
Summary of Total Fractionated Extractable Petroleum Hydrocarbons (EPH) in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

	TRC Sample No.:	SED-09-A/3-3.5	SED-09-C/4.5-5	SED-19-B/6-6.5	SED-19-C/7.5-8	SED-20-A	SED-20-C	SED-21-A	SED-21-C
	Date Sampled:	03/20/14	03/20/14	03/21/14	03/21/14	02/28/14	02/28/14	02/28/14	02/28/14
	Depth Sampled (ft):	3.0-3.5	4.5-5.0	6.0-6.5	7.5-8.0	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
	Lab Sample No.:	JB62513-1	JB62621-2	JB62621-3	JB62621-4	JB60857-1	JB60857-2	JB60857-4	JB60857-3
	Laboratory:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Equivalent Carbon Range									
Aliphatics	EC9-EC12	590	1720	951	369	ND (0.16)	ND (0.18)	23.6	ND (0.18)
	EC12-EC16	1290	2930	2260	1010	ND (0.25)	ND (0.28)	ND (0.25)	ND (0.27)
	EC16-EC21	572	4220	3620	1610	ND (0.22)	ND (0.25)	ND (0.22)	ND (0.24)
	EC21-EC40	1230	9440	4380	3120	48	39.4	61.9	52.5
Aromatics	EC10-EC12	65.6	565	161	56.2	ND (0.17)	ND (0.20)	6.75	ND (0.19)
	EC12-EC16	316	980	693	188	ND (0.25)	ND (0.28)	ND (0.25)	ND (0.27)
	EC16-EC21	530	3610	2200	1010	ND (0.36)	ND (0.41)	ND (0.36)	ND (0.40)
	EC21-EC36	515	4270	1790	801	35.4	ND (0.66)	29.2	ND (0.64)
Total Concentration		*5110*	***27700***	*16000*	*8170*	83.4	39.4	121	52.5
Ecological Screening Criterion (ESC)		1700	1700	1700	1700	1700	1700	1700	1700
EPH Product Limit		17000	17000	17000	17000	17000	17000	17000	17000
Above/Below Allowable EPH SRC (i.e., PASS or FAIL)		Above (FAIL)	Above (FAIL)	Above (FAIL)	Above (FAIL)	Below (PASS)	Below (PASS)	Below (PASS)	Below (PASS)

EPH = Extractable Petroleum Hydrocarbons

ND = Not Detected

NA = Not Analyzed

Italics = Above ESC

Bold = Above EPH Product Limit

Table III
Summary of Volatile Organic Compounds (VOCs) in Sediment
Former Chevron Facility
Perth Amboy, New Jersey

		Sample No.:	SED-19-B/6-6.5		SED-19-C/7.5-8		SED-20-A		SED-20-C		SED-21-A		SED-21-C	
		Date Sampled:	03/21/14		03/21/14		02/28/14		02/28/14		02/28/14		02/28/14	
		Depth (ft):	4.0-4.5		7.5-8.0		0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5	
		LAB Sample ID:	JB62621-3		JB62621-4		JB60857-1		JB60857-2		JB60857-4		JB60857-3	
		LAB:	Accutest, NJ		Accutest, NJ		Accutest, NJ		Accutest, NJ		Accutest, NJ		Accutest, NJ	
Parameter (mg/kg)	***ER-L***	***ER-M***												
Acetone	--	--	ND (0.50)		ND (0.97)		ND (0.0049)		ND (0.0052)		ND (0.0044)		ND (0.0055)	
Benzene	*0.34*	--	**0.437**		0.173	J	ND (0.00014)		ND (0.00014)		ND (0.00012)		ND (0.00015)	
Bromochloromethane	--	--	ND (0.057)		ND (0.11)		ND (0.00056)		ND (0.00059)		ND (0.00050)		ND (0.00063)	
Bromodichloromethane	--	--	ND (0.031)		ND (0.060)		ND (0.00030)		ND (0.00032)		ND (0.00027)		ND (0.00034)	
Bromoform	--	--	ND (0.029)		ND (0.056)		ND (0.00028)		ND (0.00030)		ND (0.00025)		ND (0.00032)	
Bromomethane	--	--	ND (0.053)		ND (0.10)		ND (0.00052)		ND (0.00055)		ND (0.00046)		ND (0.00058)	
2-Butanone (MEK)	--	--	ND (0.49)		ND (0.94)		ND (0.0048)		ND (0.0050)		ND (0.0042)		ND (0.0053)	
Carbon Disulfide	--	--	0.0471	J	ND (0.030)		ND (0.00015)		ND (0.00016)		ND (0.00014)		ND (0.00017)	
Carbon tetrachloride	--	--	ND (0.028)		ND (0.054)		ND (0.00027)		ND (0.00028)		ND (0.00024)		ND (0.00030)	
Chlorobenzene	--	--	0.216	J	0.253	J	ND (0.00021)		ND (0.00022)		ND (0.00019)		ND (0.00024)	
Chloroethane	--	--	ND (0.11)		ND (0.21)		ND (0.0011)		ND (0.0011)		ND (0.00096)		ND (0.0012)	
Chloroform	--	--	ND (0.028)		ND (0.054)		ND (0.00028)		ND (0.00029)		ND (0.00024)		ND (0.00031)	
Chloromethane	--	--	ND (0.038)		ND (0.073)		ND (0.00037)		ND (0.00039)		ND (0.00033)		ND (0.00041)	
cis-1,2-Dichloroethene	--	--	ND (0.023)		ND (0.044)		ND (0.00022)		ND (0.00023)		ND (0.00020)		ND (0.00025)	
cis-1,3-Dichloropropene	--	--	ND (0.025)		ND (0.049)		ND (0.00025)		ND (0.00026)		ND (0.00022)		ND (0.00027)	
Cyclohexane	--	--	2.39		1.29		ND (0.00028)		ND (0.00029)		ND (0.00025)		ND (0.00031)	
1,2-Dibromo-3-chloropropane	--	--	ND (0.15)		ND (0.28)		ND (0.0014)		ND (0.0015)		ND (0.0013)		ND (0.0016)	
Dibromochloromethane	--	--	ND (0.027)		ND (0.052)		ND (0.00026)		ND (0.00027)		ND (0.00023)		ND (0.00029)	
1,2-Dibromoethane	*Product Limit*	--	ND (0.061)		ND (0.12)		ND (0.00059)		ND (0.00062)		ND (0.00053)		ND (0.00066)	
1,2-Dichlorobenzene	--	*0.013*	**0.0781**	J	ND (0.072)		ND (0.00037)		ND (0.00038)		ND (0.00032)		ND (0.00041)	
1,3-Dichlorobenzene	--	--	0.0768	J	0.145	J	ND (0.00024)		ND (0.00025)		ND (0.00021)		ND (0.00026)	
1,4-Dichlorobenzene	--	*0.11*	**0.391**	J	**0.971**	J	ND (0.00027)		ND (0.00028)		ND (0.00024)		ND (0.00030)	
Dichlorodifluoromethane	--	--	ND (0.039)		ND (0.075)		ND (0.00038)		ND (0.00040)		ND (0.00034)		ND (0.00043)	
1,1-Dichloroethane	--	--	ND (0.035)		ND (0.067)		ND (0.00034)		ND (0.00036)		ND (0.00030)		ND (0.00038)	
1,2-Dichloroethane	--	--	ND (0.035)		ND (0.069)		ND (0.00035)		ND (0.00036)		ND (0.00031)		ND (0.00039)	
1,1-Dichloroethene	--	--	ND (0.032)		ND (0.061)		ND (0.00031)		ND (0.00033)		ND (0.00028)		ND (0.00035)	
1,2-Dichloropropane	--	--	ND (0.048)		ND (0.093)		ND (0.00047)		ND (0.00049)		ND (0.00042)		ND (0.00053)	
1,3-Dichloropropene (total)	--	--	ND		ND		ND		ND		ND		ND	
Ethylbenzene	*1.4*	--	1.23		**2.27**		ND (0.00019)		ND (0.00020)		ND (0.00017)		ND (0.00021)	
2-Hexanone	--	--	0.794		0.741	J	ND (0.00016)		ND (0.00017)		ND (0.00014)		ND (0.00018)	
Isopropylbenzene	--	--	0.198	J	ND (0.36)		ND (0.0018)		ND (0.0019)		ND (0.0016)		ND (0.0020)	
Methyl Acetate	--	--	18.7		9.16		ND (0.00018)		ND (0.00019)		ND (0.00016)		ND (0.00020)	
Methyl Tert Butyl Ether (MTBE)	--	--	ND (0.038)		ND (0.073)		ND (0.00037)		ND (0.00039)		ND (0.00033)		ND (0.00041)	
4-methyl-2-pentanone (MIBK)	--	--	ND (0.15)		ND (0.28)		ND (0.0014)		ND (0.0015)		ND (0.0013)		ND (0.0016)	
Methylcyclohexane	--	--	18.7		9.16		ND (0.00018)		ND (0.00019)		ND (0.00016)		ND (0.00020)	
Methylene chloride	--	--	ND (0.19)		ND (0.36)		ND (0.0018)		ND (0.0019)		ND (0.0016)		0.0042	J
Styrene	--	--	ND (0.026)		ND (0.050)		ND (0.00025)		ND (0.00026)		ND (0.00022)		ND (0.00028)	
1,1,2,2-Tetrachloroethane	--	--	ND (0.038)		ND (0.073)		ND (0.00037)		ND (0.00039)		ND (0.00033)		ND (0.00041)	
Tetrachloroethene	*0.45*	--	ND (0.045)		ND (0.088)		ND (0.00044)		ND (0.00046)		ND (0.00039)		ND (0.00050)	
Toluene	*2.5*	--	0.0808	J	0.0976 J	J	ND (0.00015)		ND (0.00016)		ND (0.00014)		ND (0.00017)	
trans-1,2-Dichloroethene	--	--	ND (0.030)		ND (0.058)		ND (0.00029)		ND (0.00031)		ND (0.00026)		ND (0.00033)	
trans-1,3-Dichloropropene	--	--	ND (0.030)		ND (0.058)		ND (0.00029)		ND (0.00031)		ND (0.00026)		ND (0.00033)	
Freon 113	--	--	ND (0.048)		ND (0.093)		ND (0.00047)		ND (0.00049)		ND (0.00042)		ND (0.00053)	
1,2,3-Trichlorobenzene	--	--	ND (0.023)		ND (0.044)		ND (0.00022)		ND (0.00023)		ND (0.00020)		ND (0.00025)	
1,1,1-Trichloroethane	--	--	ND (0.032)		ND (0.061)		ND (0.00031)		ND (0.00033)		ND (0.00028)		ND (0.00035)	
1,1,2-Trichloroethane	--	--	ND (0.091)		ND (0.18)		ND (0.00089)		ND (0.00093)		ND (0.00079)		ND (0.00099)	
Trichloroethene	*1.6*	--	ND (0.039)		ND (0.075)		ND (0.00038)		ND (0.00040)		ND (0.00034)		ND (0.00042)	
Trichlorofluoromethane	--	--	ND (0.025)		ND (0.048)		ND (0.00024)		ND (0.00026)		ND (0.00022)		ND (0.00027)	
1,2,4-Trichlorobenzene	--	*0.0048*	ND (0.020)		ND (0.039)		ND (0.00020)		ND (0.00021)		ND (0.00017)		ND (0.00022)	
Vinyl Chloride	--	--	ND (0.038)		ND (0.073)		ND (0.00037)		ND (0.00039)		ND (0.00033)		ND (0.00041)	
m,p-Xylene	--	--	1.72		6.52		ND (0.00052)		ND (0.00055)		ND (0.00047)		ND (0.00059)	
o-Xylene	--	--	2.94		3.15		ND (0.00019)		ND (0.00020)		ND (0.00017)		ND (0.00022)	
Xylenes (total)	*0.12*	--	**4.66**		**9.67**		ND (0.00019)		ND (0.00020)		ND (0.00017)		ND (0.00022)	
Total VOC TIC	--	--	197	J	79	J	ND		ND		ND		ND	

ER-L = NJDEP Eco Screening Criteria Effects Low Range (Saline)
ER-M =NJDEP Eco Screening Criteria Effects Medium Range (Saline)
Bold indicates concentrations above the ER-L
Bold and Underline indicates concentrations above the ER-M
ND = Not Detected
NA = Not Analyzed
J = Estimated value below sample reporting limit

Table IV
Summary of Semi-Volatile Organic Compounds (SVOCs) in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

		Sample No.:	SED-19-B/6-6.5	SED-19-C/7.5-8	SED-20-A	SED-20-C	SED-21-A	SED-21-C
		Date Sampled:	03/21/14	03/21/14	02/28/14	02/28/14	02/28/14	02/28/14
		Depth (ft):	6.0-6.5	7.5-8.0	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
		LAB Sample ID:	JB62621-3	JB62621-4	JB60857-1	JB60857-2	JB60857-4	JB60857-3
		LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter (mg/kg)	***ER-L***	***ER-M***						
Acenaphthene	*0.016*	*0.5*	ND (0.076)	**1.26**	ND (0.011)	**0.235**	ND (0.0098)	**0.0235** J
Acenaphthylene	*0.044*	*0.64*	ND (0.084)	ND (0.11)	ND (0.012)	ND (0.013)	ND (0.011)	ND (0.013)
Acetophenone	--	--	ND (0.046)	ND (0.060)	ND (0.0065)	ND (0.0073)	ND (0.0060)	ND (0.0071)
Anthracene	*0.085*	*1.1*	**3.55**	**3.16**	0.0521	**0.277**	0.0268 J	0.0748
Atrazine	--	--	ND (0.052)	ND (0.067)	ND (0.0072)	ND (0.0082)	ND (0.0067)	ND (0.0079)
Benzaldehyde	--	--	ND (0.060)	ND (0.078)	ND (0.0084)	ND (0.0096)	ND (0.0078)	ND (0.0093)
Benzo(a)pyrene	*0.43*	*1.6*	**10.6**	**6.24**	0.376	**0.465**	0.199	0.166
Benzo(a)anthracene	*0.261*	*1.6*	**7.03**	**4.63**	**0.345**	**0.475**	0.17	0.151
Benzo(b)fluoranthene	--	*1.8*	**6.94**	**3.91**	0.541	0.608	0.245	0.217
Benzo(ghi)perylene	*0.17*	--	**12.8**	**5.08**	**0.285**	**0.317**	0.155	0.136
Benzo(k)fluoranthene	*0.24*	--	**0.882**	**0.853**	0.185	0.214	0.0922	0.0681
BHC (Benzohexachloride)	*0.003*	--	NA	NA	NA	NA	NA	NA
1,1-Biphenyl	*Product Limit*	--	ND (0.030)	ND (0.039)	ND (0.0043)	0.0959	ND (0.0039)	ND (0.0047)
bis(2-Chloroethoxy)methane	--	--	ND (0.11)	ND (0.14)	ND (0.015)	ND (0.017)	ND (0.014)	ND (0.016)
bis(2-Chloroethyl)ether	--	--	ND (0.079)	ND (0.10)	ND (0.011)	ND (0.013)	ND (0.010)	ND (0.012)
bis(2-Chloroisopropyl)ether	--	--	ND (0.078)	ND (0.10)	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.012)
bis(2-Ethylhexyl)phthalate	*0.18216*	*2.64651*	**7.01**	**23.5**	0.158	**0.277**	0.115	**0.476**
4-Bromophenyl-phenylether	--	--	ND (0.095)	ND (0.12)	ND (0.013)	ND (0.015)	ND (0.012)	ND (0.015)
Butyl benzyl phthalate	--	*0.063*	ND (0.15)	ND (0.20)	ND (0.021)	ND (0.024)	ND (0.020)	ND (0.023)
Caprolactam	--	--	ND (0.083)	ND (0.11)	ND (0.012)	ND (0.013)	ND (0.011)	ND (0.013)
Carbazole	--	--	ND (0.12)	ND (0.16)	0.0641 J	0.207	0.0247 J	0.0355 J
4-Chloroaniline	--	--	ND (0.084)	ND (0.11)	ND (0.012)	ND (0.013)	ND (0.011)	ND (0.013)
4-Chloro-3-methyl phenol	--	--	ND (0.26)	ND (0.34)	ND (0.037)	ND (0.042)	ND (0.034)	ND (0.040)
2-Chloronaphthalene	--	--	ND (0.081)	ND (0.10)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)
2-Chlorophenol	--	*0.008*	ND (0.26)	ND (0.34)	ND (0.037)	ND (0.042)	ND (0.034)	ND (0.040)
4-Chlorophenyl-phenylether	--	--	ND (0.079)	ND (0.10)	ND (0.011)	ND (0.013)	ND (0.010)	ND (0.012)
Chrysene	*0.384*	*2.8*	**11.7**	**6.96**	**0.521**	**0.601**	0.25	0.21
Dibenz(a,h)anthracene	*0.063*	*0.26*	**2.92**	**1.67**	**0.0731**	**0.0816**	0.0382	0.0298 J
Dibenzofuran	--	--	ND (0.078)	ND (0.10)	ND (0.011)	0.22	ND (0.010)	0.0164 J
3,3'-Dichlorobenzidine	--	--	ND (0.067)	ND (0.086)	ND (0.0093)	ND (0.011)	ND (0.0086)	ND (0.010)
2,4-Dichlorophenol	--	*0.005*	ND (0.42)	ND (0.55)	ND (0.059)	ND (0.067)	ND (0.055)	ND (0.065)
Diethyl phthalate	--	*0.006*	ND (0.089)	ND (0.12)	ND (0.013)	ND (0.014)	ND (0.012)	ND (0.014)
2,4-Dimethyl phenol	--	--	ND (0.44)	ND (0.57)	ND (0.062)	ND (0.070)	ND (0.057)	ND (0.068)
Dimethyl phthalate	--	--	ND (0.092)	ND (0.12)	ND (0.013)	ND (0.015)	ND (0.012)	ND (0.014)
Di-n-butyl phthalate	--	*0.058*	ND (0.058)	ND (0.075)	ND (0.0081)	ND (0.0092)	ND (0.0075)	ND (0.0089)
4,6-Dinitro-o-cresol	--	--	ND (0.32)	ND (0.41)	ND (0.045)	ND (0.051)	ND (0.041)	ND (0.049)
4,6-Dinitro-2-methylphenol	--	--	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	ND (0.32)	ND (0.41)	ND (0.045)	ND (0.051)	ND (0.041)	ND (0.049)
Dinitrotoluene (2,4-2,6- mixture)	--	--	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	ND (0.11)	ND (0.15)	ND (0.016)	ND (0.018)	ND (0.015)	ND (0.018)
2,6-Dinitrotoluene	--	--	ND (0.10)	ND (0.13)	ND (0.014)	ND (0.016)	ND (0.013)	ND (0.015)
Di-n-octyl phthalate	--	--	ND (0.13)	ND (0.16)	ND (0.018)	ND (0.020)	ND (0.017)	ND (0.020)
1,4-Dioxane	--	--	ND (0.17)	ND (0.22)	ND (0.024)	ND (0.027)	ND (0.022)	ND (0.026)
Fluoranthene	*0.6*	*5.1*	**6.63**	**5.1**	**0.909**	**1.24**	0.365	0.368
Fluorene	*0.019*	*0.54*	ND (0.086)	**2.57**	0.0145 J	**0.208**	ND (0.011)	**0.0285** J
Hexachlorobenzene	*0.02*	--	ND (0.085)	ND (0.11)	ND (0.012)	ND (0.014)	ND (0.011)	ND (0.013)
Hexachlorobutadiene	--	*0.0013*	ND (0.073)	ND (0.094)	ND (0.010)	ND (0.012)	ND (0.0094)	ND (0.011)
Hexachlorocyclopentadiene	--	--	ND (0.27)	ND (0.35)	ND (0.037)	ND (0.042)	ND (0.035)	ND (0.041)
Hexachloroethane	--	*0.073*	ND (0.073)	ND (0.094)	ND (0.010)	ND (0.012)	ND (0.0094)	ND (0.011)
Indeno(1,2,3-cd)pyrene	*0.2*	--	**2.89**	**1.79**	**0.282**	**0.32**	0.143	0.101
Isophorone	--	--	ND (0.070)	ND (0.091)	ND (0.0099)	ND (0.011)	ND (0.0091)	ND (0.011)
2-Methylnaphthalene	*0.07*	*0.67*	**14.5**	**14.9**	ND (0.020)	**0.438**	ND (0.019)	ND (0.022)
2-Methylphenol	--	--	ND (0.30)	ND (0.39)	ND (0.042)	ND (0.047)	ND (0.039)	ND (0.046)
3&4-Methylphenol	--	--	ND (0.33)	ND (0.43)	ND (0.047)	ND (0.053)	ND (0.043)	ND (0.051)
Naphthalene	*0.16*	*2.1*	**3.12**	**4.06**	ND (0.010)	**0.268**	ND (0.0093)	ND (0.011)
2-Nitroaniline	--	--	ND (0.12)	ND (0.15)	ND (0.016)	ND (0.018)	ND (0.015)	ND (0.018)
3-Nitroaniline	--	--	ND (0.10)	ND (0.14)	ND (0.015)	ND (0.017)	ND (0.014)	ND (0.016)
4-Nitroaniline	--	--	ND (0.10)	ND (0.13)	ND (0.014)	ND (0.016)	ND (0.013)	ND (0.016)
Nitrobenzene	--	--	ND (0.076)	ND (0.098)	ND (0.011)	ND (0.012)	ND (0.0098)	ND (0.012)
2-Nitrophenol	--	--	ND (0.28)	ND (0.36)	ND (0.039)	ND (0.044)	ND (0.036)	ND (0.043)
4-Nitrophenol	--	--	ND (0.44)	ND (0.57)	ND (0.062)	ND (0.070)	ND (0.057)	ND (0.068)
n-Nitrosodi-n-propylamine	--	--	ND (0.064)	ND (0.083)	ND (0.0089)	ND (0.010)	ND (0.0083)	ND (0.0098)
n-Nitrosodiphenylamine	--	--	ND (0.16)	ND (0.20)	ND (0.022)	ND (0.025)	ND (0.020)	ND (0.024)
p-Chloroaniline	--	--	NA	NA	NA	NA	NA	NA
p-Chloro-m-cresol	--	--	NA	NA	NA	NA	NA	NA
Pentachlorophenol	--	*0.017*	ND (0.45)	ND (0.58)	ND (0.063)	ND (0.071)	ND (0.058)	ND (0.069)
Phenanthrene	*0.24*	*1.5*	**19.2**	**12.6**	**0.37**	**1.15**	0.13	**0.316**
Phenol	--	*0.13*	ND (0.28)	ND (0.36)	ND (0.038)	ND (0.044)	ND (0.036)	ND (0.042)
Pyrene	*0.665*	*2.6*	**13.1**	**12**	**0.813**	**1.09**	0.346	0.408
1,2,4,5-Tetrachlorobenzene	--	--	ND (0.080)	ND (0.10)	ND (0.011)	ND (0.013)	ND (0.010)	ND (0.012)
2,3,4,6-Tetrachlorophenol	--	--	ND (0.27)	ND (0.35)	ND (0.038)	ND (0.043)	ND (0.035)	ND (0.042)
2,4,5-Trichlorophenol	--	*0.003*	ND (0.30)	ND (0.39)	ND (0.043)	ND (0.048)	ND (0.039)	ND (0.047)
2,4,6-Trichlorophenol	--	*0.006*	ND (0.25)	ND (0.32)	ND (0.034)	ND (0.039)	ND (0.032)	ND (0.038)
Low Molecular Weight PAHs	--	--	40.37	38.55	0.4366	2.576	0.1568	0.4428
High Molecular Weight PAHs	--	--	86.092	48.233	4.3301	5.4116	2.0034	1.8549
Total PAHs	*4*	*45*	126.462	86.783	4.7667	7.9876	2.1602	2.2977
Total SVOC TIC	--	--	336 J	221 J	3.06 J	2.95 J	4.91 J	1.27 J
Total VOC and SVOC TICs	--	--	533 J	493 J	3.06 J	2.95 J	4.91 J	1.27 J

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Bold indicates concentrations above the ER-L
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ND = Not Detected
NA = Not Analyzed
J = Estimated value below sample reporting limit

Table V
Summary of Polychlorinated Biphenyls (PCBs) in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

		Sample No.:	SED-19-B/6-6.5		SED-19-C/7.5-8		SED-20-A		SED-20-C		SED-21-A		SED-21-C	
		Date Sampled:	03/21/14		03/21/14		02/28/14		02/28/14		02/28/14		02/28/14	
		Depth (ft):	6.0-6.5		7.5-8.0		0.0-0.5		0.0-0.5		0.0-0.5		0.0-0.5	
		LAB Sample ID:	JB62621-3		JB62621-4		JB60857-1		JB60857-2		JB60857-4		JB60857-3	
		LAB:	Accutest, NJ		Accutest, NJ		Accutest, NJ		Accutest, NJ		Accutest, NJ		Accutest, NJ	
Parameter (mg/kg)	***ER-L***	***ER-M***												
Aroclor 1016	*0.007*	--	ND (0.028)		ND (0.043)		ND (0.0098)		ND (0.010)		ND (0.0088)		ND (0.0097)	
Aroclor 1221	--	--	ND (0.065)		ND (0.10)		ND (0.023)		ND (0.024)		ND (0.020)		ND (0.022)	
Aroclor 1232	--	--	ND (0.055)		ND (0.085)		ND (0.019)		ND (0.020)		ND (0.017)		ND (0.019)	
Aroclor 1242	--	--	ND (0.035)		ND (0.053)		ND (0.012)		ND (0.013)		ND (0.011)		ND (0.012)	
Aroclor 1248	*0.03*	--	**2.57**		**3.96**	B	ND (0.011)		ND (0.012)		ND (0.010)		ND (0.011)	
Aroclor 1254	*0.06*	--	**4.01**	B	**2.91**		ND (0.018)		ND (0.019)		ND (0.016)		ND (0.017)	
Aroclor 1260	*0.005*	--	ND (0.036)		ND (0.055)		ND (0.012)		ND (0.013)		ND (0.011)		ND (0.012)	
Aroclor 1262	--	--	ND (0.035)		ND (0.053)		ND (0.012)		ND (0.013)		ND (0.011)		ND (0.012)	
Aroclor 1268	--	--	ND (0.032)		ND (0.049)		ND (0.011)		ND (0.012)		ND (0.010)		ND (0.011)	
Total PCBs	*0.023*	*0.18*	**6.58**		**6.87**		ND		ND		ND		ND	

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ND = Not Detected
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J = Estimated value below sample reporting limit
b Reported from 1st signal. %D of check on 2nd signal excess method criteria (20 %) so using for confirmation only.

Table VI
Summary of Pesticides and Herbicides in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

		Sample No.:	SED-19-B/6-6.5	SED-19-C/7.5-8	SED-20-A	SED-20-C	SED-21-A	SED-21-C
		Date Sampled:	03/21/14	03/21/14	02/28/14	02/28/14	02/28/14	02/28/14
		Depth (ft):	6.0-6.5	7.5-8.0	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
		LAB Sample ID:	JB62621-3	JB62621-4	JB60857-1	JB60857-2	JB60857-4	JB60857-3
		LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter (mg/kg)	***ER-L***	***ER-M***						
Aldrin	*0.002*	--	ND (0.0010)	ND (0.0015)	ND (0.00035)	ND (0.00037)	ND (0.00031)	ND (0.00034)
alpha-BHC	--	--	ND (0.00065)	ND (0.0010)	ND (0.00023)	ND (0.00024)	ND (0.00020)	ND (0.00022)
alpha-Chlordane	--	--	ND (0.00080)	0.0107	0.0025	ND (0.00030)	ND (0.00025)	ND (0.00027)
beta-BHC	--	--	ND (0.0014)	ND (0.0021)	ND (0.00047)	ND (0.00050)	ND (0.00042)	ND (0.00046)
Chlordane (alpha and gamma)	*0.007*	--	ND (0.00080)	**0.0191**	0.005	ND (0.00030)	ND (0.00025)	ND (0.00027)
4,4'-DDD	*0.002*	*0.02*	**1.83**	**0.0558**	ND (0.00041)	ND (0.00044)	ND (0.00037)	ND (0.00041)
4,4'-DDE	*0.0022*	*0.027*	**0.302**	**0.104**	ND (0.00030)	ND (0.00032)	ND (0.00027)	ND (0.00030)
4,4'-DDT	*0.001*	*0.007*	ND (0.0011)	ND (0.0016)	ND (0.00037)	ND (0.00040)	ND (0.00033)	ND (0.00037)
Delta-BHC	--	--	ND (0.0011)	ND (0.0017)	ND (0.00037)	ND (0.00040)	ND (0.00034)	ND (0.00037)
Dieldrin	*0.002*	--	ND (0.00085)	ND (0.0013)	0.0011	ND (0.00031)	ND (0.00027)	ND (0.00029)
Endrin	*0.003*	--	ND (0.00070)	ND (0.0011)	ND (0.00024)	ND (0.00026)	ND (0.00022)	ND (0.00024)
Endrin Aldehyde	--	--	ND (0.0011)	ND (0.0017)	ND (0.00039)	ND (0.00042)	ND (0.00036)	ND (0.00039)
Endrin Ketone	*Product Limit*	--	ND (0.00088)	ND (0.0014)	ND (0.00031)	ND (0.00033)	ND (0.00028)	ND (0.00030)
Endosulfan-I	--	--	ND (0.00082)	ND (0.0013)	ND (0.00029)	ND (0.00030)	ND (0.00026)	ND (0.00028)
Endosulfan-II	--	--	ND (0.0013)	ND (0.0020)	ND (0.00045)	ND (0.00048)	ND (0.00041)	ND (0.00044)
Endosulfan sulfate	--	--	ND (0.00093)	ND (0.0014)	ND (0.00032)	ND (0.00035)	ND (0.00029)	ND (0.00032)
Lindane (Gamma-BHC)	--	--	ND (0.0011)	ND (0.0016)	ND (0.00037)	ND (0.00039)	ND (0.00033)	ND (0.00036)
Heptachlor	--	*0.0003*	ND (0.0011)	0.0103	ND (0.00037)	ND (0.00039)	ND (0.00033)	ND (0.00036)
Heptachlor epoxide	*0.005*	--	**0.0427**	ND (0.0013)	ND (0.00028)	ND (0.00030)	ND (0.00025)	ND (0.00028)
Methoxychlor	--	--	ND (0.0021)	ND (0.0033)	ND (0.00074)	ND (0.00079)	ND (0.00066)	ND (0.00073)
Toxaphene	--	--	ND (0.027)	ND (0.042)	ND (0.0095)	ND (0.010)	ND (0.0086)	ND (0.0094)
DDT (Total)	*0.0016*	*0.046*	**2.132**	**0.1598**	ND	ND	ND	ND

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J = Estimated value below sample reporting limit
b Reported from 1st signal. %D of check on 2nd signal excess method criteria (20 %) so using for confirmation only.

Table VII
Summary of Metals in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

		Sample No.:	SED-19-B/6-6.5	SED-19-C/7.5-8	SED-20-A	SED-20-C	SED-21-A	SED-21-C
		Date Sampled:	03/21/14	03/21/14	02/28/14	02/28/14	02/28/14	02/28/14
		Depth (ft):	6.0-6.5	7.5-8.0	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
		LAB Sample ID:	JB62621-3	JB62621-4	JB60857-1	JB60857-2	JB60857-4	JB60857-3
		LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter (mg/kg)	***ER-L***	***ER-M***						
Aluminum	--	*18000*	10800	10100	6590	5070	6170	8660
Antimony	--	*9.3*	**9.5**	4.1	<2.3	<2.6	<2.3	<2.5
Arsenic	*8.2*	*70*	**47.6**	**62.3**	**8.8**	**11.3**	5.7	3.8
Barium	--	*48*	**161**	**213**	23.4	33.1	<23	<25
Beryllium	--	--	0.81	0.89	0.85	1.3	0.95	0.64
Cadmium	*1.2*	*9.6*	***5.6***	**10**	<0.57	<0.64	<0.57	<0.62
Calcium	--	--	2540	1980	865	910	1150	1240
Chromium	*81*	*370*	72.4	**99.1**	16	29.2	22	20.8
Cobalt	--	*10*	**11**	<9.3	**12.3**	**14.5**	**13.4**	**13.1**
Copper	*34*	*270*	**447**	**337**	28.6	33.6	**41.4**	30.3
Cyanide	--	--	0.43	0.92	<0.26	2.4	<0.24	0.42
Iron	--	--	24400	20000	31900	44800	49500	21500
Lead	*47*	*218*	**817**	**166**	39.5	42.4	33.7	35.7
Magnesium	--	--	3760	3490	2180	1540	1400	2890
Manganese	--	*260*	153	127	199	236	175	150
Mercury	*0.15*	*0.71*	**1.7**	**7.1**	<0.036	<0.041	<0.035	<0.038
Nickel	*t Limit*	*52*	**91.7**	**53.1**	19.3	**25.1**	15.7	**27.1**
Potassium	--	--	2100	<1900	<1100	<1300	<1100	<1200
Selenium	--	*1*	**18.4**	**27.2**	<2.3	<2.6	<2.3	<2.5
Silver	*1*	*3.7*	**1.1**	**2**	**1.2**	**1.2**	**1.1**	<0.62
Sodium	--	--	4490	4990	<1100	<1300	<1100	<1200
Thallium	--	--	<1.5	<1.9	<1.1	<1.3	<1.1	<1.2
Vanadium	--	*57*	**59.8**	**59.3**	22.9	35.8	22.2	30.7
Zinc	*150*	*410*	**476**	**375**	139	**219**	**664**	131

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J = Estimated value below sample reporting limit

Table VIII
Summary of General Chemistry Parameters in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

Sample No.:	SED-02-A/6-6.5	SED-02-B/3.5-4	SED-03-B/1.5-2	SED-03-B/4.5-5	SED-03-C/1.5-2	SED-03-C/6-6.5	SED-04-C/1.5-2	SED-06-B/4-4.5
Date Sampled:	03/21/14	03/21/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14
Depth (ft):	6.0-6.5	3.5-4.0	1.5-2.0	4.5-5.0	1.5-2.0	6.0-6.5	1.5-2.0	4.0-4.5
LAB Sample ID:	JB62621-2	JB62621-1	JB62513-7	JB62513-8	JB62513-5	JB62513-6	JB62513-4	JB62513-3
LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter								
Solids, Percent (%)	47.4	41.8	61.7	57.2	41.6	41.5	50.2	54.4
Total Organic Carbon (mg/kg)	139000	67600	27500	19100	88100	74000	14200	23300
pH (su)	7.61	8.44	7.74	7.31	8.53	7.89	7.6	7.94

Sample No.:	SED-09-A/3-3.5	SED-09-C/4.5-5	SED-19-B/6-6.5	SED-19-C/7.5-8	SED-20-A	SED-20-C	SED-21-A	SED-21-C
Date Sampled:	03/20/14	03/20/14	03/21/14	03/21/14	02/28/14	02/28/14	02/28/14	02/28/14
Depth (ft):	3.0-3.5	4.5-5.0	6.0-6.5	7.5-8.0	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
LAB Sample ID:	JB62513-1	JB62621-2	JB62621-3	JB62621-4	JB60857-1	JB60857-2	JB60857-4	JB60857-3
LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter								
Solids, Percent (%)	48.7	51.6	65.8	45.3	85.5	80.2	88.2	81.1
Total Organic Carbon (mg/kg)	34100	113000	55900	62600	6210	4570	4370 c	5860
pH (su)	8.22	8.5	7.8	8.68	7.04	6.9	7.12	6.69

ND = Not Detected
NA = Not Analyzed
c = Multiple injections indicate possible sample non-homogeneity.
Bold = Above EPH Product Limit

Table IX
Summary of Grain Size Analysis in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

Sample No.:	SED-02-A/6-6.5	SED-02-B/3.5-4	SED-03-B/1.5-2	SED-03-B/4.5-5	SED-03-C/1.5-2	SED-03-C/6-6.5	SED-04-C/1.5-2	SED-06-B/4-4.5	SED-09-A/3-3.5	SED-09-C/4.5-5
Date Sampled:	03/21/14	03/21/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14	03/20/14
Depth (ft):	6.0-6.5	3.5-4.0	1.5-2.0	4.5-5.0	1.5-2.0	6.0-6.5	1.5-2.0	4.0-4.5	3.0-3.5	4.5-5.0
LAB Sample ID:	JB62621-2	JB62621-1	JB62513-7	JB62513-8	JB62513-5	JB62513-7	JB62513-4	JB62513-3	JB62513-1	JB62621-2
LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter (%)										
3 Inch Sieve	100	100	100	100	100	100	100	100	100	100
1.5 Inch Sieve	100	100	100	100	100	100	100	100	100	100
0.75 Inch Sieve	100	100	100	100	100	100	100	100	100	100
0.375 Inch Sieve	100	10	100	100	97	100	100	100	100	100
No.4 Sieve (4.75 mm)	100	100	100	100	95.8	100	100	100	100	100
No.8 Sieve (2.36 mm)	100	100	100	100	90.1	100	100	100	100	100
No.10 Sieve (2.00 mm)	100	100	100	100	88	100	100	100	100	100
No.16 Sieve (1.18 mm)	80.7	99.4	95.4	99.2	84.4	92	99.1	98.2	98.6	98.2
No.30 Sieve (0.60 mm)	79.5	97	88.4	96	77.1	83.5	98.2	96.3	97.3	93.6
No.50 Sieve (0.30 mm)	78.4	95.6	78.2	93.4	70.9	79.8	95.9	93.2	96.8	88.2
No.100 Sieve (0.15 mm)	77.6	93.1	71	87.1	67	75.1	90.2	89.9	96.3	70.2
No.200 Sieve (0.075 mm)	77.5	91.6	70	85.2	65	74.5	89.1	89.1	96.1	61.2
0.030 mm (Hydrometer)	58	86	66	78	51	66	85	94	100	50
0.005 mm (Hydrometer)	13	46	36	30	22	32	34	46	44	18
0.0015 mm (Hydrometer)	8	22	8	20	14	16	17	23	22	7
% Gravel	0	0	0	0	4.2	0	0	0	0	0
% Sand	22.5	8.4	30	14.8	30.8	25.5	10.9	10.9	3.9	38.8
% Silt, Clay, Colloids	77.5	91.6	70	85.2	65	74.5	89.1	89.1	96.1	61.2

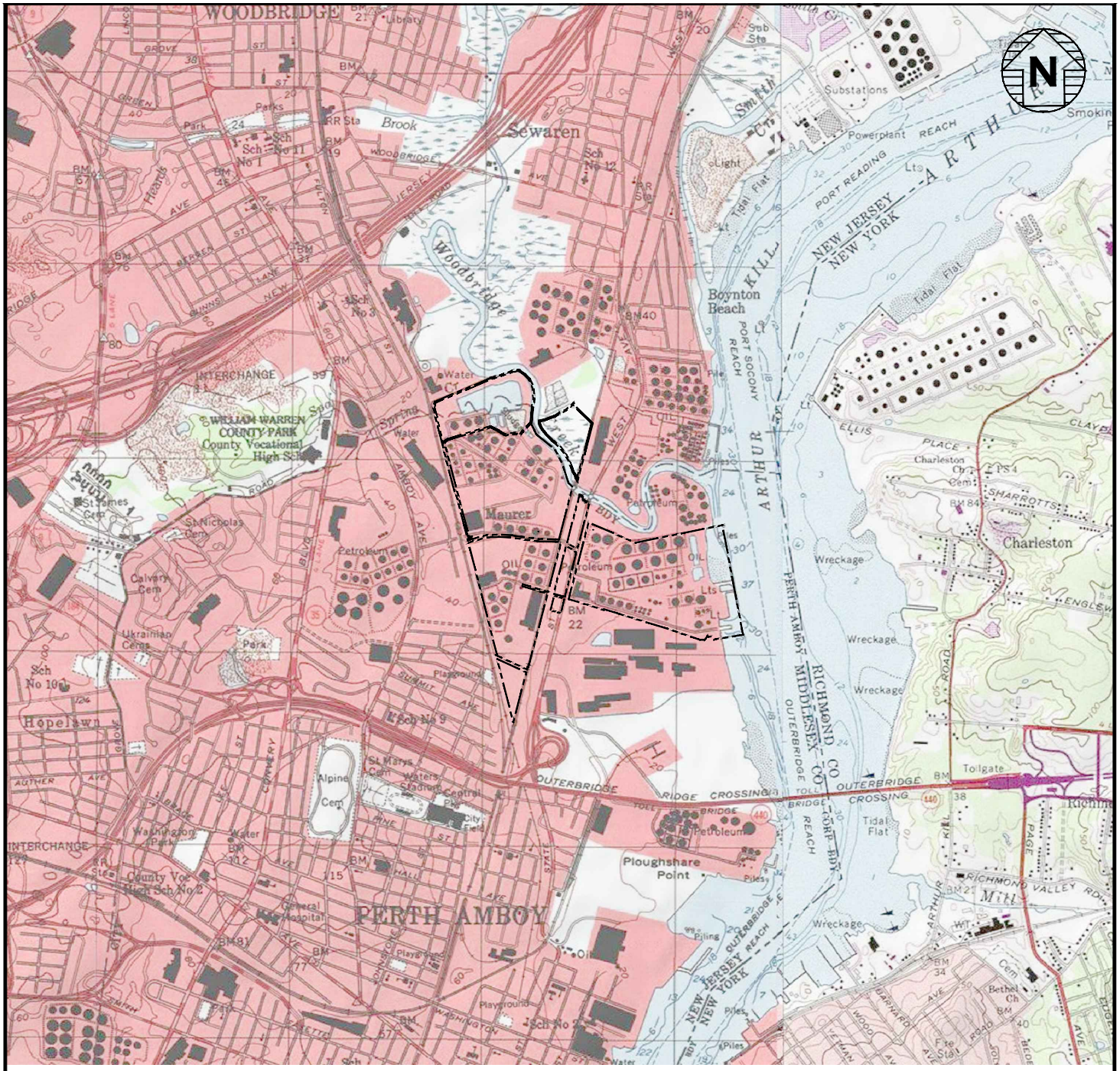
Bold = Above EPH Product Limit

Table IX
Summary of Grain Size Analysis in Sediment
Former Chevron Facility - Perth Amboy, New Jersey

Sample No.:	SED-19-B/6-6.5	SED-19-C/7.5-8	SED-20-A	SED-20-C	SED-21-A	SED-21-C
Date Sampled:	03/21/14	03/21/14	02/28/14	02/28/14	02/28/14	02/28/14
Depth (ft):	6.0-6.5	7.5-8.0	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
LAB Sample ID:	JB62621-3	JB62621-4	JB60857-1	JB60857-2	JB60857-4	JB60857-3
LAB:	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ	Accutest, NJ
Parameter (%)						
3 Inch Sieve	100	100	100	100	100	100
1.5 Inch Sieve	100	100	100	100	100	100
0.75 Inch Sieve	100	100	100	100	100	100
0.375 Inch Sieve	86.8	100	100	96.2	94.9	99
No.4 Sieve (4.75 mm)	83.5	100	94.1	84.4	82.8	82.4
No.8 Sieve (2.36 mm)	77.9	100	81.5	72.4	70.9	61.9
No.10 Sieve (2.00 mm)	76.2	100	77.7	69.4	68.1	57.8
No.16 Sieve (1.18 mm)	50.2	97.7	48.6	57.2	41.9	40.7
No.30 Sieve (0.60 mm)	48.6	96.5	20.7	37.6	15.7	22.8
No.50 Sieve (0.30 mm)	47.4	93.7	8.7	16.7	6.3	8.4
No.100 Sieve (0.15 mm)	46.2	91.3	7.1	7.5	4.9	3.9
No.200 Sieve (0.075 mm)	44.9	89.1	6.7	6.2	4.7	3.5
0.030 mm (Hydrometer)	36	88	<0.83	<0.72	<4.6	<0.61
0.005 mm (Hydrometer)	17	46	<0.83	<0.72	<4.6	<0.61
0.0015 mm (Hydrometer)	8	26	<0.83	<0.72	<4.6	<0.61
% Gravel	16.5	0	5.9	15.7	17.2	17.6
% Sand	38.6	46	87.4	78.2	78.1	78.8
% Silt, Clay, Colloids	44.9	26	6.7	6.2	4.7	3.5

Bold = Above l

FIGURES



SOURCE: PERTH AMBOY, N.J. QUADRANGLE, ARTHUR KILL, N.J. QUADRANGLE, 7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)
HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS

LEGEND

FORMER CHEVRON PROPERTY BOUNDARY

0 2500 FT.
APPROXIMATE SCALE

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, NJ 07974
Results you can rely on

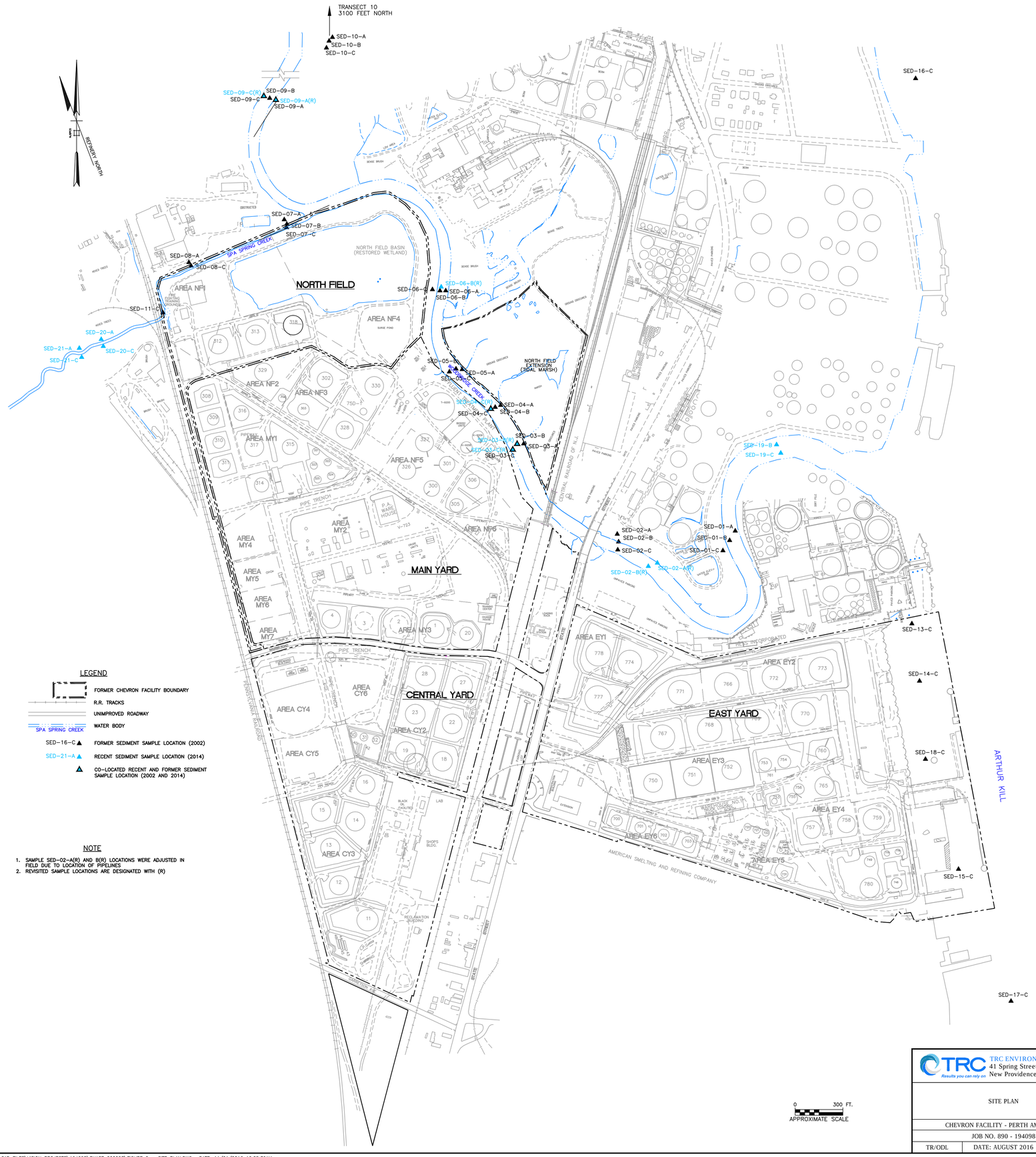
SITE LOCATION MAP

CHEVRON FACILITY - PERTH AMBOY, NJ

JOB NO. 890 - 194098

TR/ODL	DATE: AUGUST 2016	FIGURE: 1

FILE: M:\CAD FILES\VISION PROJECTS\194098\PHASE 000003\FIGURE 1 – SITE LOCATION MAP.DWG, DATE: 11/01/2016 10:21:51AM



LEGEND

- FORMER CHEVRON FACILITY BOUNDARY
- R.R. TRACKS
- UNIMPROVED ROADWAY
- SPA SPRING CREEK — WATER BODY
- SED-16-C ▲ — FORMER SEDIMENT SAMPLE LOCATION (2002)
- SED-21-A ▲ — RECENT SEDIMENT SAMPLE LOCATION (2014)
- ▲ — CO-LOCATED RECENT AND FORMER SEDIMENT SAMPLE LOCATION (2002 AND 2014)

NOTE

1. SAMPLE SED-02-A(R) AND B(R) LOCATIONS WERE ADJUSTED IN FIELD DUE TO LOCATION OF PIPELINES
2. REVISITED SAMPLE LOCATIONS ARE DESIGNATED WITH (R)

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, NJ 07974

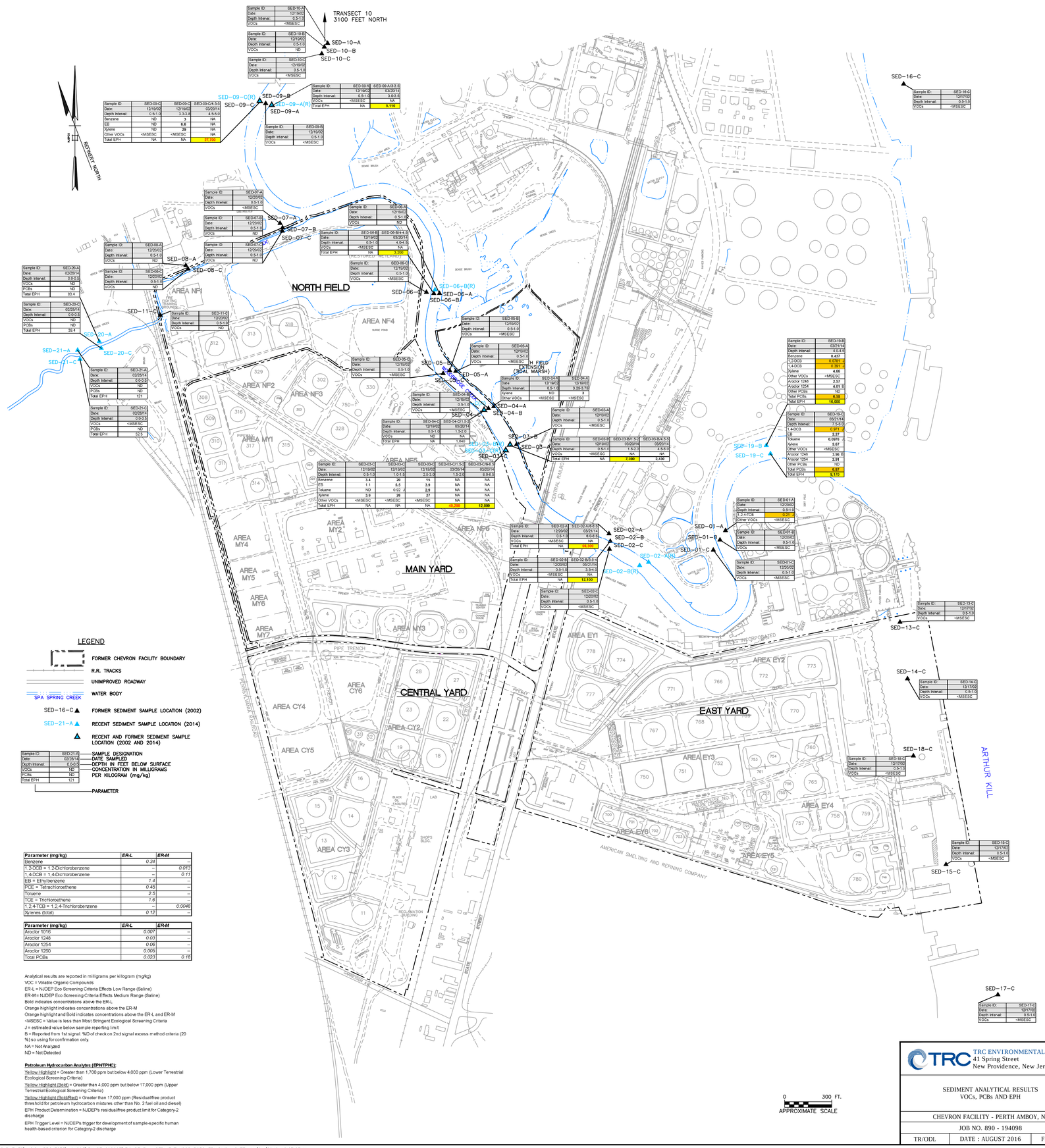
SITE PLAN

CHEVRON FACILITY - PERTH AMBOY, NJ

JOB NO. 890 - 194098

TR/ODL	DATE: AUGUST 2016	FIGURE: 2

FILE: M:\CAD FILES\VISION PROJECTS\194098\PHASE 000003\FIGURE 2 – SITE PLAN.DWG. DATE: 11/01/2016 10:25:39AM



Sample ID:	SED-10-A
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-10-B
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-10-C
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-09-C	SED-09-C(R)	SED-09-C(R)-S
Date:	12/19/02	12/19/02	03/20/14
Depth Interval:	0.5-1.0	3.3-3.8	4.5-5.0
Benzene	ND	3	NA
EB	ND	0.8	NA
Xylene	ND	29	NA
Other VOCs	<MSESC	<MSESC	NA
Total EPH	NA	NA	27,700

Sample ID:	SED-09-A	SED-09-A(R)-S
Date:	12/19/02	03/20/14
Depth Interval:	0.5-1.0	3.0-3.3
VOCs	<MSESC	NA
Total EPH	NA	5,110

Sample ID:	SED-09-B
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-16-C
Date:	12/17/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-07-A
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-07-B
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-07-C
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-08-A
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-08-B	SED-08-B(R)-S
Date:	12/19/02	03/20/14
Depth Interval:	0.5-1.0	4.0-4.3
VOCs	<MSESC	NA
Total EPH	NA	3,200

Sample ID:	SED-08-C
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-08-A
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-08-C
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-20-A
Date:	02/25/14
Depth Interval:	0.0-0.3
VOCs	ND
PCBs	ND
Total EPH	83.4

Sample ID:	SED-20-C
Date:	02/25/14
Depth Interval:	0.0-0.3
VOCs	ND
PCBs	ND
Total EPH	39.4

Sample ID:	SED-11-C
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	ND

Sample ID:	SED-21-A
Date:	02/26/14
Depth Interval:	0.0-0.3
VOCs	ND
PCBs	ND
Total EPH	121

Sample ID:	SED-21-C
Date:	02/25/14
Depth Interval:	0.0-0.3
VOCs	<MSESC
PCBs	ND
Total EPH	62.5

Sample ID:	SED-05-C
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-05-B
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-05-A
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-04-B	SED-04-C	SED-04-C(1.5-2)
Date:	12/19/02	12/19/02	03/20/14
Depth Interval:	0.5-1.0	0.5-1.0	1.5-2.0
VOCs	<MSESC	ND	NA
Total EPH	NA	1,642	NA

Sample ID:	SED-04-A	SED-04-A
Date:	12/19/02	12/19/02
Depth Interval:	0.5-1.0	3.29-3.79
Xylene	ND	3
Other VOCs	<MSESC	<MSESC

Sample ID:	SED-03-A
Date:	12/19/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-03-B	SED-03-B/1.5-2	SED-03-B/4.5-5
Date:	12/19/02	03/20/14	03/20/14
Depth Interval:	0.5-1.0	1.5-2.0	4.5-5.0
VOCs	<MSESC	NA	NA
Total EPH	NA	7,190	2,430

Sample ID:	SED-03-C	SED-03-C	SED-03-C	SED-03-C/1.5-2	SED-03-C/6-6.5
Date:	12/19/02	12/19/02	12/19/02	03/20/14	03/20/14
Depth Interval:	0.5-1.0	1.0-1.5	2.5-3.0	1.5-2.0	6.0-6.5
Benzene	3.4	26	15	NA	NA
EB	1.1	5.5	3.9	NA	NA
Toluene	ND	0.92	2.8	NA	NA
Xylene	3.6	26	27	NA	NA
Other VOCs	<MSESC	<MSESC	<MSESC	NA	NA
Total EPH	NA	NA	NA	61,700	12,000

Sample ID:	SED-02-A	SED-02-A/6-6.5
Date:	12/20/02	03/21/14
Depth Interval:	0.5-1.0	6.0-6.5
VOCs	<MSESC	NA
Total EPH	NA	58,300

Sample ID:	SED-02-B	SED-02-B/3.5-4
Date:	12/20/02	03/21/14
Depth Interval:	0.5-1.0	3.5-4.0
VOCs	<MSESC	NA
Total EPH	NA	12,100

Sample ID:	SED-02-C
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-19-B
Date:	02/21/14
Depth Interval:	4.0-4.3
Benzene	0.437
1,2-DCB	0.0781 J
1,4-DCB	0.391 J
Xylene	4.66
Other VOCs	<MSESC
Total PCBs	6.58
Total EPH	16,000

Sample ID:	SED-19-C
Date:	02/21/14
Depth Interval:	7.5-8.0
1,4-DCB	0.371 J
EB	2.27
Toluene	0.0976 J
Xylene	8.67
Other VOCs	<MSESC
Aroclor 1248	3.96 B
Aroclor 1254	2.99
Other PCBs	ND
Total PCBs	6.87
Total EPH	8,170

Sample ID:	SED-01-A
Date:	12/20/02
Depth Interval:	0.5-1.0
1,2,4-TCB	0.31
Other VOCs	<MSESC

Sample ID:	SED-01-B
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-01-C
Date:	12/20/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-13-C
Date:	12/17/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-14-C
Date:	12/17/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-18-C
Date:	12/17/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-15-C
Date:	12/17/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

Sample ID:	SED-17-C
Date:	12/17/02
Depth Interval:	0.5-1.0
VOCs	<MSESC

LEGEND

- FORMER CHEVRON FACILITY BOUNDARY
- R.R. TRACKS
- UNIMPROVED ROADWAY
- WATER BODY (SPA SPRING CREEK)
- SED-16-C ▲ FORMER SEDIMENT SAMPLE LOCATION (2002)
- SED-21-A ▲ RECENT SEDIMENT SAMPLE LOCATION (2014)
- ▲ RECENT AND FORMER SEDIMENT SAMPLE LOCATION (2002 AND 2014)

Sample ID:	SED-21-A
Date:	02/26/14
Depth Interval:	0.0-0.3
VOCs	ND
PCBs	ND
Total EPH	121

- SAMPLE DESIGNATION
- DATE SAMPLED
- DEPTH IN FEET BELOW SURFACE
- CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/kg)
- PARAMETER

Parameter (mg/kg)	ER-L	ER-M
Benzene	0.34	–
1,2-DCB = 1,2-Dichlorobenzene	–	0.013
1,4-DCB = 1,4-Dichlorobenzene	–	0.11
EB = Ethylbenzene	1.4	–
PCE = Tetrachloroethene	0.45	–
Toluene	2.5	–
TCE = Trichloroethene	1.6	–
1,2,4-TCB = 1,2,4-Trichlorobenzene	–	0.0048
Xylenes (total)	0.12	–

Parameter (mg/kg)	ER-L	ER-M
Aroclor 1016	0.007	–
Aroclor 1248	0.03	–
Aroclor 1254	0.06	–
Aroclor 1260	0.005	–
Total PCBs	0.023	0.18

Analytical results are reported in milligrams per kilogram (mg/kg)
VOC = Volatile Organic Compounds
ER-L = NJDEP Eco Screening Criteria Effects Low Range (Saline)
ER-M = NJDEP Eco Screening Criteria Effects Medium Range (Saline)
Bold indicates concentrations above the ER-L
Orange highlight indicates concentrations above the ER-M
Orange highlight and Bold indicates concentrations above the ER-L and ER-M
<MSESC = Value is less than Most Stringent Ecological Screening Criteria
J = estimated value below sample reporting limit
B = Reported from 1st signal. %D of check on 2nd signal exceeds method criteria (20 %) so using for confirmation only.
NA = Not Analyzed
ND = Not Detected

Petroleum Hydrocarbon Analytes (EPH/TPHC):

Yellow Highlight = Greater than 1,700 ppm but below 4,000 ppm (Lower Terrestrial Ecological Screening Criteria)

Yellow Highlight (Bold) = Greater than 4,000 ppm but below 17,000 ppm (Upper Terrestial Ecological Screening Criteria)

Yellow Highlight (Bold/Red) = Greater than 17,000 ppm (Residual/free product threshold for petroleum hydrocarbon mixtures other than No. 2 fuel oil and diesel)

EPH (Product Determination = NJDEP's residual/free product limit for Category-2 discharge

EPH Trigger Level = NJDEP's trigger for development of sample-specific human health-based criterion for Category-2 discharge

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

SEDIMENT ANALYTICAL RESULTS
VOCs, PCBs AND EPH

CHEVRON FACILITY - PERTH AMBOY, NJ

JOB NO. 890 - 194098

TR/ODL	DATE : AUGUST 2016	FIGURE: 3

FILE: M:\CAD FILES\VISION PROJECTS\194098\PHASE 000003\FIGURE 3 – SEDIMENT VOCS PCBS EPH.DWG, DATE: 11/01/2016 10:27:23AM

Sample ID:	SED-10-A
Date:	12/19/02
Depth Interval:	0.0-0.5
B(2-EH)P	0.46
Other BNs	<MSESC

Sample ID:	SED-10-C
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.017
B(2-EH)P	5.2
Other BNs	<MSESC

Sample ID:	SED-10-B
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.052
ANT	0.19
B(a)A	0.63
B(a)P	0.65
B(g,h,i)P	0.21
B(k)F	0.34
B(2-EH)P	1 J
Chrysene	1
DB(a,h)a	0.073
Fluoranthene	1.1
Fluorene	0.074
I(1,2,3-cd)P	0.22
2-MNap	0.22
Naphthalene	0.22
PhA	0.77
Pyrene	1.4
Total PAHs	8.276
Other BNs	<MSESC

Sample ID:	SED-09-C	SED-09-C	SED-09-C/4.5-5
Date:	12/19/02	12/19/02	03/20/14
Depth Interval:	0.0-0.5	2.75-3.25	4.5-5.0
ACP	0.099	1.9	NA
ACPL	0.083	0.97	NA
ANT	0.31	3.1	NA
B(a)A	1.2	6.5	NA
B(a)P	1.5	13	NA
B(b)F	2.3	9.6	NA
B(g,h,i)P	1	18	NA
B(k)F	0.71	1.2	NA
B(2-EH)P	7	37	NA
Chrysene	1.7	11	NA
DB(a,h)a	0.23	4	NA
Fluoranthene	2.1	5.5	NA
Fluorene	0.085	3.8	NA
I(1,2,3-cd)P	0.8	4.1	NA
2-MNap	0.032	21	NA
Naphthalene	0.049	5.9	NA
PhA	0.95	18	NA
Pyrene	2.9	13	NA
Total PAHs	16.048	140.57	NA
Other BNs	<MSESC	<MSESC	NA
Total EPH	NA	NA	27,700

Sample ID:	SED-09-B
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.2
ACPL	0.052
ANT	0.67
B(a)A	1.9
B(a)P	1.7
B(b)F	2.1
B(g,h,i)P	1
B(k)F	0.95
B(2-EH)P	1.4
Chrysene	2.1
DB(a,h)a	0.28
Fluoranthene	2.3
Fluorene	0.22
I(1,2,3-cd)P	0.99
PhA	2
Pyrene	4.6
Total PAHs	21.197
Other BNs	<MSESC

Sample ID:	SED-07-A
Date:	12/20/02
Depth Interval:	0.0-0.5
ACP	0.017 J
ACPL	0.083
ANT	0.13
B(a)A	0.29
B(a)P	0.45
B(g,h,i)P	0.74
B(2-EH)P	0.5 J
Chrysene	0.39
DB(a,h)a	0.15
Fluorene	0.031
I(1,2,3-cd)P	0.37
PhA	0.31
Total PAHs	4.891
Other BNs	<MSESC

Sample ID:	SED-09-A	SED-09-A/3-3.5
Date:	12/19/02	03/20/14
Depth Interval:	0.0-0.5	3.0-3.5
ACP	0.032	NA
ACPL	0.053	NA
ANT	0.29	NA
B(a)A	0.69	NA
B(a)P	0.55	NA
B(g,h,i)P	0.24	NA
B(2-EH)P	4.2	NA
Chrysene	1.1	NA
DB(a,h)a	0.07	NA
Fluoranthene	0.71	NA
Fluorene	0.028	NA
Pyrene	1.9	NA
Total PAHs	6.874	NA
Other BNs	<MSESC	NA
Total EPH	NA	5,110

Sample ID:	SED-06-B	SED-06-B/4-4.5
Date:	12/19/02	03/20/14
Depth Interval:	0.0-0.5	4.0-4.5
B(2-EH)P	0.71 J	NA
Pyrene	0.71	NA
Other BNs	<MSESC	NA
Total EPH	NA	3,200

Sample ID:	SED-07-B
Date:	12/20/02
Depth Interval:	0.0-0.5
BNs	<MSESC

Sample ID:	SED-06-C
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.056
ACPL	0.05
ANT	0.2
B(a)A	0.8
B(a)P	0.94
B(g,h,i)P	0.54
B(k)F	0.46
B(2-EH)P	3.1
Chrysene	1.1
DB(a,h)a	0.14
Fluoranthene	1.2
Fluorene	0.059
I(1,2,3-cd)P	0.44
PhA	0.72
Pyrene	1.7
Total PAHs	9.858
Other BNs	<MSESC

Sample ID:	SED-06-A
Date:	12/19/02
Depth Interval:	0.0-0.5
B(2-EH)P	0.69 J
Other BNs	<MSESC

Sample ID:	SED-08-A
Date:	12/20/02
Depth Interval:	0.0-0.5
BNs	<MSESC

Sample ID:	SED-07-C
Date:	12/20/02
Depth Interval:	0.0-0.5
BNs	<MSESC

Sample ID:	SED-05-A
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.045 J
ACPL	0.088
ANT	0.19
B(a)A	0.83
B(a)P	1.3
B(g,h,i)P	1.2
B(k)F	0.43
B(2-EH)P	2.1 J
Chrysene	1.1
DB(a,h)a	0.28
Fluoranthene	1.1
Fluorene	0.072
I(1,2,3-cd)P	0.64
PhA	0.7
Pyrene	2.3
Total PAHs	11.616
Other BNs	<MSESC

Sample ID:	SED-20-A
Date:	02/28/14
Depth Interval:	0.0-0.5
B(a)A	0.376
B(g,h,i)P	0.285
Chrysene	0.521
DB(a,h)a	0.0731
Fluoranthene	0.909
I(1,2,3-cd)P	0.282
PhA	0.37
Pyrene	0.813
Total PAHs	4.7667
Other BNs	<MSESC
Total EPH	83.4

Sample ID:	SED-08-C
Date:	12/20/02
Depth Interval:	0.0-0.5
B(g,h,i)P	0.23
B(2-EH)P	0.86 J
Other BNs	<MSESC

Sample ID:	SED-21-A
Date:	02/28/14
Depth Interval:	0.0-0.5
BNs	<MSESC
Total EPH	121

Sample ID:	SED-11-C
Date:	12/20/02
Depth Interval:	0.0-0.5
BNs	<MSESC

Sample ID:	SED-05-C
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.068
ACPL	0.11
ANT	0.18
B(a)A	0.54
B(a)P	0.71
B(g,h,i)P	0.68
B(k)F	0.32
B(2-EH)P	18
Chrysene	0.96
DB(a,h)a	0.17
Fluoranthene	1.1
Fluorene	0.065
I(1,2,3-cd)P	0.54
2-MNap	0.13
Pyrene	1.4
Total PAHs	8.253
Other BNs	<MSESC

Sample ID:	SED-05-B
Date:	12/19/02
Depth Interval:	0.0-0.5
B(g,h,i)P	0.27
B(2-EH)P	0.51
DB(a,h)a	0.064
Other BNs	<MSESC

Sample ID:	SED-04-B
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.092
ANT	0.28
B(a)A	0.51
B(a)P	0.6
B(g,h,i)P	0.5
B(2-EH)P	0.85
Chrysene	0.68
DB(a,h)a	0.11
Fluoranthene	1.1
Fluorene	0.092
I(1,2,3-cd)P	0.41
PhA	1
Pyrene	1.4
Total PAHs	7.796
Other BNs	<MSESC

Sample ID:	SED-21-C
Date:	02/28/14
Depth Interval:	0.0-0.5
ACP	0.0235 J
B(2-EH)P	0.476
Fluorene	0.0285 J
PhA	0.316
Other BNs	<MSESC
Total EPH	52.5

Sample ID:	SED-20-C
Date:	02/28/14
Depth Interval:	0.0-0.5
ACP	0.235
ANT	0.277
B(a)A	0.465
B(a)P	0.475
B(g,h,i)P	0.317
B(2-EH)P	0.277
Chrysene	0.601
DB(a,h)a	0.0816
Fluoranthene	1.24
Fluorene	0.208
I(1,2,3-cd)P	0.32
2-Mnap	0.438
Naphthalene	0.268
PhA	1.15
Pyrene	1.09
Total PAHs	7.9876
Other BNs	<MSESC
Total EPH	39.4

Sample ID:	SED-04-C	SED-04-C/1.5-2
Date:	12/19/02	03/20/14
Depth Interval:	0.0-0.5	1.5-2.0
BNs	<MSESC	NA
Total EPH	NA	1,640

Sample ID:	SED-03-C	SED-03-C	SED-03-C	SED-03-C/1.5-2	SED-03-C/6-6.5
Date:	12/19/02	12/19/02	12/19/02	03/20/14	03/20/14
Depth Interval:	0.0-0.5	1.0-1.5	3.0-3.5	1.5-2.0	6.0-6.5
ACP	1.9	2.8	0.46	NA	NA
ACPL	0.8	1.2	0.33	NA	NA
ANT	1.9	1.4	0.32	NA	NA
B(a)A	3.9	1.4	0.4	NA	NA
B(a)P	8.5	1.1	0.29	NA	NA
B(b)F	5.9	1.4	0.39	NA	NA
B(g,h,i)P	14	0.94	0.25	NA	NA
B(k)F	1.1	0.46	0.11	NA	NA
B(2-EH)P	12	8 J	ND	NA	NA
Chrysene	7.5	2.5	0.53	NA	NA
DB(a,h)a	3.1	0.22	0.058 J	NA	NA
Fluoranthene	4.2	3.7	1	NA	NA
Fluorene	3.7	5.8	0.99	NA	NA
I(1,2,3-cd)P	3.6	0.69	0.16	NA	NA
2-MNap	7.5	39	8.9	NA	NA
Naphthalene	3.4	10	3.4	NA	NA
PhA	11	10	2.8	NA	NA
Pyrene	8.6	5.1	1.8	NA	NA
Total PAHs	90.6	87.71	22.188	NA	NA
Other BNs	<MSESC	<MSESC	<MSESC	NA	NA
Total EPH	NA	NA	NA	40,200	12,000

Sample ID:	SED-04-A	SED-04-A
Date:	12/19/02	12/19/02
Depth Interval:	0.0-0.5	3.25-3.75
ACP	0.036 J	0.64
ACPL	0.063 J	0.29
ANT	0.2	0.97
B(a)A	0.72	2
B(a)P	1.1	2
B(g,h,i)P	1	2.4
B(k)F	0.44	0.46
B(2-EH)P	2.3	5.2 J
Chrysene	1	2.8
DB(a,h)a	0.2	0.48
Fluoranthene	1.2	2.5
Fluorene	0.052 J	1.1
I(1,2,3-cd)P	0.76	0.86
2-MNap	0.027 J	1.4
Naphthalene	ND	0.42
PhA	0.6	4.5
Pyrene	1.8	6.1
Total PAHs	10.498	30.52
Other BNs	<MSESC	<MSESC

Sample ID:	SED-16-C
Date:	12/17/02
Depth Interval:	0.0-0.5
ACP	0.027
ACPL	0.15
ANT	0.25
B(a)A	0.44
B(a)P	0.65
B(g,h,i)P	0.33
B(k)F	0.33
B(2-EH)P	21
Chrysene	0.7
DB(a,h)a	0.094
Fluoranthene	1
Fluorene	0.05
I(1,2,3-cd)P	0.36
Pyrene	1.3
Total PAHs	6.956
Other BNs	<MSESC

Sample ID:	SED-03-B	SED-03-B/1.5-2	SED-03-B/4.5-5
Date:	12/19/02	03/20/14	03/20/14
Depth Interval:	0.0-0.5	1.5-2.0	4.5-5.0
ACP	0.26	NA	NA
ACPL	0.13	NA	NA
ANT	0.95	NA	NA
B(a)A	2.9	NA	NA
B(a)P	3.3	NA	NA
B(b)F	3.8	NA	NA
B(g,h,i)P	2.1	NA	NA
B(k)F	1.3	NA	NA
B(2-EH)P	1.7	NA	NA
Chrysene	3.6	NA	NA
DB(a,h)a	0.59	NA	NA
Fluoranthene	4.8	NA	NA
Fluorene	0.25	NA	NA
I(1,2,3-cd)P	1.9	NA	NA
2-MNap	0.093	NA	NA
PhA	2.5	NA	NA
Pyrene	6	NA	NA
Total PAHs	34.559	NA	NA
Other BNs	<MSESC	NA	NA
Total EPH	NA	7,390	2,430

Sample ID:	SED-19-B/6-6.5
Date:	03/21/14
Depth Interval:	6.0-6.5
ANT	3.55
B(a)A	10.6
B(a)P	7.03
B(b)F	6.94
B(g,h,i)P	12.8
B(k)F	0.882
B(2-EH)P	7.01
Chrysene	11.7
DB(a,h)a	2.92
Fluoranthene	6.63
I(1,2,3-cd)P	2.89
2-Mnap	14.5
Naphthalene	3.12
PhA	19.2
Pyrene	13.1
Total PAHs	126.462
Other BNs	ND
Total EPH	16,000

Sample ID:	SED-03-A
Date:	12/19/02
Depth Interval:	0.0-0.5
ACP	0.086 J
ACPL	0.15
ANT	0.36
B(a)A	1.3
B(a)P	1.1
B(g,h,i)P	1.6
B(k)F	0.44
B(2-EH)P	50
Chrysene	2.3
DB(a,h)a	0.35
Fluoranthene	2
I(1,2,3-cd)P	0.72
PhA	0.25
Pyrene	5.2
Total PAHs	17.563
Other BNs	<MSESC

Sample ID:	SED-01-A
Date:	12/20/02
Depth Interval:	0.0-0.5
ACPL	0.062
ANT	0.086
B(a)A	0.31
B(g,h,i)P	0.42
B(2-EH)P	6.5
DB(a,h)a	0.096
Fluoranthene	0.64
Fluorene	0.022
I(1,2,3-cd)P	0.36
Pyrene	0.72
Total PAHs	4.296
Other BNs	<MSESC

Sample ID:	SED-19-C/7.5-8
Date:	03/21/14
Depth Interval:	7.5-8.0
ACP	1.26
ANT	3.16
B(a)A	6.24
B(a)P	4.63
B(b)F	3.91
B(g,h,i)P	5.08
B(k)F	0.853
B(2-EH)P	23.5
Chrysene	6.96
DB(a,h)a	1.67
Fluoranthene	5.1
Fluorene	2.57
I(1,2,3-cd)P	1.79
2-Mnap	14.9
Naphthalene	4.06
PhA	12.6
Pyrene	12
Total PAHS	86.783
Other BNs	ND
Total EPH	8,170

Sample ID:	SED-02-A	SED-02-A/6-6.5
Date:	12/20/02	03/21/14
Depth Interval:	0.0-0.5	6.0-6.5
ACP	0.034 J	NA
ACPL	0.11	NA
ANT	0.24	NA
B(a)A	0.55	NA
B(a)P	0.78	NA
B(g,h,i)P	0.76	NA
B(k)F	0.4	NA
B(2-EH)P	4.3	NA
BBP	0.25 J	NA
Chrysene	0.83	NA
DB(a,h)a	0.17	NA
Fluoranthene	1.3	NA
Fluorene	0.049 J	NA
I(1,2,3-cd)P	0.58	NA
PhA	0.33	NA
Pyrene	1.6	NA
Total PAHs	9.102	NA
Other BNs	<MSESC	NA
Total EPH	NA	59,300

Sample ID:	SED-02-B	SED-02-B/3.5-4
Date:	12/20/02	03/21/14
Depth Interval:	0.0-0.5	3.5-4.0
ACP	0.45	NA
ACPL	0.046 J	NA
ANT	1.3	NA
B(a)A	2.1	NA
B(a)P	2.2	NA
B(b)F	2.6	NA
B(g,h,i)P	1.6	NA
B(k)F	0.99	NA
B(2-EH)P	2.1	NA
Chrysene	2.3	NA
DB(a,h)a	0.34	NA
Fluoranthene	4.8	NA
Fluorene	0.5	NA
I(1,2,3-cd)P	1.4	NA
2-MNap	0.15	NA
Naphthalene	0.19	NA
PhA	4.9	NA
Pyrene	5.1	NA
Total PAHs	30.966	NA
Other BNs	<MSESC	NA
Total EPH	NA	12,100

Sample ID:	SED-02-C
Date:	12/20/02
Depth Interval:	0.0-0.5
ACP	0.037 J
ACPL	0.11
ANT	0.22
B(a)A	0.65
B(a)P	1.4
B(g,h,i)P	1.5
B(k)F	0.48
B(2-EH)P	20
Chrysene	1.4
DB(a,h)a	0.37
Fluoranthene	0.94
Fluorene	0.037 J
I(1,2,3-cd)P	0.75
Pyrene	3.3
Total PAHs	13.021
Other BNs	<MSESC

Sample ID:	SED-01-C
Date:	12/20/02
Depth Interval:	0.0-0.5
ACP	0.084
ACPL	0.17
ANT	0.5
B(a)A	0.59
B(a)P	0.42
B(g,h,i)P	0.2
B(k)F	0.19
Chrysene	1.2
Fluoranthene	1.3
Fluorene	0.1
I(1,2,3-cd)P	0.16
PhA	0.29
Pyrene	2.6
Total PAHs	8.702
Other BNs	<MSESC

Sample ID:	SED-01-B
Date:	12/20/02
Depth Interval:	0.0-0.5
ACP	0.077
ACPL	0.059
ANT	0.2
B(a)A	0.61
B(a)P	0.86
B(g,h,i)P	0.87
B(k)F	0.36
B(2-EH)P	3.2
Chrysene	0.91
DB(a,h)a	0.21
Fluoranthene	1
Fluorene	0.069
I(1,2,3-cd)P	0.64
PhA	0.61
Pyrene	1.3
Total PAHs	8.856
Other BNs	<MSESC

Sample ID:	SED-13-C
Date:	12/17/02
Depth Interval:	0.0-0.5
ACP	0.077
ACPL	0.14
ANT	0.29
B(a)A	0.56
B(a)P	0.66
B(g,h,i)P	0.37
B(k)F	0.37
B(2-EH)P	4.5
Chrysene	0.68
DB(a,h)a	0.1
Fluoranthene	1.2
Fluorene	0.085
I(1,2,3-cd)P	0.38
PhA	0.3
Pyrene	1.3
Total PAHs	7.621
Other BNs	<MSESC

Sample ID:	SED-14-C
Date:	12/20/02
Depth Interval:	0.0-0.5
ACP	0.46
ACPL	0.15
ANT	0.31
B(a)A	0.61
B(a)P	0.65
B(g,h,i)P	0.32
B(k)F	0.34
B(2-EH)P	3.7
Chrysene	0.62
DB(a,h)a	0.092
Fluoranthene	1.3
Fluorene	0.21
I(1,2,3-cd)P	0.35
2-MNap	0.085
PhA	0.28
Pyrene	1.6
Total PAHs	8.437
Other BNs	<MSESC

Sample ID:	SED-18-C
Date:	12/17/02
Depth Interval:	0.0-0.5
ACP	0.065
ACPL	0.12
ANT	0.27
B(a)A	0.52
B(a)P	0.61
B(g,h,i)P	0.26
B(2-EH)P	4.7
B(k)F	0.33
Chrysene	0.67
DB(a,h)a	0.084
Fluoranthene	0.92
Fluorene	0.069
I(1,2,3-cd)P	0.3
PhA	0.34
Pyrene	1.2
Total PAHs	6.131
Other BNs	<MSESC

Sample ID:	SED-15-C
Date:	12/17/02
Depth Interval:	0.0-0.5
ACP	0.04
ACPL	0.15
ANT	0.3
B(a)A	0.65
B(a)P	0.85
B(g,h,i)P	0.63
B(k)F	0.44
B(2-EH)P	3.9
Chrysene	0.94
DB(a,h)a	0.15
Fluoranthene	1.1
Fluorene	0.053
I(1,2,3-cd)P	0.64
PhA	0.36
Pyrene	1.4
Total PAHs	9.167
Other BNs	<MSESC

Sample ID:	SED-17-C
Date:	12/17/02
Depth Interval:	0.0-0.5
ACP	3.9
ACPL	0.59
ANT	2.4
B(a)A	3.7
B(a)P	3.2
B(b)F	3.7
B(g,h,i)P	1.7
B(k)F	1.2
Chrysene	3.8
DB(a,h)a	0.47
Fluoranthene	6.4
Fluorene	1.2
I(1,2,3-cd)P	1.6
2-MNap	0.67
Naphthalene	0.8
PhA	2.2
Pyrene	7.3
Total PAHs	44.83
Other BNs	<MSESC

LEGEND

FORMER CHEVRON FACILITY BOUNDARY
R.R. TRACKS
UNIMPROVED ROADWAY
SPA SPRING CREEK — WATER BODY
SED-16-C ▲ FORMER SEDIMENT SAMPLE LOCATION (2002)
SED-21-A ▲ RECENT SEDIMENT SAMPLE LOCATION (2014)
▲ RECENT AND FORMER SEDIMENT SAMPLE LOCATION (2002 AND 2014)

Sample ID:	SED-21-A	SAMPLE DESIGNATION
Date:	02/28/14	DATE SAMPLED
Depth Interval:	0.0-0.5	DEPTH IN FEET BELOW SURFACE
VOCs	ND	CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/kg)
PCBs	ND	
Total EPH	121	

PARAMETER

Parameter (mg/kg)	ER-L	ER-M
ACP = Acenaphthene	0.016	0.5
ACPL = Acenaphthylene	0.044	0.64
ANT = Anthracene	0.085	1.1
B(a)A = Benzo(a)anthracene	0.261	1.6
B(a)P = Benzo(a)pyrene	0.43	1.6
B(b)F = Benzo(b)fluoranthene	--	1.8
B(g,h,i)P = Benzo(ghi)perylene	0.17	--
B(k)F = Benzo(k)fluoranthene	0.24	--
BHC (Benzohexachloride)	0.003	--
B(2-EH)P = bis(2-Ethylhexyl)phthalate	0.18216	2.64651
BBP = Butyl benzyl phthalate	--	0.063
2-CP = 2-Chlorophenol	--	0.008
Chrysene	0.384	2.8
DB(a,h)A = Dibenz(a,h)anthracene	0.063	0.26
2,4-DCP = 2,4-Dichlorophenol	--	0.005
DEP = Diethyl phthalate	--	0.006
DBP = Di-n-butyl phthalate	--	0.058
Fluoranthene	0.6	5.1
Fluorene	0.019	0.54
HCB = Hexachlorobenzene	0.02	--
HCBD = Hexachlorobutadiene	--	0.0013
HCE = Hexachloroethane	--	0.073
I(1,2,3-cd)P = Indeno(1,2,3-cd)pyrene	0.2	--
2-Mnap = 2-Methylnaphthalene	0.07	0.67
Naphthalene	0.16	2.1
PCP = Pentachlorophenol	--	0.017
PhA = Phenanthrene	0.24	1.5
Phenol	--	0.13
Pyrene	0.665	2.6
2,4,5-TCP = 2,4,5-Trichlorophenol	--	0.003
2,4,6-TCP = 2,4,6-Trichlorophenol	--	0.006
Total PAHs	4	45

Analytical results are reported in milligrams per killogram (mg/kg)
ER-L = NJDEP Eco Screening Criteria Effects Low Range (Saline)
ER-M =NJDEP Eco Screening Criteria Effects Medium Range (Saline)
Bold indicates concentrations above the ER-L
Orange highlight indicates concentrations above the ER-M
Orange highlight and Bold indicates concentrations above the ER-L and ER-M
<MSESC = Value is less than Most Stringent Ecological Screening Criteria
J = estimated value below sample reporting limit
ND = Not Detected
All samples were not analyzed for BHC (Benzohexachloride)

Petroleum Hydrocarbon Analytes (EPH/TPHC):
Yellow Highlight = Greater than 1,700 ppm but below 4,000 ppm (Lower Terrestrial Ecological Screening Criteria)
Yellow Highlight (Bold) = Greater than 4,000 ppm but below 17,000 ppm (Upper Terrestrial Ecological Screening Criteria)
Yellow Highlight (Bold/Red) = Greater than 17,000 ppm (Residual/free product threshold for petroleum hydrocarbon mixtures other than No. 2 fuel oil and diesel)
EPH Product Determination = NJDEP's residual/free product limit for Category-2 discharge
EPH Trigger Level = NJDEP's trigger for development of sample-specific human health-based criterion for Category-2 discharge

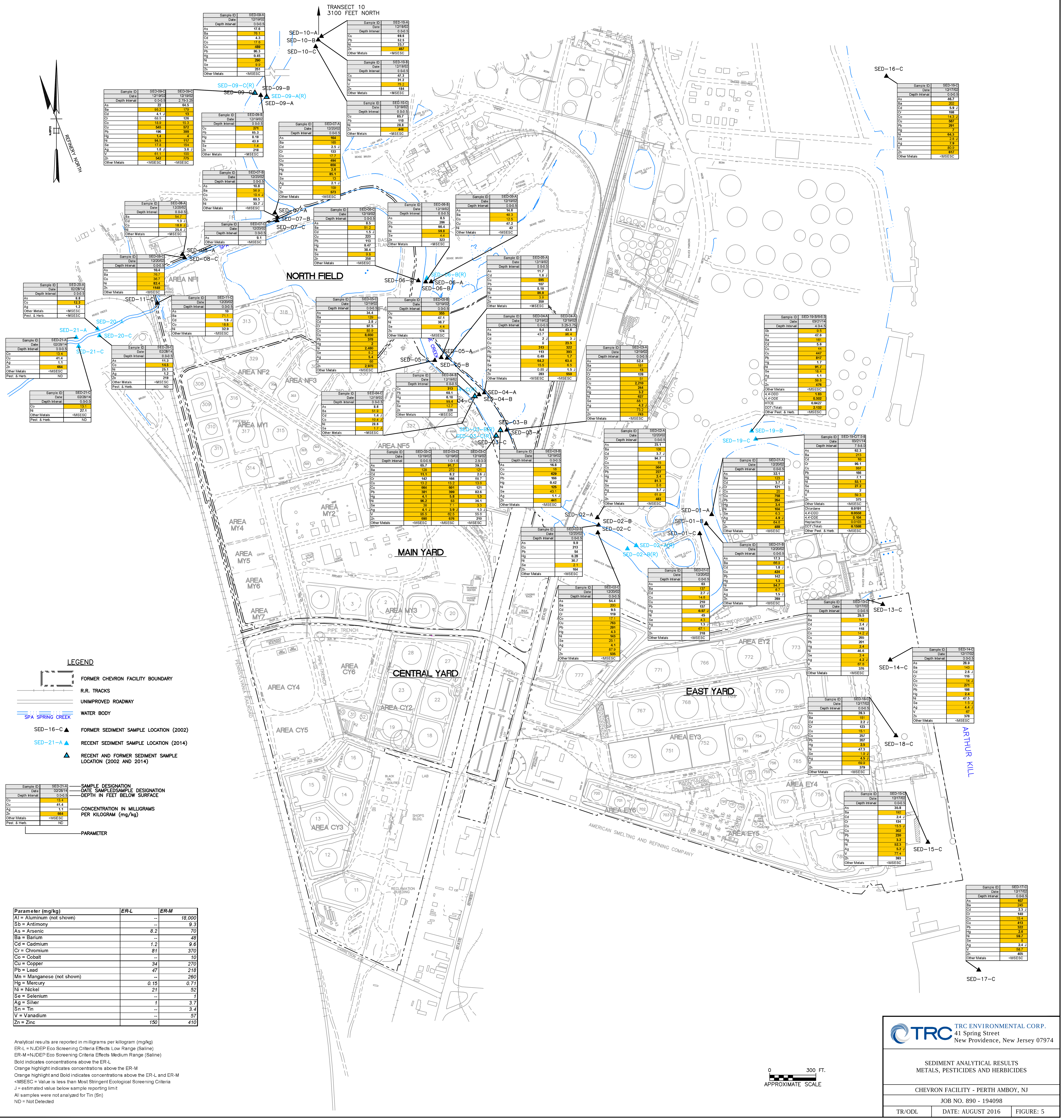
0 300 FT.
APPROXIMATE SCALE

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

SEDIMENT ANALYTICAL RESULTS
SVOCs AND EPH

CHEVRON FACILITY - PERTH AMBOY, NJ
JOB NO. 890 - 194098
TR/ODL | DATE: AUGUST 2016 | FIGURE: 4

FILE: M:\CAD FILES\VISION PROJECTS\194098\PHASE 000003\FIGURE 4 – SEDIMENT BNS AND EPH.DWG, DATE: 11/01/2016 10:29:36AM



Sample ID:	SED-10-A
Date:	12/19/02
Depth Interval:	0.0-0.5
Cu	69.6
Pb	52.5
Ni	33.7
Zn	457
Other Metals	<MSESC

Sample ID:	SED-10-B
Date:	12/19/02
Depth Interval:	0.0-0.5
Cu	47.3
Ni	31.2
V	75.2
Zn	184
Other Metals	<MSESC

Sample ID:	SED-10-C
Date:	12/19/02
Depth Interval:	0.0-0.5
Cu	85.7
Pb	110
Ni	28.8
Zn	448
Other Metals	<MSESC

Sample ID:	SED-09-A
Date:	12/19/02
Depth Interval:	0.0-0.5
As	17.6
Ba	76.1
Cd	4.3
Co	17.6
Cu	489
Pb	86.3
Hg	0.45
Ni	290
Se	9.9
Zn	251
Other Metals	<MSESC

Sample ID:	SED-09-C	SED-09-C
Date:	12/19/02	12/19/02
Depth Interval:	0.0-0.5	2.75-3.25
As	22	64.5
Ba	95.2	179
Cd	4.1 J	13
Cr	68.5	126
Co	18.9	15.3
Cu	545	572
Pb	196	399
Hg	1.4	4
Ni	94.5	117
Se	17.8	154
Ag	1.8 J	3.6 J
V	61.1	100
Zn	542	775
Other Metals	<MSESC	<MSESC

Sample ID:	SED-09-B
Date:	12/19/02
Depth Interval:	0.0-0.5
Cu	271
Pb	65.3
Hg	0.19
Ni	43.9
Se	1.4
Zn	218
Other Metals	<MSESC

Sample ID:	SED-07-A
Date:	12/20/02
Depth Interval:	0.0-0.5
As	164
Ba	165
Cd	2.5 J
Cr	133
Co	17.7
Cu	494
Pb	656
Hg	2.6
Ni	85.1
Se	13
Ag	2.1 J
V	109
Zn	573
Other Metals	<MSESC

Sample ID:	SED-07-B
Date:	12/20/02
Depth Interval:	0.0-0.5
As	10.8
Ba	56.9
Co	10.4 J
Cu	69.5
Ni	33.7 J
Other Metals	<MSESC

Sample ID:	SED-08-A
Date:	12/20/02
Depth Interval:	0.0-0.5
Ba	54.7
Cd	1.3 J
Co	18.8 J
Ni	25.4 J
Other Metals	<MSESC

Sample ID:	SED-07-C
Date:	12/20/02
Depth Interval:	0.0-0.5
As	9.1
Other Metals	<MSESC

Sample ID:	SED-08-C
Date:	12/20/02
Depth Interval:	0.0-0.5
As	10.4
Ba	76.7
Co	36.7
Ni	82.4
Zn	1140
Other Metals	<MSESC

Sample ID:	SED-20-A
Date:	02/28/14
Depth Interval:	0.0-0.5
As	8.8
Co	12.3
Ag	1.2
Other Metals	<MSESC
Pest. & Herb.	<MSESC

Sample ID:	SED-11-C
Date:	12/20/02
Depth Interval:	0.0-0.5
As	10
Ba	71.1
Cd	1.6 J
Co	18.8
Ni	32.9
Other Metals	<MSESC

Sample ID:	SED-21-A
Date:	02/28/14
Depth Interval:	0.0-0.5
Co	13.4
Cu	41.4
Ag	1.1
Zn	664
Other Metals	<MSESC
Pest. & Herb.	ND

Sample ID:	SED-20-C
Date:	02/28/14
Depth Interval:	0.0-0.5
As	11.3
Co	14.5
Ni	25.1
Ag	1.2
Zn	219
Other Metals	<MSESC
Pest. & Herb.	ND

Sample ID:	SED-21-C
Date:	02/28/14
Depth Interval:	0.0-0.5
Co	13.1
Ni	27.1
Other Metals	<MSESC
Pest. & Herb.	ND

Sample ID:	SED-06-C
Date:	12/19/02
Depth Interval:	0.0-0.5
As	8.5
Ba	51.2
Cd	1.5 J
Cu	223
Pb	113
Hg	0.47
Ni	38.4
Se	9.8
Zn	258
Other Metals	<MSESC

Sample ID:	SED-06-B
Date:	12/19/02
Depth Interval:	0.0-0.5
As	8.5
Cu	206
Pb	90.4
Ni	59.8
Se	4.4
Zn	323
Other Metals	<MSESC

Sample ID:	SED-06-A
Date:	12/19/02
Depth Interval:	0.0-0.5
As	14.6
Ba	48.3
Co	12.5
Cu	47.2
Ni	42
Other Metals	<MSESC

Sample ID:	SED-05-A
Date:	12/19/02
Depth Interval:	0.0-0.5
As	11.7
Cd	1.8 J
Cu	595
Pb	107
Hg	0.19
Ni	86.9
Se	3.9
Zn	359
Other Metals	<MSESC

Sample ID:	SED-05-C
Date:	12/19/02
Depth Interval:	0.0-0.5
As	34.4
Ba	129
Cd	2.8 J
Cr	97.5
Co	85.9
Cu	8,030
Pb	378
Hg	2
Ni	2,480
Se	5.2
Ag	5.4
V	66
Zn	2,970
Other Metals	<MSESC

Sample ID:	SED-05-B
Date:	12/19/02
Depth Interval:	0.0-0.5
Cu	355
Pb	47.1
Ni	38.7
Se	4.4
Zn	174
Other Metals	<MSESC

Sample ID:	SED-04-A	SED-04-A
Date:	12/19/02	12/19/02
Depth Interval:	0.0-0.5	3.25-3.75
As	9.4	43.6
Ba	43.7	96.4
Cd	2 J	3 J
Co	9	23.5
Cu	313	322
Pb	113	393
Hg	0.49	1.7
Ni	64.2	63.4
Se	15.5	6.5
Ag	0.85 J	1.5 J
Zn	283	550
Other Metals	<MSESC	<MSESC

Sample ID:	SED-04-B
Date:	12/19/02
Depth Interval:	0.0-0.5
Cu	313
Pb	68.1
Hg	0.18
Ni	55.4
Se	12.7
Zn	228
Other Metals	<MSESC

Sample ID:	SED-04-C
Date:	12/19/02
Depth Interval:	0.0-0.5
As	8.6
Ba	51.9
Cd	1.4 J
Co	10.4 J
Ni	28.6
Se	1.7 J
Other Metals	<MSESC

Sample ID:	SED-03-A
Date:	12/19/02
Depth Interval:	0.0-0.5
As	52.4
Ba	181
Cd	13
Cr	128
Co	51
Cu	2,210
Pb	244
Hg	3.2
Ni	627
Se	88.1
Ag	4.2 J
V	73.2
Zn	743
Other Metals	<MSESC

Sample ID:	SED-03-C	SED-03-C	SED-03-C
Date:	12/19/02	12/19/02	12/19/02
Depth Interval:	0.0-0.5	1.0-1.5	2.5-3.0
As	65.7	91.7	39.2
Ba	128	272	121
Cd	11.1	8.2	2.6 J
Cr	142	166	68.7
Co	13.2	13.2	13.6
Cu	664	601	121
Pb	381	399	82.6
Hg	4.1	5.8	1.3
Ni	96.2	53	36.1
Se	38	7.1	3.3
Ag	4.1 J	3.9 J	1.3 J
V	95.5	62.5	55.6
Zn	690	676	210
Other Metals	<MSESC	<MSESC	<MSESC

Sample ID:	SED-03-B
Date:	12/19/02
Depth Interval:	0.0-0.5
As	16.8
Co	16
Cu	629
Pb	166
Hg	0.42
Ni	125
Se	43.1
Ag	1.1 J
Zn	441
Other Metals	<MSESC

Sample ID:	SED-02-A
Date:	12/20/02
Depth Interval:	0.0-0.5
As	23.1
Ba	108
Cd	3.7 J
Cr	94.7
Co	15
Cu	564
Pb	227
Hg	2.4
Ni	81.3
Se	5.6
Ag	3.7 J
V	61.9
Zn	483
Other Metals	<MSESC

Sample ID:	SED-02-B
Date:	12/20/02
Depth Interval:	0.0-0.5
As	9.9
Cu	213
Pb	54
Hg	0.28
Ni	30.7
Se	2.1
Zn	164
Other Metals	<MSESC

Sample ID:	SED-02-C
Date:	12/20/02
Depth Interval:	0.0-0.5
As	54.4
Ba	200
Cd	9.5
Cr	119
Co	17.1
Cu	763
Pb	291
Hg	4.3
Ni	143
Se	25.1
Ag	4.1
V	87.9
Zn	535
Other Metals	<MSESC

Sample ID:	SED-01-A
Date:	12/20/02
Depth Interval:	0.0-0.5
As	32.1
Ba	123
Cd	3.7 J
Cr	121
Co	20
Cu	758
Pb	264
Hg	3.4
Ni	104
Se	6.3
Ag	4.9 J
V	64.6
Zn	488
Other Metals	<MSESC

Sample ID:	SED-01-B
Date:	12/20/02
Depth Interval:	0.0-0.5
As	17.3
Ba	66.9
Cd	1.8 J
Cu	424
Pb	142
Hg	1.3
Ni	54.7
Se	6.7
Ag	1.5 J
Zn	289
Other Metals	<MSESC

Sample ID:	SED-01-C
Date:	12/20/02
Depth Interval:	0.0-0.5
As	63
Ba	137
Cd	2.7 J
Co	14.6
Cu	210
Pb	137
Hg	0.97 J
Ni	45
Se	4.3
Ag	1.3 J
V	67.1
Zn	218
Other Metals	<MSESC

Sample ID:	SED-19-B/6-6.5
Date:	03/21/14
Depth Interval:	4.0-4.5
Sb	9.5
As	47.6
Ba	161
Cd	5.6
Co	11
Cu	447
Pb	817
Hg	1.7
Ni	91.7
Se	18.4
Ag	1.1
V	59.8
Zn	476
Other Metals	<MSESC
4,4'-DDD	1.83
4,4'-DDE	0.302
HTCE	0.0427
DDT (Total)	2.132
Other Pest. & Herb.	<MSESC

Sample ID:	SED-19-C/7.5-8
Date:	03/21/14
Depth Interval:	7.5-8.0
As	62.3
Ba	213
Cd	10
Cr	99.1
Cu	337
Pb	166
Hg	7.1
Ni	53.1
Se	27.2
Ag	2
V	59.3
Zn	375
Other Metals	<MSESC
Chlordane	0.0191
4,4'-DDD	0.0558
4,4'-DDE	0.104
Heptachlor	0.0103
DDT (Total)	0.1598
Other Pest. & Herb.	<MSESC

Sample ID:	SED-16-C
Date:	12/17/02
Depth Interval:	0.0-0.5
As	46.7
Ba	202
Cd	5.9 J
Cr	198
Co	14.3 J
Cu	587
Pb	291
Hg	7
Ni	64.3
Se	2.8 J
Ag	7.9
V	80.9
Zn	617
Other Metals	<MSESC

Sample ID:	SED-13-C
Date:	12/17/02
Depth Interval:	0.0-0.5
As	29.5
Ba	142
Cd	2.4 J
Cr	118
Co	14.2 J
Cu	265
Pb	201
Hg	2.4
Ni	46.6
Se	3.4
Ag	4.2 J
V	67.6
Zn	376
Other Metals	<MSESC

Sample ID:	SED-14-C
Date:	12/17/02
Depth Interval:	0.0-0.5
As	28.9
Ba	143
Cd	2.6 J
Cr	116
Co	14 J
Cu	271
Pb	198
Hg	2.4
Ni	47.5
Se	1.5 J
Ag	4.4 J
V	67
Zn	378
Other Metals	<MSESC

Sample ID:	SED-18-C
Date:	12/17/02
Depth Interval:	0.0-0.5
As	28.3
Ba	151
Cd	2.2 J
Cr	123
Co	15.1
Cu	257
Pb	207
Hg	2.5
Ni	47.3
Se	1.9 J
Ag	4.5 J
V	69.9
Zn	379
Other Metals	<MSESC

Sample ID:	SED-15-C
Date:	12/17/02
Depth Interval:	0.0-0.5
As	35.8
Ba	192
Cd	2.4 J
Cr	134
Co	15.5 J
Cu	302
Pb	230
Hg	3.2
Ni	52.3
Se	5.2 J
Ag	5.2 J
V	77.4
Zn	393
Other Metals	<MSESC

Sample ID:	SED-17-C
Date:	12/17/02
Depth Interval:	0.0-0.5
As	107
Ba	245
Cd	2.3 J
Cr	140
Co	15.4
Cu	413
Pb	322
Hg	2.6
Ni	59.7
Se	8
Ag	2.4 J
V	58.7
Zn	405
Other Metals	<MSESC

LEGEND

FORMER CHEVRON FACILITY BOUNDARY

R.R. TRACKS

UNIMPROVED ROADWAY

SPA SPRING CREEK — WATER BODY

SED-16-C — FORMER SEDIMENT SAMPLE LOCATION (2002)

SED-21-A — RECENT SEDIMENT SAMPLE LOCATION (2014)

RECENT AND FORMER SEDIMENT SAMPLE LOCATION (2002 AND 2014)

Sample ID:	SED-21-A
Date:	02/28/14
Depth Interval:	0.0-0.5
Co	13.4
Cu	41.4
Ag	1.1
Zn	664
Other Metals	<MSESC
Pest. & Herb.	ND

SAMPLE DESIGNATION
DATE SAMPLEDSAMPLE DESIGNATION
DEPTH IN FEET BELOW SURFACE
CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/kg)
PARAMETER

Parameter (mg/kg)	*ER-L*	*ER-M*
Al = Aluminum (not shown)	--	18,000
Sb = Antimony	--	9.3
As = Arsenic	8.2	70
Ba = Barium	--	48
Cd = Cadmium	1.2	9.6
Cr = Chromium	81	370
Co = Cobalt	--	10
Cu = Copper	34	270
Pb = Lead	47	218
Mn = Manganese (not shown)	--	260
Hg = Mercury	0.15	0.71
Ni = Nickel	21	52
Se = Selenium	--	1
Ag = Silver	1	3.7
Sn = Tin	--	3.4
V = Vanadium	--	57
Zn = Zinc	150	410

Analytical results are reported in milligrams per killogram (mg/kg)
ER-L = NJDEP Eco Screening Criteria Effects Low Range (Saline)
ER-M =NJDEP Eco Screening Criteria Effects Medium Range (Saline)
Bold indicates concentrations above the ER-L
Orange highlight indicates concentrations above the ER-M
Orange highlight and Bold indicates concentrations above the ER-L and ER-M
<MSESC = Value is less than Most Stringent Ecological Screening Criteria
J = estimated value below sample reporting limit
All samples were not analyzed for Tin (Sn)
ND = Not Detected

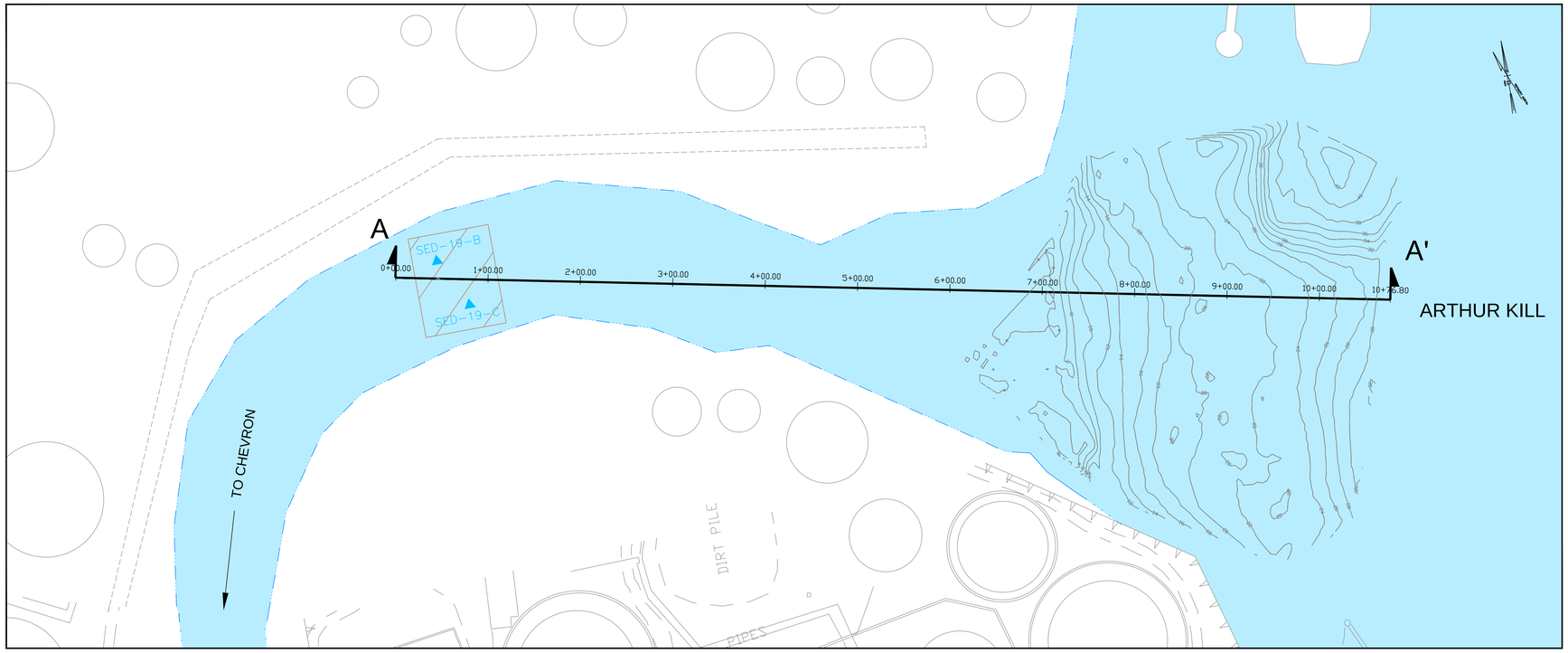
TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

SEDIMENT ANALYTICAL RESULTS
METALS, PESTICIDES AND HERBICIDES

CHEVRON FACILITY - PERTH AMBOY, NJ

JOB NO. 890 - 194098

TR/ODL | DATE: AUGUST 2016 | FIGURE: 5



PLAN

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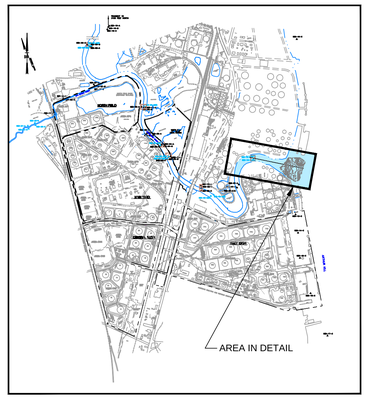
APPROXIMATE SCALE

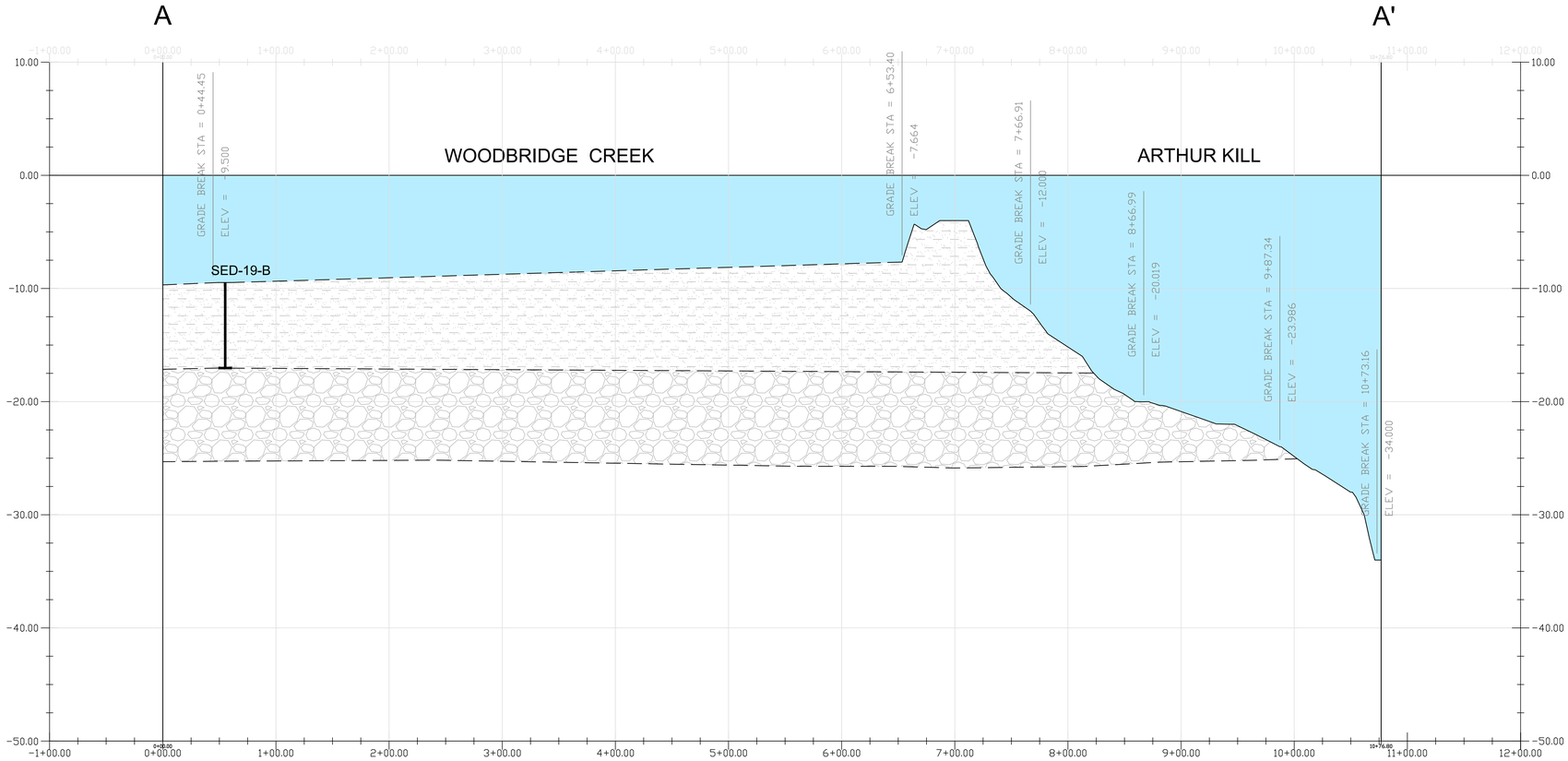


LEGEND

- UNIMPROVED ROADWAY
- WOODBRIDGE CREEK — WATER BODY
- SED-19-C ▲ — SEDIMENT SAMPLE LOCATION
- SURFACE WATER BODY
- CROSS SECTION TRANSECT
- SED-19-B — TRC BORING ID (SAMPLE ID)
- INTERPOLATED SEDIMENTARY LAYER
- WOODBRIDGE CREEK
- SANDY SILT
- GRAVEL/TILL

REFERENCES:

1. WOODBRIDGE CREEK WATER LEVELS BASED ON AVERAGE TIDAL WATER LEVELS.
2. BATHYMETRIC SURVEY SOUNDINGS COLLECTED BY AQUA SURVEY, MARCH 2014.



CROSS SECTION A - A'

5 FT.
0
0 50 FT.
APPROXIMATE SCALE

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

BATHYMETRIC SURVEY AND CROSS SECTION

CHEVRON FACILITY – PERTH AMBOY, NJ

JOB NO.: 890 – 194098

DM/LB	DATE: AUGUST 2016	FIGURE: 6

FILE: M:\CAD FILES\VISION PROJECTS\194098\PHASE 000003\FIGURE 6 – BATHY SURVEY 2014.DWG, DATE: 11/01/2016 10:34:33AM

APPENDICES

APPENDIX A

APPENDIX A

EPA/NJDEP Correspondances (2004 and 2009)

February 13, 2004

Chevron

Mr. Raymond Basso
Branch Chief
Environmental Planning & Protection Division, RCRA Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, New York 10007-1866

Chevron Environmental
Management Company
1200 State Street
Perth Amboy, NJ 08861

R. Lavorerio
Environmental Projects Manager
Phone No 732 738 2207
Fax No. 732 738 2039

SUBJECT: EPA ID #NJD081982902
HSWA PERMIT
NOTIFICATION OF NEWLY IDENTIFIED AOC's

Dear Mr. Basso:

Pursuant to Module III, Section C.1 of the Refinery HSWA permit, Chevron is formally notifying the United States Environmental Protection Agency (USEPA) of thirteen (13) new Areas of Concern (AOC) identified at the Perth Amboy Refinery.

As part of Chevron's recent "Potential Area of Concern" Investigation, Chevron has identified thirteen (13) distinct areas of potential environmental impact at the Chevron Perth Amboy Refinery. The Investigation was conducted to satisfy NJDEP's interest in exploring areas of the Refinery not addressed by Chevron's current HSWA Permit. These areas included tank basins, pipe manifolds, process units and loading racks.

Based on the Site Investigation of over forty (40) units, it has been determined that thirteen (13) of the units possess contamination, which appears historic in nature. These units will subsequently be subject to the provisions of Module III, Section C of the HSWA Permit. Future evaluations will determine if dissolved contamination in proximity to these new AOCs are a result of a more global dissolved phase area versus a direct source to groundwater from the individual units. For future reference, the areas will be designated as follows:

- AOC 37 - East Yard Gasoline Filters
- AOC 38 - Barge Loading Manifold at Tank 761 & G180/181 Naphtha Pumps
- AOC 39 - East Yard Pump House & PRC Loading Rack
- AOC 40 - Tank Basin 22
- AOC 41 - Tank Basin 300
- AOC 42 - Tank Basin 310
- AOC 43 - Tank Basin 311
- AOC 44 - Tank Basin 313
- AOC 45 - Tank Basin 748
- AOC 46 - Tank Basin 749/780
- AOC 47 - No. 4 Crude Unit
- AOC 48 - Isomax Process Plant
- AOC 49 - No. 3 Rheniformer

SWMU/AOC Assessment Reports (SARs) for the newly identified units are currently being prepared for Agency submittal as specified in Module III, Section C.2 of the HSWA Permit. However, due to the fact that Site Investigations of the units have already been conducted, a SWMU/AOC Sampling and Analysis Plan (SAP) will not be submitted for the units. USEPA can review the results of Chevron's PAOC Site Investigation in Chevron's *PAOC Site Investigation Report,* dated February 2004, which will be submitted under separate cover. Chevron intends to expedite the field work and associated reporting requirements relating to the Full RFI of these units so they can be included in Chevron's upcoming Corrective Measures Study.

If you have any questions regarding this notification, please call Bob Mancini at 732-738-2023 or the writer at (732) 738-2207.

Sincerely,

Robert Lavorerio

cc: Mr. Anthony Cinque - NJDEP Case Manager (3 copies)
Mr. Andrew Park - USEPA Project Manager (2 copies)

bcc: R. Lavorerio / CEMC File# 020203CAG3333E004602132004
R. Mancini
K. Siet (TRC Associates)
M. Kominek (SAIC)

Richard J. Codey
Acting Governor

State of New Jersey

Department of Environmental Protection

Bradley M. Campbell
Commissioner

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

DEC 2 3 2004

Re: Chevron USA Products Company, A Division of Chevron USA, Inc. ("Chevron")
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902
Full RCRA Facility Investigation Report.

Dear Mr. Park:

The New Jersey Department of Environmental Protection ("NJDEP" or "Department") has completed the review of the above-referenced document titled "Full RCRA Facility Investigation Report" dated December 3, 2003. The NJDEP has the following comments which must be addressed.

General Comments:

It should be noted that the Full RCRA Facility Investigation (RFI) Report documents the investigation of the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) contained in North Field/Main Yard, East Yard and Central Yard only. It does not include those SWMUs and AOCs within the West Yard, Amboy Field, or the North Field Extension. In addition the RFI Report does not address Potential Areas of Concern (POACs) identified separately by the NJDEP.

Vertical delineation of contamination has not been completed. There are areas across the site where the till layer is in contact with sandy till or other sandy units. In these areas there appears to be a downward vertical gradient. Chevron shall determine the vertical hydraulic gradients at the site through the installation of deep monitor wells. Chevron shall delineate the vertical extent of ground water contamination at the site.

Chevron shall present a list of chemicals that would effectively monitor releases from specialized storage, production, and waste disposal units located at the site. For example, the TCL (BTEX in particular) would effectively monitor releases from gasoline storage and production units. However, TCL may not effectively monitor potential releases from naphtha storage areas since petroleum naphtha is composed mainly of hexane and pentane. If there are any areas where samples were not analyzed for the proper chemicals, Chevron shall propose additional sampling and analyses.

Specific Comments

Source Characterization - Soils, Chapter 6

Arsenic was detected in excess of the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) in approximately 15% of the soil samples collected at the Chevron Refinery site. Chevron states that the elevated arsenic is resulting from either natural background or anthropogenic off-site sources. Therefore, Chevron has concluded that arsenic is not a facility-related chemical. While the NJDEP concurs that natural background concentrations have been found in the State of New Jersey in excess of the 20 parts per million (ppm) RDCSCC, Chevron has not proven this to be the case. The Technical Regulations for Site Remediation provide a mechanism to establish natural background in N.J.A.C. 7:26E-3.10. Should Chevron wish to make the claim that arsenic is natural background, then appropriate procedures must be implemented. Therefore, Chevron's request to exclude arsenic from

the list of site contaminants cannot be accepted at this time.

Section 2.3, Overview of Waste Management Practices

Numerous wastewater discharge points are reported along Woodbridge Creek related to waste management practices prior to 1976. This includes separators, ponds, and mudflats (as further discussed in Section 6.1.3). The locations of these discharges shall be noted on a site map and targeted as part of the surface water and sediment investigation.

Section A.2.1, SWMA 1

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to volatile organic compounds (VOCs) and metals in SWMA 1. Further delineation is necessary for VOCs (benzene being the primary indicator) and metals (lead being the primary indicator) along the eastern boundary. This is critical due to the proximity of the property boundary.

Section A.2.2, SWMA 2

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to PAHs in SWMA 2. Further delineation is necessary for PAHs (benzo(a)pyrene being the primary indicator) along the eastern boundary. This is critical due to the proximity of the property boundary. The site map for the Chevron Perth Amboy site incorrectly labels a block along State Street as part of the site, however this is a commercial/residential strip

Section A.2.3, SWMA 3

Chevron has elected to defer further investigation of SWMA 3 due to the ongoing activities associated with the closure of the North Field Basin (SWMU 1) and Surge Pond (SWMU 2). This is currently acceptable, however Chevron shall provide to the Department a projected timeframe for implementation of the investigation at SMWA 3.

Section A.2.7, SWMU 7

The site map for SWMU 7 is difficult to read. There are too many sample points labeled on the map, to the point that the numbers overlap each other and make the map illegible. Chevron shall utilize maps at a greater scale than 1"=50' when the sample points and their labels are too tightly compressed together.

Section A.2.8, SWMU 16

The discussion on SWMU 16 does not make reference to the significance of the elevated benzene concentrations in soils. Chevron should clarify whether this is related to the LNAPL plume or if there is another source.

Section A.2.9, SWMU 17

The discussion on SWMU 17 does not make reference to the significance of the elevated benzene concentrations in soils. Chevron should clarify whether this is related to an unknown source.

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to volatile organic compounds (VOCs) in SWMU 17. Further delineation is necessary for VOCs (benzene being the primary indicator) along the western and northern sides.

Section A.2.10, SWMU 18

The discussion on SWMU 18 does not make reference to the significance of the elevated benzene concentrations in soils. Chevron should clarify whether this is related to an unknown source.

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to volatile organic compounds (VOCs) in SWMU 18. Further delineation is necessary for VOCs (benzene being the primary indicator) along the western and southern sides.

Section A.2.11, SWMU 19

The site map for SWMU 19 is difficult to read. There are too many sample points labeled on the map, to the point that the numbers overlap each other. Chevron shall utilize maps at a greater scale than 1"=50' when the sample points and their labels are too tightly compressed together.

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. Based on the quality of the site map and other data gaps, it is difficult to verify if this assessment is correct as it relates to volatile organic compounds (VOCs) in SWMU 19.

Figure 6-2 defines the limits of exceedances for VOCs based on what appears to be elevated roadways. Chevron should clarify whether this is the justification. Without knowing the source of the soil contamination, it is difficult to conclude that the proposed boundaries are appropriate without clean verification samples outside the limits.

Further delineation may be necessary for VOCs (benzene being the primary indicator) after review of the supplemental information for SMWU 19.

Section A.2.12, SWMU 20

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP cannot concur with this assessment as it relates to lead and TEL/TOL in SWMU 20. Chevron should verify that the current berm configuration existed at the time the source material was placed in this area. Further delineation may be necessary for lead and TEL/TOL along all sides.

Section A.2.16, SWMU 35

There is no discussion about investigating or delineating contamination that may be associated with the feeder ditch that is located off the southwest corner of the separator footprint. Chevron should clarify this issue.

Section A.2.17, SWMU 40

Chevron shall explain the relationship of the former surface impoundment (circular structure on Figure 6-14) with the rectangular configuration adjacent to the south of the former surface impoundment. Chevron shall clarify whether this is the oil/water separator.

Samples were collected from only one location within the footprint of the former surface impoundment at SWMU 40 and analyzed for full parameters. One additional location was sampled from the rectangular area and analyzed for full parameters. The results from these two locations fail to properly characterize this area. The NJDEP reserves judgement on the appropriateness of moving on to the CMS pending the discussion on the proposed corrective measure for SWMU 40.

Section A.2.20, SWMU 51

Chevron has concluded that the Oily Soil Pad (SWMU 51) does not require action per Module III of the HSWA Permit. While that may or may not be true, this potential area of concern does require investigation under the New Jersey Technical Requirements for Site Remediation (7:26E).

Section A.2.25, AOC 6A

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to VOCs and SVOCs in AOC 6A. Chevron should verify that the current berm and road configuration existed during the times that the No. 4 Separator operated. Further delineation may be necessary for VOCs (benzene being the primary indicator) and SVOCs (benzo(a)pyrene being the primary indicator).

The NJDEP is in agreement with the recommendation that AOC6A be combined with SWMU 35.

Section A.2.31, AOC 16

As previously noted in the Department's review of the Chevron Phase II OWSS Report, the sampling strategy for the Phase II OWSS Investigation was modified to emphasize ground water as the primary media to assess contaminant impact. The Department agreed to this approach due to the random nature of soil contamination associated with miles of pipeline where a potential source is unknown. Ground water is a more accurate indicator of a release in a broad area of concern.

On a number of the investigation areas, significantly high contaminant levels were detected in ground water, indicating a likely source of ground water contamination upgradient of the sample location. Therefore, a soil investigation of the potential source areas must be undertaken and reflected in the recommendation sections of the Report.

These investigation areas include:

MY3 – H0303 (volatiles), H0452 (metals)
NF2 – H0312 (volatiles), H0316 (volatiles), H0458 (benzene)
NF3 – H0319 (volatiles, semi-volatiles, lead), H0458 (benzene)
NF4 – H0324 (benzene), H0423 (benzene)
NF5 – H0325 (volatiles), H0326 (volatiles), H0327 (volatiles), H0328 (lead), H0443 (volatiles)
NF6 – H0442 (lead), H0444 (volatiles), H0465 (volatiles)

Chevron's request for no further action in the aforementioned investigative areas cannot be accepted at this time. Chevron shall address the potential for soil sources of groundwater contamination for each of these areas.

Section A.2.34, AOC 19

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to SVOCs in AOC 19. Further delineation may be necessary for SVOCs (benzo(a)pyrene being the primary indicator).

Section A.2.37, AOC 24

Figure A.2.33 fails to identify the location of boring S0863. Chevron should clarify if it was installed in the same location as MW154. In addition, the figure must identify the limits of the soil excavation that occurred when the release was first discovered. Chevron should clarify how the limits of excavation compare to the location of boring S0863.

Any action regarding the request for no further action at AOC 24 will be deferred until the above information is provided and reviewed.

Section A.2.38, AOC 33

Due to the potential for vapor intrusion from the elevated benzene contamination in ground water, Chevron shall identify the two buildings adjacent to Tank 314. Further investigation of this pathway (as generally discussed below) appears to be warranted.

Section A.3.1, SWMU 11A

As previously stated, the site map (Figure 2-2) identifying the SWMUs and AOCs shall be modified to differentiate SWMU11A and SWMU 11B. Currently, the site maps label them as SWMU 11 and SWMU 11(2). Consistency in the alphanumeric designation would alleviate some of the confusion regarding SWMU 11.

Section A.3.7, SWMU 34

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to SVOCs in SWMU 34.

The analytical results for boring S1432 reveals elevated concentrations for benzo(a)pyrene (9.3 ppm) at the intermediate depth. Since this sample is located along the property boundary, further delineation is necessary for SVOCs (benzo(a)pyrene being the primary indicator).

Section A.4.2, SWMU 8

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to VOCs in SWMU 8.

The analytical results for numerous borings reveal elevated concentrations for benzene at the intermediate depth. Since these samples are located along the property boundary, further delineation is necessary for VOCs (benzene being the primary indicator).

Section A.4.4, SWMU 10

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to volatile organic compounds (VOCs) and metals in SWMU 10. Further delineation is necessary for VOCs (benzene being the primary indicator) and metals (lead and TOL/TEL being the primary indicators) primarily in the Tank 767 berm area.

Section A.4.14, AOC 14

Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to VOCs in AOC 14. The analytical results for numerous borings reveal elevated concentrations for benzene at the intermediate depth. Thus, further delineation is necessary for VOCs (benzene being the primary indicator).

In addition, Chevron recommends that AOC 14 be incorporated into EY4B LNAPL area and removed from the AOC list. The soil contamination associated with AOC 14 represents a source of ground water contamination. Therefore, the NJDEP cannot concur with Chevron's proposal to terminate the AOC

designation.

Section A.4.16, AOC 26

Chevron previously suggested that the source of the oily petroleum material was oily fill used historically in the East Yard. Based on this, Chevron is proposing to investigate this AOC as part of the LNAPL plume delineation.

Chevron shall be aware that soil contamination must be fully delineated. There are no soil samples collected on the western side of Wharf Avenue, where the two bunker slabs were located. Chevron shall address this issue.

The 1st Phase RFI Soils Report recommended the development and implementation of a regional (eastern portion of the East Yard) assessment of the distribution of historic oily fill. Chevron should clarify whether this approach has been considered.

Section 8.0, Ground Water and the Vapor Intrusion Pathway

Chevron shall evaluate the vapor intrusion pathway within the site. The assessment shall be consistent with the USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway for Groundwater and Soils (November 2002). This provision is required for all RCRA sites in order to determine whether the vapor intrusion pathway is complete. It should be noted that Chevron shall evaluate both current and future use scenarios in determining whether the pathway is complete.

If a determination is made that the pathway is complete, a supplemental workplan shall be prepared to properly investigate the potential migration of subsurface vapors from contaminated ground water and/or soils.

Site Map, Figure 2-2

The site map for the Chevron Perth Amboy site appears to incorrectly label a block along State Street as part of the site. In fact, this is a commercial/residential strip bordering Garretson Avenue and is not part of the site. The site map should be modified.

Pg. 38, 4.1.2 Groundwater: Chevron indicates that they are utilizing a combination of low flow and three volume purging techniques to obtain more representative data from monitor wells. Chevron indicates that the change was made due to the minimal amount of water drawn from the well during low flow sampling. Chevron indicates that based on the minimal amount of water drawn from each well, the sample water may still contain some small percentage of original well volume water, which may not be representative of volatile or semi-volatile organic constituents. Chevron should be advised that the Department has noted instances where monitor well and hydropunch ground water sampling data are not comparable. This may be caused by sampling error and is discussed further below. Chevron shall determine the best method for sampling wells at their site and submit a revised sampling SOP to the Department for approval. If Chevron plans to attempt low flow purge and sample techniques in the future, the method shall conform to the Department's "Low Flow Sampling Guidance" at http://www.nj.gov/dep/srp/guidance/lowflow. With regard to low yielding wells, the guidance states the following:

"Low Flow Purging and Sampling for Low Yielding Wells"

Wells that yield less than 0.1 l/min (100ml/min) frequently incur significant drawdown during well purging. If drawdown occurs across the screened interval or open borehole of a well, VOC loss may result. The increased stress on a well caused by significant drawdown may also result in an increase in water turbidity. In an effort to facilitate the collection of a representative groundwater sample from low-yielding wells, the NJDEP will allow special sampling procedures to be used. This may include sample collection without regard to monitoring Water Quality Indicator Parameters (WQIPs) associated with well stabilization.

At a minimum, water-quality data, well-construction data, water-level data, and accurate well-yield data for each low yielding well will need to be submitted to the Department prior to the development of an acceptable sampling procedure. Since sample collection may begin almost as soon as purging is initiated, it is imperative that the exact interval where the sample will be collected along the screen be predetermined. Aside from the considerations for monitoring drawdown and WQIPs, all other Low Flow Purging and sampling considerations discussed above apply here as well. The owner of the well shall also propose possible explanations for the low yield of the well(s). Once the aforementioned information has been received, the Department will work with the well owner to formulate an acceptable sampling plan. The sampling plans will be approved on a case-by-case basis and will be well specific. Implementation of any special sampling procedure or use of any special sampling equipment shall not be performed without prior NJDEP approval".

Section 7 LNAPL

For each LNAPL area, Chevron shall submit an evaluation of potential preferential pathways for contaminant migration. These include subsurface piping, heterogeneous fill etc. If potential preferential pathways exist near an LNAPL area, the pathway shall be investigated to determine if LNAPL or dissolved ground water contaminants are migrating along or through the identified pathway to assure that delineation has been completed.

Chevron shall submit a table with the following column headings: MW ID, northing, easting, elevation top of casing, depth to ground water, elevation ground water, depth to top of screen, screen length, elevation top of screen. If any monitor wells intended for the purpose of monitoring LNAPL are not screened across the water table, Chevron shall replace them with properly screened wells.

pg. 133, #6, bullet 3: Chevron indicates that many of the lenses and layers of material which contain LNAPL are found below the water table. In addition, there is a tidal influence on ground water. The Department is concerned that there may be a tidal influence on LNAPL thickness measurements. Therefore, for each AOC at which there is a tidal influence on ground water elevation and LNAPL has been found or is suspected, Chevron shall perform a tidal study in representative monitor wells. Chevron shall collect depth to top of LNAPL and depth to the ground water LNAPL interface data during both high and low tide. Chevron shall determine if there is a relationship between LNAPL thickness and tidal stage.

Section 7.1 SWMU 40 (Old Pond) LNAPL

Chevron has not included an evaluation of the effect of subsurface piping on LNAPL migration. Therefore, using the data gathered to date, Chevron shall determine if subsurface utilities/piping are controlling LNAPL migration. Chevron shall submit a report detailing this evaluation. The report shall include recommendations for additional investigation where appropriate.

Section 7.1.4 LNAPL Extent:

pg. 135, #5: Chevron indicates that the extent of LNAPL has been defined using piezometers and permanent wells. According to figure 7-2, the most downgradient permanent monitor well (MW-33) contained LNAPL. Therefore, Chevron shall propose to install additional permanent monitor wells downgradient from MW-33 and HP-0001-P. The purpose of these wells will be to monitor for the presence of NAPL and to monitor ground water quality. While a boring program was completed along Woodbridge Creek and no NAPL was detected there is a need to regularly monitor ground water quality as it discharges to the Woodbridge Creek located close to this AOC.

pg. 137, #3: Chevron indicates that the lateral delineation of LNAPL at SWMU 40 was completed with NFTP2, MW-124, MW-125 and MW-126. The distance between LNAPL delineation points at SWMU 40 is large considering that LNAPL is found in discontinuous pockets and lenses. The spacing of the sampling grid should match the expected size of the LNAPL pockets. For example, according to figure 7-2, it can be determined that LNAPL ends somewhere between HP-0001-P and monitor well MW-126, a distance of

approximately ninety feet. In order to evaluate potential corrective measures at this SWMU, it will be necessary to have a better grasp on the lateral extent of the contamination and the location of additional pockets of LNAPL.

pg. 138, last #: Chevron indicates that the lack of VOCs above the groundwater criteria suggest that the NAPL does not pose a threat to groundwater or any nearby sensitive receptors. The Department notes that semi-volatile organic compounds have been detected in H0840. These compounds may have an impact on the Woodbridge Creek. This potential needs additional evaluation. Chevron shall propose to collect sediment samples from the Woodbridge Creek at a location downgradient from SWMU 40.

Section 7.2 SWMU 41 (former Drying Area)

pg. 143, #4: Chevron indicates that the LNAPL area at SWMU 41 does not pose a threat to Woodbridge Creek. Chevron shall install a permanent monitor well at the location of H0903 and include this well in the monitoring program to confirm dissolved constituents are not migrating to the Woodbridge Creek.

Section 7.3 SWMU 43 (former surface impoundment near surge pond)

pg. 149, last #: Chevron indicates that the LNAPL at SWMU 43 does not extend beyond the decontamination pad. Additional delineation is required in this area beneath the pad. Chevron shall complete delineation after the decontamination pad is removed.

Section 7.4 AOC 8-NF6

pg. 162, #6: Chevron indicates that "no indications have been found that would suggest AOC8-NF6 is receiving LNAPL from ongoing or upgradient sources". Chevron shall detail the potential sources (tanks, crude unit etc.) of the NAPL found in this area. Chevron shall indicate if any of the potential sources are currently in use. This information is required to confirm that there are no potential ongoing sources of NAPL in the area.

Section 7.5 AOC 19

pg. 167, #3: Chevron indicates that M133A1 was installed side gradient from the LNAPL area. This well later developed trace amounts of LNAPL. LNAPL has not been satisfactorily delineated in this area. Chevron must continue delineating free and residual NAPL in the area surrounding M133A1.

pg. 167, #4: Chevron indicates that the lateral extent of LNAPL at AOC 19 has been delineated. The Department cannot concur with determination at this time. Additional delineation is required in the area surrounding M133A1 and A19TP7.

pg. 167, #5: Chevron indicates that piezometer A19TP7 is located upgradient from the AOC8-NF6 NAPL area. However, according to figure 7-6, it appears that this piezometer is located downgradient from the NAPL area. The statement should be revised. Additional delineation of this NAPL is required both downgradient from A19TP7 and between the AOC8-NF6 area and this piezometer.

pg. 167, last #: Chevron indicates that an additional piezometer will be installed south of MW-133 if only NAPL detection persists. The NJDEP cannot concur. A boring program shall be instituted to delineate the extent of free and residual NAPL in this area at this time. The Department is particularly concerned that this NAPL is found adjacent to the refinery sewer system. This may be a preferential pathway for NAPL and dissolved contaminant migration.

Section 7.6 AOC 16 Investigation Area NF2

pg. 177, 1st #: Chevron indicates that "based upon the lack of VOCs and SVOCs within downgradient well MW-120, the dissolved phase plume appears to be stable". The Department cannot concur with this conclusion. Monitor well NF-11 and hydropunch sample H0310 both have elevated concentrations of

benzene. These sampling points are located downgradient from the AOC 16/NF2 area. Chevron must complete delineation of the horizontal and vertical extent of this dissolved plume.

Section 7.8 AOC 16 Investigation Area NF4

pg. 183; last #: Chevron indicates that ground water flow direction at area NF4 is northeast toward Woodbridge Creek. However, figure 8-10 shows a ground water depression between tanks 302, 328 and 330 and ground water flow in the area of tank 330 is toward that depression (toward the southeast). It may be that ground water flow in this area is controlled by subsurface utilities or by a downward vertical gradient in the area of NF-10. Chevron must determine the fate of ground water contamination in this area. Chevron shall install two additional monitoring wells between tank 330 and MW-0070 at the approximate locations indicated on attached, modified figure 7-9.

The source of the LNAPL in area NF4 is not identified. Chevron shall identify the source of the LNAPL at NF4. Chevron shall add this source to the HSWA permit as a SWMU/AOC. Chevron shall determine if the source is continuing to release contaminants to the environment.

Section 7.9 AOC 16 Investigation Area NF5

Figure 7-10: Figure 7-10 shows ground water flow direction toward the Woodbridge Creek. This is contradicted by figure 8-10, which shows that ground water flow direction is toward an area between tanks 327 and 301. Ground water flow direction and hence contaminant fate may be influenced by subsurface utilities, Chevron must more accurately determine the fate of contamination from AOC 16 Investigation Area NF5. Chevron shall install two monitor wells to more accurately determine local ground water flow direction. The wells shall be installed at the locations of NF5TP5 and NF5TP4. If it is found that local ground water flow is significantly different from that depicted on figure 7-10, then Chevron shall propose additional sampling to delineate contamination in the direction of ground water flow.

Section 7.10 AOC 25

pg. 192, #2: The Overview and Location section does not identify the source of the LNAPL in this area. The source of the LNAPL must be identified and added to the HSWA permit as a SWMU/AOC. Construction details and materials handled at the source need to be outlined in the report. This information is required to evaluate the completeness of the investigations performed in this area to date.

Figure 7-11: The Department notes that free product was detected in sample TPZM371 located within 20 feet of the SAR. No additional samples were taken directly downgradient of the SAR Trailer. Therefore, Chevron shall install 3 monitoring wells immediately downgradient from the western-most SAR trailer (as depicted on figure 7-11. These wells shall screen the water table aquifer.

It is noted that the free product found near the SAR trailers could cause an indoor air quality problem. Chevron shall determine if indoor air in the SAR trailers is compromised due to the potential presence of free product in the area.

pg. 199, #5: Chevron indicates that the lateral extent of LNAPL has been delineated. The Department cannot concur at this time. Additional monitoring wells need to be installed to complete delineation in this area.

Section 7.11 SWMU 42

pg. 207, #3: Chevron shall install three permanent monitoring wells downgradient from the free product area to confirm local ground water flow direction and to monitor contaminant migration in the area. The wells shall be installed in the locations shown on attached modified figure 7-12 from the report and shall be constructed to screen the water table.

Section 7.12 AOC 16 Investigation Area EY1

pg. 212, #3: Chevron indicates that caprolactam and bis(2-ethylhexyl)phthalate may result from latex gloves and the nylon cord used in ground water sampling. If this is the case, these parameters should show up in the method blank. Chevron shall submit a discussion of the method blank lab results to confirm their theory.

NOTE: Caprolactam is a white crystalline solid with an unpleasant odor. It is used in making nylon, plastics, coatings, and synthetic leather.

Section 7.13 AOC 16 Investigation Area EY3

Figure 7-14: Figure 7-14 indicates that ground water flow in this area is radial. Chevron shall install five additional monitor wells at the locations specified on attached modified figure 7-14. The wells shall screen the water table aquifer. The wells are required to better define local ground water flow direction so that a final determination concerning the need for additional delineation in the area may be made.

pg. 219, #1: Chevron indicates that benzene was detected in MW-157 at a relatively low concentration. Chevron argues that this suggests that degradation of dissolved phase constituents is occurring. However, the Department notes that a concentration of benzene (380 µg/L) was detected at sampling point H0836 located downgradient from MW-157. Additional delineation of this contamination is required.

Section 7.14 AOC 16 Investigation Area EY4a

pg. 229, #5: Chevron states that the lack of dissolved phase VOC and SVOC in recovery well RW-94 suggests that the EY4a LNAPL does not extend beyond the location of RW-94. To confirm that contamination is not migrating away from the LNAPL area, Chevron shall install three monitor wells for the purpose of monitoring ground water quality in the area surrounding the LNAPL found in Area EY4a. The monitor wells shall be installed at the locations of H0388, H0354 and H0386. The wells shall be constructed to screen the water table.

Section 7.15 AOC 16 Investigation Area EY4b

pg. 239, #3: Chevron indicates that groundwater has been impacted by NAPL in this area and that these dissolved contaminants are limited and stable. Additional monitor wells are required to provide better definition of local ground water flow patterns and to monitor dissolved contamination emanating from this NAPL area. The wells shall be installed at the locations of H0342, H0389 and EY4TP44. The wells shall screen the water table.

Section 7.16 AOC 28

pg. 239, #5: Chevron indicates that the LNAPL was identified in the footprint of Tank 719 which was used to store a Refinery intermediate distillate product used in asphalt product. On pg. 240, Chevron indicates that a sample of the product could not be collected due to insufficient LNAPL volume. Chevron shall present a list of all chemicals that were stored in the vicinity of AOC 28. Chevron shall indicate if the analyses performed on ground water samples were sufficient to detect chemicals that may have been released from the tanks in the general vicinity of AOC 28.

Section 7.17 AOC 29

pg. 247, #4: Vertical Extent; The vertical extent of free and residual NAPL has not been delineated in this area (according to table 7-75). Chevron shall propose additional investigations to determine the vertical extent of free and residual NAPL in this area.

The viscosity and specific gravity of the NAPL found in this area must be reported. All findings must be reported including any findings of dense non-aqueous phase liquid found in this area.

Section 8 Ground Water

In several instances, it appears that hydropunch and monitor well results are not comparable. In particular, the Department is concerned that the concentrations of volatile organic compounds in ground water samples retrieved via hydropunch or geoprobe methods are generally greater (and in some instances much greater) then in samples retrieved via monitor wells. Chevron shall perform an evaluation of ground water sampling results at several representative locations where both monitor well and hydropunch/geoprobe type results are available. Chevron shall present a map showing the locations of the samples that are evaluated. Chevron shall present a table showing: monitor well construction details (including the elevation of both the top and bottom of the screened interval), geoprobe/hydropunch screened interval, monitor well sampling method and pump placement, geoprobe/hydropunch sampling method (grab, pump, etc.), water table elevation; and ground water sample concentrations from each method.

At areas where it appears that the concentration of benzene contamination may be stratified within a monitor wells screened interval, Chevron shall propose to collect ground water samples from discreet depth intervals via passive diffusion bags or other depth discrete method.

Section 8.1.2 East Yard Hydrogeology

pg. 251, #5: Chevron states "the data show a ridge of groundwater trending east-west through the central portion of the East Yard... this ridge is due to perched water on Clay Horizon A and till deposits". Chevron shall determine the cause of ground water depression found between MW-173 and MW-146 (as depicted on figure 8-1). Chevron shall clarify whether this is ground water from the shallow fill aquifer discharging to a deeper aquifer in this area or are subsurface piping and utilities the discharge point for ground water in this area.

pg. 251, last #: Chevron indicates that Woodward Clyde Associates performed falling head slug tests in 1982. Chevron shall include the data and analyses for these tests as an appendix to the RFI report.

pg. 252, #2: Chevron indicates that laboratory shelby tube tests were conducted for the till layer by Woodward Clyde. The data and analyses for these tests shall be submitted as an appendix to the RFI report.

pg. 252: In addition to the discussion concerning horizontal gradients and transport, Chevron must submit a discussion concerning vertical gradients and vertical contaminant migration. This shall include a discussion of the adequacy of the current ground water monitoring network for detecting vertical migration of contaminants.

pg. 254, #1: Chevron indicates that the presence of nitrosodiphenylamine in MW-152 needs to be confirmed through additional sampling. The Department concurs with this proposal. Chevron further states that this chemical will not be further evaluated. The NJDEP cannot concur. First, as originally proposed, Chevron shall confirm the presence of nitrosodiphenylamine in MW-152. If it is determined that the compound is not present, then further evaluation will not be required.

pg. 254, #3: Chevron indicates that iron, manganese and aluminum will not be included in further evaluations in the East Yard. This proposal is acceptable to the Department.

pg. 259, last #: Chevron states "methyl tert-butyl ether (MTBE) was detected at 71 µg/L in MW-135. This compound was never used at the Refinery and its presence must be attributable to other sources". The Department notes that MTBE is a gasoline additive and its presence at a refinery would not be unexpected. Chevron should submit additional information to support their claim that MTBE is not site related. In addition, if Chevron is claiming that the MTBE is from an off-site source, then a background ground water investigation is required pursuant to the Department's technical requirements.

Section 8.1.4.1 AOC 21 – Maurer Road Excavation

Figure 8-6: Chevron shall determine the cause of the disparity between ground water samples collected at H0198 (benzene 4,500 µg/L) and MW-135 (benzene 3 µg/L).

Chevron should note that additional delineation of ground water contamination at the Loading Rack area (AOC 21) is required. According to figure 8-1 (East Yard GW Contours) MW-0043 does not appear to be directly downgradient from H0198. Chevron shall collect additional ground water samples from the area between MW-0043 and HP0019 (at the intersection of State St and the Chevron/Hess property boundary).

Chevron shall delineate the contamination found in monitor well MW-0035 (benzene 90 µg/L).

Chevron shall determine the vertical hydraulic gradients at the site through the installation of deep monitor wells. Chevron shall delineate the vertical extent of ground water contamination at the site.

Section 8.1.4.2 AOC 27 Tank 777 (Pipeway) SWMU 10 (TEL Burial in Tank Basin 771)

Figure 8-6: Chevron shall collect additional ground water samples upgradient from sample HP-0044 (the sample location number is illegible on figure 8-6, the sample is located between samples H0514 and HP-0059). Additional sampling is required upgradient from this area to confirm that the source area has been effectively delineated.

pg. 266, #1: Chevron proposes to assess remedial options for the TEL burials in this area during the CMS. The NJDEP concurs. Chevron shall also evaluate remedial options for the dissolved contaminant plume during the CMS.

pg. 266, #2: Chevron proposes to monitor seven wells (MW-145, MW-152, MW-146, MW-131, MW-043, MW-173, MW-148) for a minimum of six sampling rounds. In addition, a monitor well shall be installed at the location of HP-0044. This well is required to monitor trends at the location of the highest benzene concentration found in the area.

The closest proposed downgradient monitor well is 350 feet from the apparent edge of the contaminant plume. In order to effectively monitor contaminant plume trends, Chevron shall determine the location of the edge of the contaminant plume. Chevron shall install a plume fringe well at the location of the edge of the contaminant plume. Chevron shall add this new monitoring point to the proposed ground water monitoring plan.

Section 8.1.4.3 SWMU 42 – Crude Slab

pg. 266, #3: Chevron states, "This plume extends from the Crude Slab east to MW-141". However, the Department notes that, according to figure 8-1, ground water elevation in MW-141 is 14.09 feet while ground water elevations in the area of the Crude Slab are 10 to 12 feet. Therefore, contamination must be flowing from the Crude Slab to the northwest. This indicates that the source of the contamination in the tank basins is not the Crude Slab. Chevron shall determine the source of the ground water contamination in tank basins 750, 751 and 752.

The Department notes that, according to cross section figure 8-4, MW-141 is screened in a till layer while MW-143 is screened in fill over gray clay (clay horizon A). It may be inappropriate to contour water level data from these two distinct layers on the same map. Chevron shall submit revised ground water contour maps for the East Yard. One map shall contour the apparently perched water within the fill where it is underlain by the gray clay. The other map shall contour the fill and till layers where the perching clay is absent.

Based on ground water flow direction, the delineation of the dissolved phase ground water contamination plume emanating from the Crude Slab shall be re-evaluated and a revised RFI report submitted to the Department.

Section 8.1.4.4 AOC-31 - Tank Basin 772 Pump Pad

pg. 267, last #: Chevron indicates that the dissolved plume has been delineated to the east by ground water samples located at H0454 and H0464. The Department notes that, according to figure 8-1, these samples are located upgradient from the contaminant plume. Chevron indicates that the tank 772 Pump Pad contaminant plume is delineated to the west by samples at H0345 and H0456. The Department notes that (according to figure 8-1) these samples are located sidegradient from the contaminant plume. Chevron indicates that downgradient delineation is provided by MW-9. The Department notes that, according to figure 8-1, MW-9 is not located directly downgradient from the contaminant plume and is located 180 feet from H0544. Chevron shall determine the location of the edge of the contaminant plume. Chevron shall install plume fringe wells that delineate the extent of this contamination.

Section 8.1.4.5 SWMU 8 - TEL Burial

pg. 269, #2: Chevron indicates that ground water flow direction in this area is toward the east. However, as depicted on figure 8-1, ground water flow is toward the northeast at this AOC. Additional delineation of this contamination to the north and northeast is required.

Figure 8-6: The downgradient extent of this contamination is not delineated (toward the northeast or north). Chevron shall collect ground water samples downgradient from this area along the Hess property boundary. If necessary, Chevron shall continue to delineate this contamination onto the Hess property.

pg. 269, #3: Chlorobenzene has been found in this area. Chlorobenzene has a density of 1.1066 and can be present in the environment as a dense non-aqueous phase liquid (DNAPL). Chevron shall delineate the vertical extent of chlorobenzene contamination in this area. Chevron shall determine the source of chlorobenzene contamination in ground water.

Section 8.1.4.6 AOC-6B and AOC 29 – Oily Fill Area

Figure 8-6: Chevron shall collect additional ground water samples downgradient from H0354. This hydropunch sample contained 690 µg/L of benzene. The additional samples shall be collected between H0386 and H0881 to verify that a benzene plume does not extend between these two sampling points.

Section 8.1.4.7 AOC 26 and AOC 14 – East Yard Bunker Slab

pg. 271, #3: Chevron states "Some earlier hydropunch results such as the 1,100 µg/L of benzene detected in H0218 have not been substantiated by analysis of groundwater samples collected from wells. MW-144 was placed near the location of H0218 and has been non-detect for benzene for two rounds of samples". The Department notes that, according to figure 8-6, MW-144 is approximately 30 feet and sidegradient from H0218. Chevron shall install a monitor well at the location of H0218 and add it to the proposed monitoring program for this area. Chevron shall perform additional ground water investigations to determine the location of the edge of the contamination at H0218 in the northerly (sidegradient) and easterly (downgradient) directions.

Figure 8-6: Permanent monitor wells are required downgradient from RW-83. Chevron shall perform additional investigations to determine the location of the edge of the contaminant plume in this area. After the edge of contamination is found, Chevron shall install permanent monitor wells to monitor contaminant trends at the plume fringe.

Section 8.1.4.8 MW-6

pg. 272, #3: Chevron indicates that the source of ground water contamination in monitor well MW-6 is uncertain. Chevron indicates that the contamination may be from an upgradient source. Chevron shall determine if monitor wells are located on the ASARCO property. If monitor wells are present, and are constructed in the same water-bearing zone, Chevron shall collect synoptic water level data from the

Chevron East Yard and ASARCO properties. Chevron shall submit a ground water contour map depicting ground water flow direction across the two properties. These data and maps shall be submitted to the Department for review.

Section 8.1.4.9 Historical Hydropunch Detections

pg. 273, H0406: Chevron shall collect three ground water samples within 20 feet and downgradient from H0406. The samples are required to characterize the potential ground water contaminant plume in this area. If the samples are clean, Chevron shall install a permanent monitor well at the location and add it to the regular monitoring program. If the samples are contaminated, then Chevron shall perform additional delineation until the plume is fully delineated and characterized.

pg. 273, H0448 and H0359: Chevron shall collect three ground water samples within 20 feet and downgradient from H0448. According to figure 8-6, there are no downgradient ground water samples within 200 feet of this sample location. If the samples are clean, Chevron shall install a permanent monitor well at the location and add it to the regular monitoring program. If the samples are contaminated, then Chevron shall perform additional delineation until the plume is fully delineated and characterized.

Section 8.2.1 Geology

pg. 274, #3: Chevron indicates that there are discontinuous deposits of light gray sands and clays at depths of 15 to 25 feet within the till. The glacial sediments map of New Jersey DGS96-1 Glacial Sediments of New Jersey available at http://www.state.nj.us/dep/njgs/geodata/dgs96-1.htm indicates that deltaic or glacial meltwater deposits are present beneath the Chevron refinery. Chevron should clarify whether these deposits can be described as deltaic. Chevron should be aware that this potential preferential flow path needs to be delineated as it may be an important feature in the site conceptual model. The Department notes that this feature is present at the location of a ground water depression (see figure 8-10). Chevron shall determine if there is a downward vertical head in this area.

Section 8.2.3.2 Contaminant Distribution – Second Round

pg. 285, 1st #: Chevron states that MTBE was detected in MW117 but was never used at the refinery. Since this compound is not detected in background monitor wells and Chevron stored gasoline on-site, the Department must consider MTBE to be a site-related contaminant.

pg. 285, last #: Chevron states "MW-180 is a deeper well screened in the first water bearing zone beneath the fill/native interface". The concentrations of VOCs in this well indicate that vertical delineation has not been accomplished in the North Field/Main Yard. Chevron shall complete vertical delineation of contamination to complete the RFI.

pg. 288, #2: Chevron states that further assessment of the North Field/Main Yard groundwater relating to VOCs should be focused on benzene. The purpose of the RFI is to delineate all ground water contamination not just benzene. Chevron must consider not only relative toxicity of a compound but also persistence and mobility in the environment. Therefore, in areas where there are more persistent or more mobile chemicals present in ground water, these chemicals must be considered. In addition, Chevron is responsible to cleanup all ground water contamination at this site. Therefore, all ground water contamination must be considered during the corrective measures study.

pg. 288, last #: The boundaries of the contaminant plumes are difficult to distinguish at the scale at which figure 8-16 is presented. In addition, it is difficult to determine if horizontal delineation of ground water contamination is complete on figure 8-16. Chevron shall submit a map for each contaminant plume area at a scale of 1 inch to 40 feet or less pursuant to N.J.A.C. 7:26E-4.2b3i. Chevron shall submit these maps for each contaminant plume area including the East Yard and Central Yard.

pg. 289, last #: Chevron notes several instances where benzene concentrations have decreased when a comparison between hydropunch samples collected in 1997 and monitor well samples collected in 2002 is

made. The Department notes that hydropunch samples and monitor well samples may not be comparable if contamination is stratified. The small screen length of the hydropunch may give much higher results than the longer screened interval of a monitor well. Several factors may account for this including: improper placement of sampling pump during low flow sampling, mixing of relatively clean ground water with more contaminated ground water during 3 to 5 volume purge sampling and/or improper placement of screened interval of monitor well. As stated above Chevron shall perform a detailed comparison of hydropunch and monitor well samples to determine the cause of the significantly lower concentrations of contaminants in monitor wells.

pg. 290, # 1: Chevron states that a depression in the water table centered on tanks 327 and 301 is apparent. It appears that this depression is caused by pumping ground water from the OWSS out of the basin and up the effluent treatment plant (ETP). Chevron should clarify whether or not water is constantly being pumped from this basin to the ETP.

pg. 291, # 1: Chevron states that there is evidence that VOC concentrations in ground water have been declining over the past five years. The Department believes that the referenced evidence is the result of sampling technique and not the result of actual contaminant decrease.

Section 8.2.4.2 Investigation Area MY1 (AOCs 33 and 34)

pg. 291, # 5: Chevron indicates that high concentrations of VOC were detected in MW-179. According to figure 8-10, ground water flow direction in this area is toward the north, northeast or northwest. Chevron has not collected ground water samples north of MW-179. Therefore, Chevron shall delineate the extent of contamination found in MW-179 in the northern direction. After delineation is completed, Chevron shall install permanent monitor wells to monitor the ground water plume.

Section 8.2.4.3 Area NF2

Chevron's proposal for continued monitoring in this area is acceptable.

Section 8.2.4.4 Area NF3 (AOC 9 and SWMU 20 – TEL Burial)

pg. 295: Chevron indicates that ground water contamination was found in deep monitor well MW-180. The horizontal and vertical extent of this contamination must be delineated.

pg. 296, # 2: Chevron indicates that ground water flow is towards Tank Basin 302 and 330 in this area potentially due to a sump. In addition to this possibility, Chevron shall determine if there is a downward vertical gradient between monitor well MW-10 and MW-180.

pg. 296, last #: Chevron indicates that additional investigation will be conducted for the ground water contamination found in monitor well MW-180. Chevron indicates that a report will be submitted after this investigation is completed. The proposal is acceptable.

pg. 297, # 2: Chevron proposes to abandon monitor well MW-180 since it may screen two separate water-bearing zones. This proposal is acceptable provided that MW-180 is replaced with two monitor wells (one for each zone currently monitored by MW-180).

Section 8.2.4.5 Area MY3 (AOC 19)

pg. 297: Chevron proposes to continue monitoring this contamination. This proposal is acceptable. The Department withholds comment concerning delineation of this area until a large-scale map of the area, as required above, is submitted showing sampling results and ground water flow direction. According to figure 8-10, it appears that inadequate sampling has been performed to the north. However, ground water contours for the immediate area surrounding MW-133 are not shown, and no water level measurement is available.

Section 8.2.4.6. SWMA 1

pg. 298, last #: Chevron states "The only results that are of limited concern are the detection of benzene at 1 µg/L in MW-165 and 12 µg/L of dichloroethene in MW-164. These results will be confirmed or not confirmed in the next round of samples". The purpose of the RFI is to delineate the extent of contamination. Chevron shall collect confirmation samples in this area, if after these samples are collected, delineation is not complete, Chevron shall complete delineation and begin an investigation on the potential impact of this area on Spa Spring Creek.

pg. 299, # 1: Chevron states "If the levels of benzene and/or other constituents fall below the delineation criteria for two consecutive rounds, the (ground water) sampling will be discontinued". The NJDEP cannot concur with this proposal at this time. Chevron shall continue to monitor ground water quality in this area until source remediation has been completed and is shown to be successful.

pg. 299, last #: Chevron states "regardless of flow direction, MW-39 is surrounded by clean wells". The Department does not concur as according to figure 8-16, MW-137 has 280 µg/L benzene. It is noted that MW-137 is over 200 feet from MW-0039. Chevron shall characterize the extent of ground water contamination between MW-0039 and MW-137. After the extent of contamination has been determined, Chevron shall install permanent monitor wells in this area to monitor contaminant trends.

pg. 300, # 3: Chevron states that they will analyze ground water samples for VOC only during the continuing monitoring program. The Department does not concur as metals have been detected, albeit sporadically.

Section 8.3.2 Central Yard, Hydrogeology.

pg. 302: Chevron does not discuss hydrogeology of the glacial till. The hydrogeology of the till is important since, based on cross section 8-21, ground water from the fill layer discharges into the till layer and sand horizon A. Vertical gradients and horizontal gradients within the till layer need to be better defined and discussed so that an accurate site conceptual model may be constructed.

Section 8.3.4.1 SWMU 15

pg. 313, # 5: Chevron indicates that the benzene detected in monitor well MW-108 is delineated to the west and south. However, delineation is not completed to the east and southeast in the direction of ground water flow. Chevron shall collect additional ground water samples southeast of MW108 to confirm that MW-108 represents worst-case ground water contamination. If no additional ground water contamination is present, Chevron's proposal for continued monitoring will be acceptable to the Department.

pg. 314, # 1: Chevron indicates that they will continue to monitor pH in MW-111, however, the metals contamination is not delineated. Chevron must also delineate the extent of metals contamination in ground water in this area as well as the low pH with which it appears to be associated.

Section 8.3.4.2 AOC 25

pg. 314, last #: In addition to the proposed additional activities, Chevron shall install three monitor wells at locations within 20 feet and downgradient from the LNAPL plume in this area to monitor any potential for dissolved contaminants to migrate from the area. Samples from the monitor wells shall be analyzed for TCL VO, TCL SVO and TAL metals.

Section 8.3.4.3 Area CY2

pg. 315, last #: Chevron's proposal for continued monitoring in this area is acceptable.

Section 8.3.4.4 AOC 22

pg. 317, # 3: Chevron's proposal to install and monitor MW-169R is acceptable. Depending on the outcome of the chlorinated plume delineation effort, the Department may require additional sampling and or monitor wells in this area.

Chlorinated Organic Plume (AOC 36)

pg. 318, # 1: Chevron proposes to install two wells, one screened in Sand Horizon A and a shallow well upgradient from the expected point of release for the chlorinated compounds.

pg. 318, # 2: Chevron's proposal to perform additional delineation in this area by use of field screening is acceptable to the Department.

Appendix A (SWMU AOC Reports)

Chevron presents individual reports for SWMU/AOC in Appendix A. The NJDEP has only reviewed those reports for SWMU/AOC where a no further action for ground water request is made.

A.2 North Field/Main Yard SWMU and AOC Reports

A.2.2 SWMA 2, pg. A-32: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.2.7 SWMU 7, pg. A-55: Chevron states that lead was detected in ground water samples collected at H0442 but was not detected in samples collected from monitor well MW-127 collected via low flow purge methods. The Department notes that MW-127 is located approximately 40 feet from the location of the TEL burial. The request for no further investigation concerning ground water cannot be accepted at this time. A ground water sample shall be collected from the area of worst-case soil contamination.

A.2.18 SWMU 41, pg. A-151: The ground water NFA request for SWMU 41 in table ES-1 cannot be accepted at this time. Ground water monitoring and remediation will be required in this area since LNAPL has been found.

A.2.19 SWMU 44, pg. A-164: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.2.37 AOC 24, pg. A-314: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.3. Central Yard SWMU and AOC Reports

A.3.1 SWMU 11A, pg. A-336: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.3.2 SWMU 11B, pg. A-342: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.3.5 SWMU 14, pg. A-363: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.3.12 AOC 30, pg. A-431: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.3.13 AOC 32, pg. A-437: Although Table ES-1 indicates that Chevron is requesting an NFA for this AOC, pg. A-438 of the report indicates that the ground water contamination found in this area will be included in the CMS. The proposal to include this area in the CMS is acceptable to the Department.

A.4 East Yard SWMU and AOC Reports

A.4.6 SWMU 26, pg. A-475: The proposal to re-sample in this SWMU is acceptable to the Department.

A.4.8 SWMU 36, pg. A-484: The proposal for no further action at this SWMU is not acceptable at this time. Chevron shall collect a ground water sample at the location of S1421 (a soil boring at which a sheen was identified). The sample shall be analyzed for TCL VOC, TCL SVOC and TAL.

A.4.12 AOC 6C, pg. A-510: Although Table ES-1 indicates that Chevron is requesting an NFA for this AOC, pg. A-512 of the report indicates that the ground water contamination found in this area will be included in the CMS. The proposal to include this area in the CMS is acceptable to the Department.

A.4.13 AOC 13, pg. A-517: The proposal for no further action at this AOC cannot be accepted at this time. Chevron shall collect a ground water sample at the location of S1420. Benzene contamination was found in soil at this location, therefore, a ground water sample is required to determine if ground water is contaminated with benzene prior to issuing an NFA.

A.4.18 AOC 28, pg. A-597: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

A.4.21 AOC 35, pg. A-620: Based on the information provided, the proposed NFA for ground water is acceptable to the Department at this time.

Appendix B "Potential Areas of Concern"

pg. B-3: Chevron indicates that a formal PAOC SI report will be submitted to the Department for review and comment. This proposal is acceptable to the Department. ←

Spent refinery catalysts have been deposited across various areas of the refinery. The Department recommends that the USEPA determine if these spent catalysts are hazardous waste or listed hazardous waste so that an appropriate corrective measure may be selected for areas where the catalysts have been deposited. In addition, the catalysts themselves may require remediation regardless of waste status. ←

All monitor wells shall be constructed, maintained and abandoned in accordance with N.J.A.C. 7:9D-1 et seq.

Chevron shall inform the NJDEP 14 days in advance of performing field work so that an NJDEP representative may be present.

Section 9.0, Baseline Ecological Evaluation

Section 9.3, Contaminants of Potential Concern

Background locations shall be clearly identified. While the text infers locations SED 9, 10 and 16 are background locations, it is unclear whether there are others (i.e. SED 11). The range of background data from the Woodbridge and Spa Springs Creeks should be compared to the range of site related data in those Creeks. The range of background data from the Arthur Kill should be compared with the range of site-related data from the Kill.

Frequency of detection should not be used to cull potential COCs, since "hot spot" areas may be present and require further evaluation. For example, the significance of BTEX contamination in sediments is diminished, based on "low frequency", yet the ppm-levels exceed screening criteria by two orders of

magnitude and these contaminants were identified as site-related in Table 9-2. Further investigation with a more sensitive sampling technique (i.e. diffusion bag samplers) may be warranted. Another example is the elimination of copper from further concern in sediments based on low frequency of detection in soils, even though copper is elevated in 37/42 sediment samples and severely elevated in several (See comment below). Chevron shall reexamine all data and reinstate potential COCs that were culled based on frequency of detection as appropriate.

Section 9.3.6, Conclusions (Section 9.3)

Nine contaminants were retained as COPECs (antimony, arsenic, lead, nickel, benzo(a)anthracene, benzo(a)pyrene, benzo(b)flouranthene, benzene and xylenes in sediment and nickel in surface water). The list was culled further in Section 9.5.4, Conclusions and recommendations, to a final general recommendation for further evaluation of "SVOCs and metal COPECs in the Woodbridge Creek". These conclusions must be revised after data are reexamined pursuant to the NJDEP's comment above. In addition, this section should be revised to highlight inorganic "hot spots", especially copper and zinc at location SED 3C and SED 5C. These contaminants were identified as site-related as per Table 9-2), copper is 200 times the ER-L and zinc is 20 times the ER-L at location SED 5C, and both are elevated above the range of background data. These levels are of concern from the standpoint of direct exposure as well as a potential source to downstream sediments. Similarly, total PAH levels at SED3C are elevated relative to other site related and background locations, and shall be specifically addressed. The list of COPECs that will be retained should be revised pursuant to this comment and the NJDEP comment above, and clearly provided in this section.

Review of Figures 9-6, 9-7 and 9-8 indicate visible staining at all six sample locations in the Woodbridge Creek and reference location SED 9. The conclusions of the COC section should highlight the need for further investigation of sediment cores where staining and petroleum odors were identified. This shall be addressed pursuant to N.J.A.C. 7:26E-6.1(d) whereby Chevron is responsible for remediation of free and/or residual petroleum product, or containment when treatment or removal are not practicable, regardless of depth, the presence/absence of product shall be determined by methods identified in N.J.A.C. 7:26E-2.1(a)11. This section of the regulation includes methodologies such as ultraviolet flourescence, soil-water agitation procedures, centrifuging and hydrophobic dye testing, gross observations such as visual staining, sheens, droplets, squirting NAPL, odors etc. are important additional information. As an aid to delineation of product, the NJDEP typically requires performance of Total Petroleum Hydrocarbon (TPHC) analysis via method NJDEP OQA-QAM-025-10/01 (Revision 5) or EPA method 418.1 and recommends sediments with TPHC results > 3000 ppm to be investigated for product as in 2.1(a)11 above. The TPHC method shall use a standard capable of quantifying both aliphatic and aromatic hydrocarbons.

Section 9.4, Potential Migration Pathways

The existence of the storm water network notwithstanding, if more detailed information is available, or a historic migration path was likely, to link specific SWMUs/AOCs with contaminants found in surface water bodies, it should be provided (i.e. historic soil runoff prior to emplacement of the storm water system, flood events or historic direct discharges etc.). Lack of information regarding operations/potential contaminant migration from the North Field Extension must be identified as a data gap.

Section 9.5.4, Conclusions

This section shall identify data gaps that will by addressed in the future evaluations, (i.e. need for data from areas of intertidal estuarine wetlands identified on pg. 333 and Figure 9-3). The need for characterization of the North Field Extension should be highlighted, since numerous creeks/ditched discharging to the Woodbridge Creek are indicated on Figures 9-6, 9-7 and 9-8. The need for further investigation of sediment locations exhibiting sheen and odors, per the NJDEP comments above must be indicated.

Chevron should be aware that the NJDEP concurs with the conclusion to further evaluate Woodbridge Creek, however Spa Spring Creek and the North Field Extension must also be included. In addition to the "SVOC and metal COPECs" identified for further evaluation in Section 9.5.4, the NJDEP recommends that

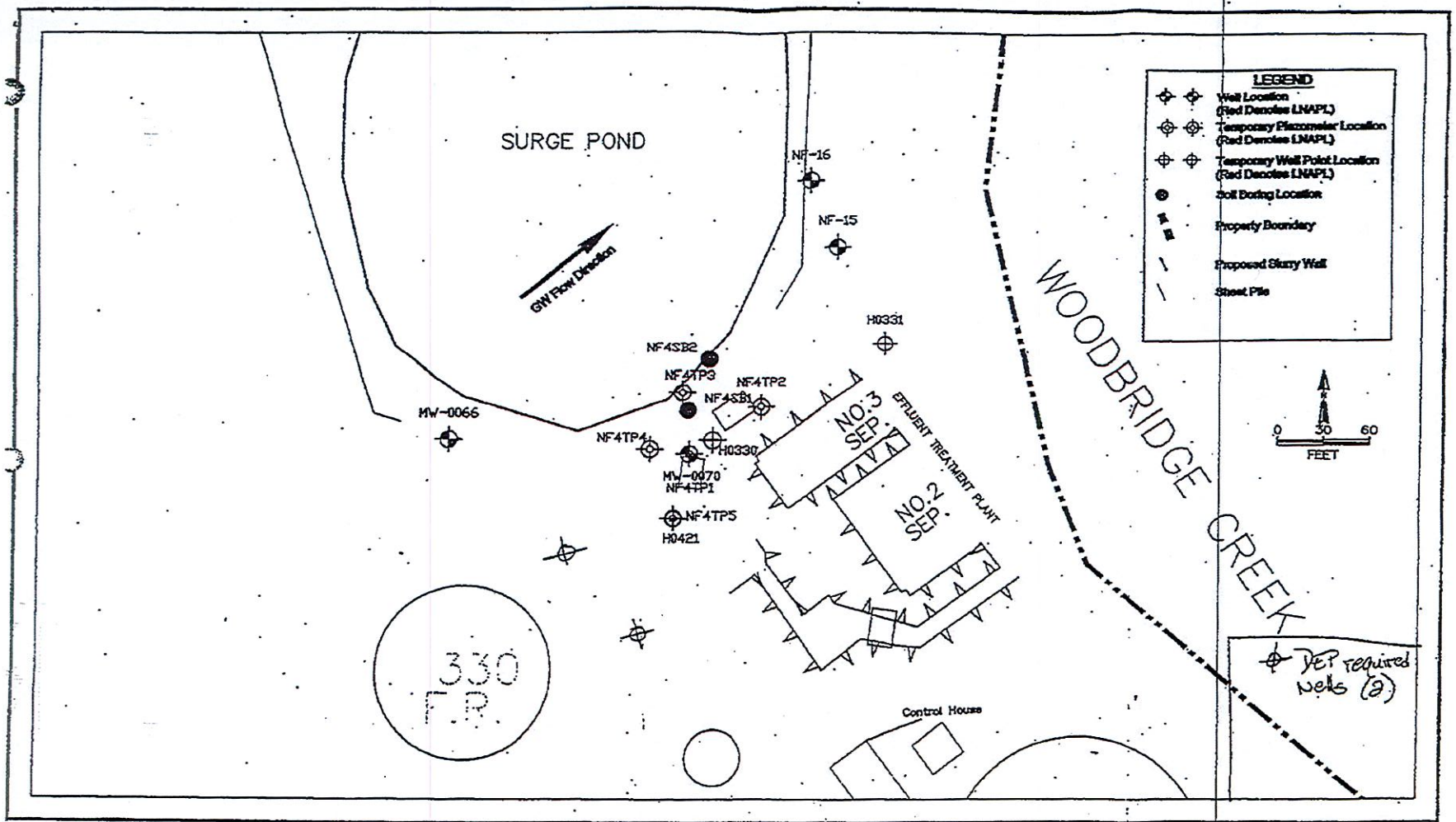
the analyses include BTEX compounds, TPHC and a more comprehensive list of metals. The BEB should be revised per the above comments.

Should you have any questions concerning this letter please contact me at (609) 633-1416.

Sincerely,

Anthony Cinque, Case Manager
Bureau of Case Management

C: John Boyer, BEERA
Bill Hanrahan, BGWPA
Nancy Hamill, BTRA



Chevron
Asphalt
Perth Amboy

TITLE:
LNAPL INVESTIGATION
AREA NF4
CHEVRON ASPHALT PERTH AMBOY

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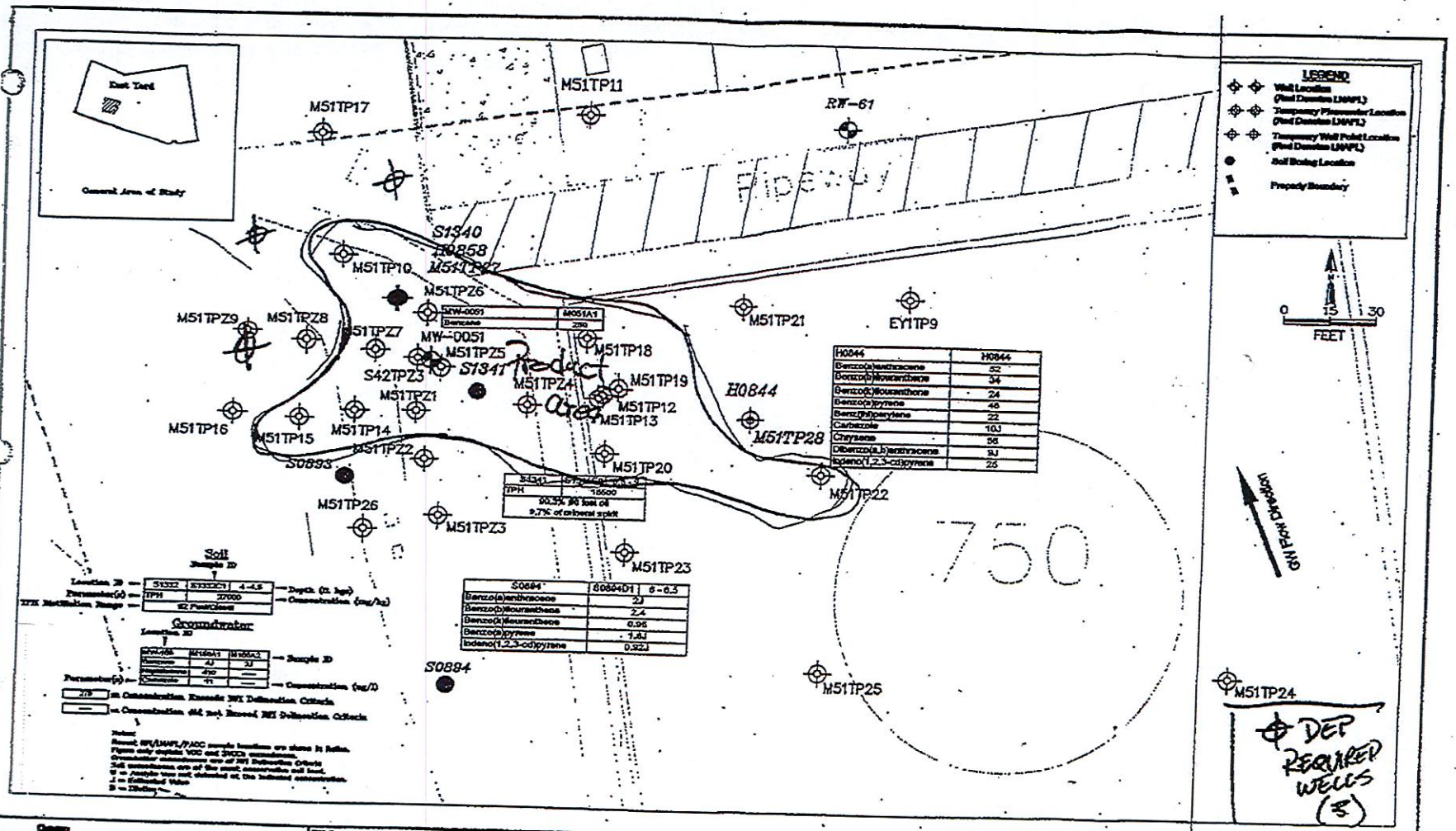
DATE: 5/2/2003	REV:	FIGURE NO.: 7-9



H0844	H0844
Benzo(a)anthracene	52
Benzo(b)flouranthene	34
Benzo(k)flouranthene	24
Benzo(a)pyrene	46
Benz(ghi)perylene	22
Carbazole	10J
Chrysene	56
Dibenzo(a,h)anthracene	9J
Indeno(1,2,3-cd)pyrene	25

S1341	S1341D1
TPH	15500
90.3% 90 feet oil 9.7% of mineral spirit	

S0894	S0894D1	6 - 6.3
Benzo(a)anthracene	2J	
Benzo(b)flouranthene	2.4	
Benzo(k)flouranthene	0.95	
Benzo(a)pyrene	1.8J	
Indeno(1,2,3-cd)pyrene	0.92J	

Chevron
Asphalt
Perth Amboy

TITLE:
LNAPL INVESTIGATION
SWMU 42
CHEVRON ASPHALT PERTH AMBOY

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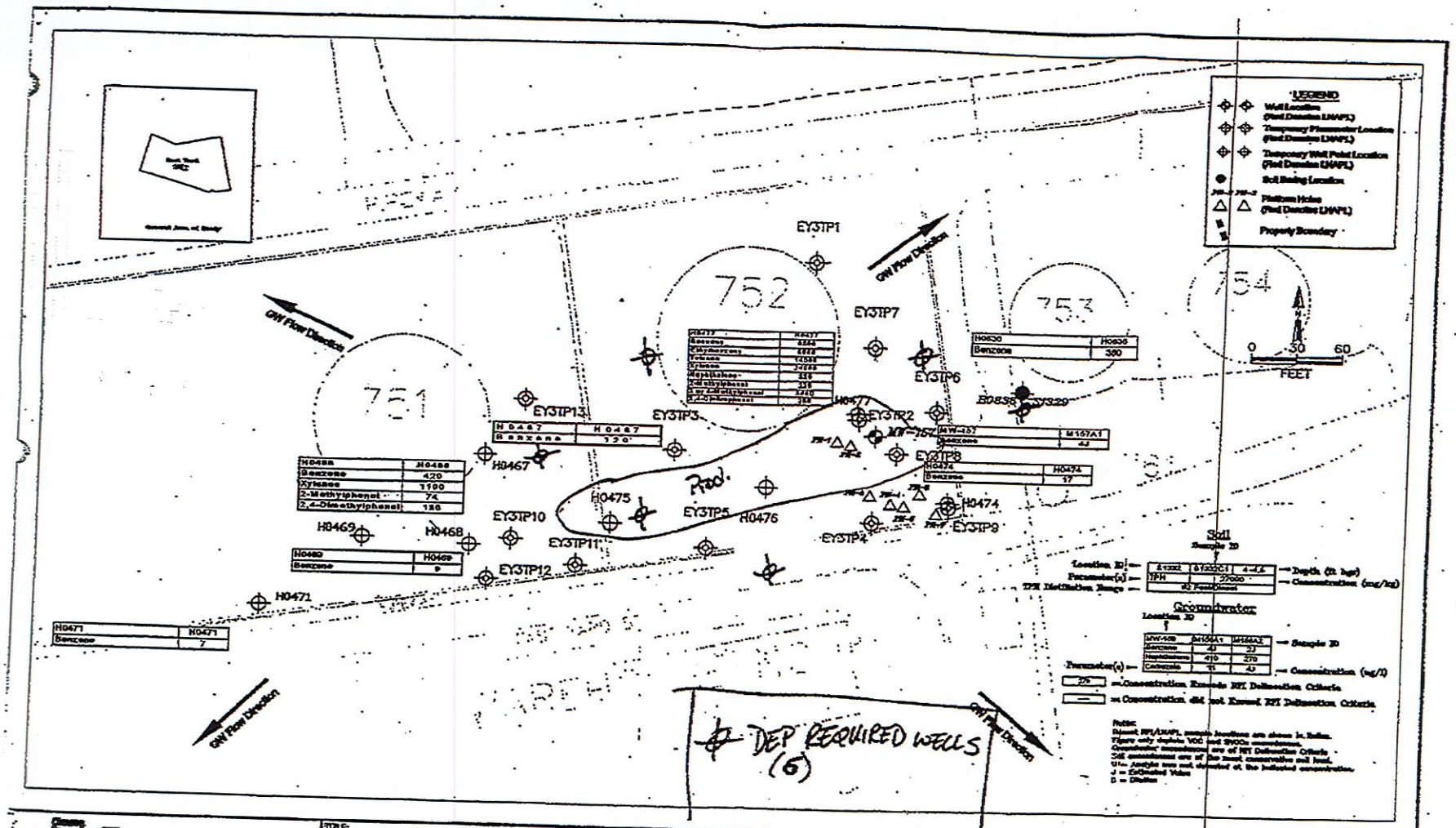
DATE: 7/23/2003	REV.:	



Chevron
Asphalt
Perth Amboy

TITLE:
LNAPL INVESTIGATION
AREA EY3
CHEVRON ASPHALT PERTH AMBOY

DWN: JSS	DES:	DRAWING NO.: ey3
CHKD:	APPD: PDP	
DATE: 7/31/2003	REV:	FIGURE NO.: 7-14

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

JAN 21 2005

Mr. Robert Lavorario
Manager, Environmental Projects
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Chevron USA Products Company, a Division of Chevron USA, Inc. ("Chevron")
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902
Full RCRA Facility Investigation (RFI) Report dated November 2003

Dear Mr. Lavorario:

The U.S. Environmental Protection Agency (EPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP) have reviewed the full RFI report cited above. Enclosed, is a letter from NJDEP, dated December 23, 2004, providing comments. Please respond to these comments by March 15, 2005.

While our ultimate goal is final remediation of the site and achievement of the new Environmental Indicators (Site-wide Remedy Selection (CA400), and Site-wide Constructions Complete (CA550)), our current goal, as indicated in letters dated June 1999 and September 2004, will be achieving the existing EIs, Human Exposures under Control (CA725), Migration of Contaminated Groundwater under Control (CA750). A meeting should now be arranged to discuss the results of the RFI and strategies and schedules for achieving CA725 and CA750 by the September 30, 2005 deadline.

Please contact Mr. Andrew Park, of my staff, at (212) 637-4184, to arrange for a meeting. Also, call Mr. Park if you have any questions or require more information.

Sincerely yours,

Adolph Everett, P.E.
Chief, RCRA Programs Branch

Enclosure

cc: Anthony Cinque, NJDEP, w/o encl.

Chevron

March 30, 2005

Chevron Environmental Management Company
1200 State Street
Perth Amboy, NJ 08861

Robert Lavorerio
Manager, Environmental Projects
Phone No. 732 738 2207
Fax No. 732 738 2039

Mr. Adolph Everett, P.E.
Chief, RCRA Programs Branch
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Re: Chevron USA Products Company
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902
USEPA Comment Letter on Full RFI Report dated January 21, 2005

Dear Mr. Everett, P.E.:

Chevron Environmental Management Company has completed our initial review of the United States Environmental Protection Agency's (EPA's) January 21, 2005 comments on the Full RCRA Facility Investigation (RFI) Report for the Chevron Perth Amboy Refinery and is in the process of preparing a detailed response to those comments. Given the large number of technical comments, Chevron is requesting an extension for its detailed reply, until May 31, 2005. During this timeframe an additional meeting with the Agencies will be held to discuss the comments in detail and agree on an appropriate response.

On March 8, 2005 Chevron met with the EPA and NJDEP case team to discuss the comments on the RFI Report. We also discussed our progress in achieving the Environmental Indicators (EIs) for Human Exposure Under Control and Migration Of Contaminated Groundwater Under Control. Our current goal is to provide EPA with draft information for the both of these EIs during April 2005.

Chevron shares your goal of expediting the final remediation of the site and achievement of the two new EIs, Site-wide Remedy Selection (CA400), and Site-wide Constructions Complete (CA550). Towards that end, Chevron would like to begin the Corrective Measures Study (CMS) phase of its RCRA permit compliance as soon as possible. The CMS is typically initiated once sufficient investigative data to adequately characterize the site and identify the distribution of potential environmental impacts, as well as other data necessary to begin the evaluation of potential remedial options has been obtained.

Chevron believes that sufficient data exists to begin the CMS. There have been several hundred groundwater, soil, surface water, and sediment samples taken to date as part of the RFI. Based on the EPA's January 21, 2005 comment letter, Chevron understands that some RFI data gaps will need to be dealt with, and suggests that additional data needs be addressed as part of, or

concurrent with the CMS. Chevron also understands that our recommendation for No Further Action on selected SWMUs and AOCs has not as yet been accepted by USEPA and NJDEP. If the Agencies determine that the NFA for a specific SWMU or AOC cannot be granted, then these units will be incorporated in the CMS.

Upon your approval, we will initiate the CMS with the transmittal of a CMS workplan.

Should you have any questions regarding this request for an extension regarding our response to comments or our request to initiate the CMS, please contact me at (732) 738-2207.

Sincerely,

R. Lavorerio

cc: Mr. Andy Park, USEPA
Mr. Anthony Cinque, NJDEP (3)
Mr. K, Siet
Mr. R. Blauvelt
Mr. M. Bolen

File 020203CAG2222C000503282005

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

Received 4/18/05 RL

APR 13 2005

Mr. Robert Lavorario
Manager, Environmental Projects
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Chevron USA Products Company
Perth Amboy, Middlesex County, New Jersey
EPA ID Number NJD081982902
RFI Report - EPA Comment Letter Dated January 21, 2005

Dear Mr. Lavorario:

The United States Environmental Protection Agency (EPA) Region 2 is in receipt of your letter dated March 30, 2005, requesting an extension for Chevron's response to EPA's comment letter, dated January 21, 2005, until May 31, 2005. The request for an extension is hereby granted. Therefore, Chevron must provide EPA and NJDEP with a response by May 31.

In addition, Chevron may proceed with a Corrective Measures Study (CMS), contingent upon Chevron addressing, as part of the CMS, the data gaps identified as a result of the review of the RCRA Facility Investigation (RFI) Report and any additional required data.

If you have any questions or require more information, please contact Mr. Andrew Park, of my staff, at (212) 637-4184.

Sincerely yours,

Adolph Everett, P.E.
Chief, RCRA Programs Branch

cc: Anthony Cinque, BCM, NJDEP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

JUL 29 2005

Mr. Robert Lavorario
Manager, Environmental Projects
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Chevron USA Products Company
Perth Amboy, Middlesex County, New Jersey
EPA ID Number NJD081982902
Full RCRA Facility Investigation
Chevron's Response Letter dated July 7, 2003 to EPA and NJDEP September 20, 2002 Comment Letter.

Dear Mr. Lavorario:

The United States Environmental Protection Agency (EPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP) have completed review of the Chevron correspondence cited above. Enclosed please find a letter from NJDEP dated March 11, 2005. Chevron's response is acceptable.

If you have any questions or require more information, please contact Mr. Andrew Park, of my staff, at (212) 637-4184.

Sincerely yours,

Adolph Everett, P.E.
Chief, RCRA Programs Branch

Enclosure

cc: Anthony Cinque, BCM, NJDEP, w/o encl.

Rec'd 7/19/05 AP

State of New Jersey

Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

MAR 1 1 2005

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

Re: Chevron Products Company
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902
Full RCRA Facility Investigation
Response to USEPA and NJDEP Comments – September 20, 2002 letter

Dear Mr. Park:

The New Jersey Department of Environmental Protection (NJDEP or Department) has completed the review of the above-referenced document titled "Full RCRA Facility Investigation, Response to USEPA and NJDEP Comments – September 20, 2002 letter" dated July 7, 2003. This document was prepared by Chevron Environmental Management Company (Chevron). The NJDEP finds this document to be acceptable as submitted.

Should you have any questions please contact me at (609) 633-1416.

Sincerely,

Anthony Cinque, Case Manager
Bureau of Case Management

C: John Boyer, BEERA
Bill Hanrahan, BGWPA

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Chevron Environmental
Management Company
1200 State Street
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RLAV@chevron.com

Robert Lavorerio
Environmental Projects Manager

Chevron

September 14, 2005

Mr. Adolph Everett, P.E.
Chief, RCRA Programs Branch
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Re: Chevron Corporation
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902
USEPA Comment Letter on Full RFI Report dated January 21, 2005

Dear Mr. Everett, P.E.:

On August 25th, 2005, Chevron Environmental Management Company met with the EPA and NJDEP case team to discuss the comments on the RFI Report received on January 21st, 2005. We also discussed our progress in achieving the Environmental Indicators (EIs) for Human Exposure Under Control and Migration of Contaminated Groundwater Under Control. At the meeting, one copy of the AOC 36 Triad-Based Chlorinated Plume Investigation Report and one copy of each EI response were hand delivered to representatives of EPA and the NJDEP. Two electronic copies were sent to NJDEP on September 8th, 2005. Additional hard copies of each report were shipped to EPA and NJDEP in early September 2005.

As a result of this recent meeting, it was mutually agreed that Chevron will address each RFI Report comment in the Supplemental RFI Report to be submitted to EPA by June 30th, 2006. This decision was based on the fact that most of the RFI comments either require further delineation of contaminants of concern or in some areas a better understanding of the local hydrogeology. To do so, Chevron proposed to re-examine their extensive database and to develop graphical presentations of the property utilizing a geographical information system (GIS). GIS will allow Chevron to better integrate both geologic and contaminant data in a three dimensional format. This three dimensional representation of the site will also be utilized to identify data gaps and to develop dynamic work plans to conduct additional field activities to fill them. Due to the complexity and potential commingling of contaminants in

the North Field and Main Yard Area, Chevron and the agencies agreed to group some of the RCRA waste management units in order to conduct further investigations more efficiently.

Chevron agreed to meet with the EPA and NJDEP case team to review the results obtained from the additional GIS effort prior to conducting any major field activities, in order to mutually agree on all technical approaches and data gathering points. As a result, no formal work plans are anticipated for review by the case team. This approach should create a more dynamic and efficient approach to collect additional field data to complete delineation of the areas in question. As such, Chevron expects to complete the following schedule as outlined below:

• Complete 3D Model of Site	November 30, 2005
• Meet w/EPA & NJDEP Case Team	December 16, 2005
• Submit Supplemental RFI Report	June 30, 2006

If you have any questions or concerns, please contact me at (732) 738-2207.

Sincerely,

R. Lavorerio

cc: Mr. Andy Park, USEPA
Mr. Anthony Cinque, NJDEP (3)
Mr. K. Siet
Mr. R. Blauvelt
Mr. J. Vorbach
Mr. M. Bolen

Received 1/24/06

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

JAN 18 2006

Mr. Robert Lavorario
Manager, Environmental Projects
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Chevron USA Products Company
Perth Amboy, Middlesex County, New Jersey
EPA ID Number NJD081982902
Chevron's Letter dated March 5, 2004 Responding to the EPA December 5, 2003 Comment Letter on the September 23, 2002 LNAPL Management Plan

Dear Mr. Lavorario:

The United States Environmental Protection Agency (EPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP) have completed review of the correspondence cited above. Enclosed please find a letter from NJDEP dated January 4, 2006, providing comments. Please provide EPA and NJDEP with a response to the comments by February 15, 2006.

If you have any questions or require more information, please contact Mr. Andrew Park, of my staff, at (212) 637-4184.

Sincerely yours,

Dale J Carpenter

FOR Adolph Everett, P.E.
Chief, RCRA Programs Branch

Enclosure

cc: Anthony Cinque, BCM, NJDEP, w/o encl.

Rec'd 1/10/06 AP

State of New Jersey

Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

Andrew Park
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

JAN 0 4 2006

Re: Chevron Products Company, a Division of Chevron USA, Inc.
Perth Amboy, Middlesex County, New Jersey
EPA ID ##NJD081982902
Response to the December 5, 2003 USEPA Comment Letter on the September 23, 2002, LNAPL Management Plan for the Chevron Perth Amboy Refinery

Dear Mr. Park:

The New Jersey Department of Environmental Protection (NJDEP or Department) has completed the review of the above-referenced document titled "Response to the December 5, 2003 USEPA Comment Letter on the September 23, 2002, LNAPL Management Plan for the Chevron Perth Amboy Refinery" dated March 5, 2004. The NJDEP has the following comments.

Specific Comments:

Page 1, last paragraph: Chevron states "a relevant finding from the subsequent LNAPL investigations was that, in many instances, the apparent thickness has been drastically reduced as compared to those thicknesses reported in the September 23, 2002 LNAPL Management Plan". Chevron should be aware that additional investigation concerning LNAPL thickness and extent is warranted. As stated in the NJDEP's comments regarding the November 2003 "Full RCRA Facility Investigation Report" Chevron U.S.A., Inc. (Chevron) shall determine if there is a relationship between tidal stage and LNAPL thickness.

AOC 16, page 3, 2nd paragraph: Chevron proposes to upgrade the existing IRM at AOC 16. This proposal is acceptable.

SWMU 43, page 5, 2nd paragraph: Based on the additional data presented, Chevron proposes that the recovery trench proposed for SWMU 43 is not necessary. Chevron indicates that a final remediation will be implemented through the Corrective Measures process. This proposal may be acceptable to the Department provided that there is no correlation between ground water elevation and LNAPL thickness. Chevron shall determine if there is a relationship between LNAPL thickness and water table elevation. If it is shown that there is a correlation between LNAPL thickness and water table elevation, then additional more aggressive IRM measures may be required. Chevron shall submit a plan to complete a tidal study of this area that includes the collection of NAPL and water table elevation data.

AOC 8 IA NF6, page 6, 3rd paragraph: Chevron proposes that the AOC 8 investigation area NF6 should be further evaluated during the Corrective Measures Study (CMS). Chevron proposes to continue LNAPL monitoring and maintain the existing IRM. This proposal is acceptable to the NJDEP. As with all NAPL areas at the site, Chevron needs to determine if there is a correlation between NAPL thickness and water table elevation. If NAPL thickness is dependent on water table elevation, then more aggressive IRM measures may be warranted.

AOC 19, page 7, 4th paragraph: Chevron proposes to evaluate the appropriateness of vacuum assisted LNAPL recovery. An evaluation will be submitted for NJDEP review. This proposal is acceptable.

AOC 16 IA NF2, page 8, last paragraph: Chevron will evaluate the effectiveness of a potential upgrade to the existing IRM at MW-116. A summary of the data collected and a preliminary evaluation of the effectiveness of dual phase extraction will be submitted for NJDEP review. This proposal is acceptable.

AOC 25, page 11, paragraph 3: Chevron proposes to evaluate dual phase extraction for this area. A summary of the data collected and a preliminary evaluation of the effectiveness of dual phase extraction will be submitted for NJDEP review. This proposal is acceptable.

AOC 16 IA EY1, page 11, 3rd paragraph: Chevron proposes to evaluate the applicability of several IRMs for EY1. A report will be submitted for NJDEP review. This proposal is acceptable.

AOC 16 IA EY3, page 12, 2nd paragraph: Based on additional information, Chevron proposes to evaluate this area under the CMS. This proposal is acceptable.

AOC 16 IA EY4a, page 13, paragraph 2: Chevron proposes to evaluate this area under the CMS. This proposal is acceptable.

AOC 16 IA EY4b, page 14, paragraph 2: Chevron proposes to evaluate this area under the CMS. This proposal is acceptable.

AOC 29, page 15, last paragraph: Chevron proposes to perform limited surficial excavations to a maximum depth of 3 feet. Chevron proposes to leave the asphalt like material below this depth as the ground water temperatures will cause it to be rock like. The proposal to excavate some of the material is acceptable, however, further evaluation of this area is warranted during the CMS since the material appears to be acting as a source of ground water contamination. In addition, the NJDEP's Technical Regulations for Site Remediation N.J.A.C. 7:26E require the removal or containment of free and residual product.

Should you have any questions please contact me at (609) 633-1416.

Sincerely,

Anthony Cinque, Case Manager
Bureau of Case Management

C: John Boyer, BEERA
Anne Pavelka, BGWPA

Chevron

Robert Lavorerio
Environmental Projects
Manager

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Fax 732-738-2039
rlav@chevron.com

March 6, 2006

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

Re: Status of Supplemental Investigation and Response to Comments For Area of Concern 36 RCRA Corrective Action Chevron Refinery, Perth Amboy, NJ

Dear Mr. Park:

Chevron has recently completed a supplemental groundwater investigation of Area of Concern 36 (AOC 36), as presented in Chevron's letter to the Environmental Protection Agency (EPA) dated January 5th, 2006. The results of this supplemental investigation are summarized below. This supplemental investigation was conducted in the southern portion of the Central Yard Area, on the Conrail property, and on the off-site State Street properties identified in Chevron's previous reports on AOC 36. Additionally, this letter provides responses to comments from EPA and the New Jersey Department of Environmental Protection (NJDEP) received via e-mail on December 7th, 2005 concerning the investigation of AOC 36.

As requested, Chevron is providing this response to EPA and NJDEP comments based on our most recent groundwater investigation of AOC 36 that occurred from November 2005 to January 2006. The investigation focused on further evaluating the nature and extent of chlorinated hydrocarbons previously detected in groundwater, both on and off-site. This investigation included soil sampling, installation of temporary well points, installation of permanent monitoring wells, groundwater gauging, and groundwater sampling. All soil and groundwater samples were collected as per NJDEP's guidelines and analyzed by a NJ certified laboratory. All recent sampling locations are depicted on Figures 1 through 3. All sampling locations were based on previous findings submitted to EPA and NJDEP in the *Central Yard Area of Concern (AOC) – Triad-Based Approach Chlorinated Plume Investigation, Chevron Perth Amboy Facility, NJ* report (AOC 36 Report) dated August 25th, 2005. In some cases, the location of permanent monitoring wells took into account concerns from each private property owner.

Soil Investigation – FM Sylvan, Inc. Property

On November 18th, 2005, Chevron collected soil samples from five shallow borings on the FM Sylvan, Inc. property. This property is located to the east of the Refinery's Central Yard and the

former Shops Building. Prior investigations conducted by Chevron reveal that chlorinated hydrocarbons were detected in shallow groundwater at this site. The location of each boring was based on previous findings that indicated high groundwater concentrations of trichloroethene (TCE) in the center of the property (temporary well point G1860). The objective of this task was to determine if relative soil contamination was evident on the FM Sylvan, Inc. property, but not to delineate its extent. These five borings were labeled H0977 through H0981 and are depicted on Figure 1. These borings were later used as temporary well points.

All soil cores were collected continuously using a macro-core sampling device using a direct push (DPT) drilling method. A combination flame ionization detector/photo-ionization detector (FID/PID) was used to screen each macro-core soil sample. Based on this field screening of each macro-core soil sample, select soil samples were collected for VOC analysis (EPA Mtd. SW-846 8260B). FID readings above background in soil were evident in four of the five borings ranging from 2 ppm to 42 ppm. The highest reading was at boring H0981 at a depth of 11 feet below ground surface (bgs), where the soil appeared stained and had a petroleum odor. Where there were no FID readings above background, soil sampling intervals were selected above the water table based on either the presence of staining, odor, proximity to the water table interface, or at the contact of permeable and nonpermeable horizons in the vadose zone.

Based on the geologic description of these five boring logs, the local subsurface stratigraphy consists of 1 to 5.5 feet of fill overlying 3.5 to 14 feet of reddish brown glacial till overlying gray marine clay. The gray marine clay (Woodbridge Clay Formation) was evident at a depth of 8 feet bgs (H0977) to 19.5 feet bgs (H0979). Bricks and broken concrete with very little sediment comprised the fill material below the asphalt pavement. The glacial till was composed mostly of reddish brown sands with gravel, silty fine sands, clayey sands, sandy silts, sandy clays, and clays indicative of a fluvial channel sequence as described in Chevron's AOC 36 Report dated August 2005. The water table was evident between 5 to 7 feet bgs. The geologic description of each soil boring and FID results per sample interval are presented in Attachment A.

As depicted in Attachment B, the analytical results indicate the presence of two chlorinated volatile organic compounds (CVOCs) in excess of the RFI Screening Criteria. Both TCE (1.5 to 19 mg/kg) and cis-1,2-dichloroethene (1.2 to 14 mg/kg) were detected above the 1 mg/kg RFI Screening Criteria. These CVOCs were found in dry glacial reddish brown clays with gravel in the vadose zone to wet glacial silty fine sands with gravels near the water table. These CVOCs were found in borings H0977 (5 to 7 feet bgs) and H0978 (6 to 9 feet bgs) located in the suspected CVOC source area on the FM Sylvan property based on previous groundwater findings. In addition, methlcyclohexane, toluene, ethylbenzene, and xylene were evident in borings H0977, H0978, and H0981 (except toluene) as well, but were found below the RFI Screening Criteria. No CVOCs were detected in the soil borings hydraulically downgradient of location H0978. In addition, no other VOCs were detected in soil samples collected on the FM Sylvan, Inc. property.

Temporary Well Points – FM Sylvan Inc. Property

On November 18th, 2005, Chevron installed five temporary well points on the FM Sylvan, Inc. property in the same boreholes used for soil sampling locations H0977 through H0981 (See Figure 1). Temporary wells (1-inch outer diameter) were installed in each open borehole and screened (5 foot) across the targeted northern sand channel in the glacial till based on historical data and the boring logs for these locations. In each case, the bottom of each well screen was

partially in or on top of the marine clay of the Woodbridge Clay Formation. The depths of each well screen ranged from 3 to 8 feet bgs (H0977) to 15 to 20 feet bgs (H0979) depending on the depth to the top of the Woodbridge Clay Formation. Attachment C contains a temporary well construction summary.

Groundwater samples were collected from temporary wells H0979, H0980, and H0981 using a dedicated bailer and analyzed for VOCs (EPA Mtd. SW-846 8260B). No water was present in H0977 and H0978 after waiting approximately 4 hours. Hence, no groundwater samples were collected from these temporary wells. All temporary wells were removed and each borehole was grouted at the end of the day (November 18th, 2005).

Based on a review of the analytical data presented in Table 1 and Attachment D, the following CVOCs were evident in groundwater samples above the Full RFI Screening Criteria.

Table 1. Temporary Well CVOC Summary

CVOC	RFI Screening Criteria (µg/L)	H0979	H0980	H0981
PCE	1	0.8U	**3J**	**9J**
TCE	1	**370**	**150**	**19J**
DCE	2	**5**	2J	4U
cis-DCE	10	**900**	**360**	**1,000**
VC	5	**8J**	5J	**260**

Notes:

J - Estimated value

U - Below the shown method detection limit

Bold values are above the RFI Screening Criteria

Trans-1,2-dichloroethene was detected below the Full RFI Screening Value (100 µg/L) at H0979 (3J µg/L), H0980 (1J µg/L), and H0981 (35 µg/L). No other CVOCs were detected in samples collected from these temporary wells.

In addition, the following VOCs were also detected in groundwater samples above the Full RFI Screening Criteria, as shown in Table 2.

Table 2. Temporary Well - Other VOC Summary

Other VOCs	RFI Screening Criteria (µg/L)	H0979	H0980	H0981
Benzene	1	**2J**	0.5J	**20J**
Ethylbenzene	700	0.8U	0.8U	**3,700**
Xylene (total)	1000	0.8U	0.8U	**8,500**
Methylcyclohexane	100	16	1U	**120**

Cyclohexane, isopropylbenzene, methyl tert-butyl ether, and toluene were detected below their respective Full RFI Screening Criteria (100 µg/L, 800 µg/L, 70 µg/L and 1000 µg/L). The sample collected at H0979 contained 9 µg/L of cyclohexane, 13 µg/L of isopropylbenzene, and 2J µg/L of methyl t-butyl ether. The sample collected at H0980 contained 3J µg/L of methyl tert-butyl ether and 2J µg/L of toluene. The sample collected at H0981 contained 260 µg/L of

isopropylbenzene and 110 μg/L of toluene. No other VOCs were detected in groundwater samples collected from these temporary wells.

Based on these findings and historical data, the locations of three permanent groundwater monitoring wells were selected on the FM Sylvan, Inc. property.

Installation of Additional Permanent Monitoring Wells

During the period of November 16th, 2005 and January 7th, 2006, Chevron installed eight shallow permanent groundwater monitoring wells as shown in Table 3 and on Figure 2.

Table 3. Well IDs and Location

Chevron Well ID#	Location
MW-219	Central Yard Area
MW-220	Central Yard Area
MW-221	FM Sylvan, Inc. property (1001 State Street)
MW-222	FM Sylvan, Inc. property (1001 State Street)
MW-223	Celauro property (975 State Street)
MW-224	Celauro property (975 State Street)
MW-225	Dave's Trucking property (991 State Street)
MW-226	Dave's Trucking property (991 State Street)
MW-232	FM Sylvan, Inc. property (1001 State Street)

All permanent monitoring wells were installed using a hollow-stem auger method. Split-barrel soil samples were obtained for the entire depth of the pilot boring for lithologic description (see Attachment A). However, no soil samples were collected during the installation of wells MW-220, MW-221, MW-222, and MW-232 due to their proximity to historical borings and/or cone penetrometer borings with detailed geologic logs.

Permanent wells were completed to approximately 14 to 21 feet bgs and had a screened interval of 5 feet bgs, with the exception of MW-219 which had a 7 foot screen. Each well was screened across the suspected glacial fluvial channels in each area based on localized lithologic descriptions and historical data. The depth of each well screen ranged from 9 to 14 feet bgs (MW-226) to 14 to 21 feet bgs (MW-219) depending on the depth to the top of the Woodbridge Clay Formation. In each case, the bottom of each well screen was partially in or on top of the Woodbridge Clay Formation. Attachment C presents a summary of all the permanent wells constructed in AOC 36 to date and their map coordinates.

The wells were constructed of two-inch diameter, schedule 40 PVC riser and screen (10 slot size), with sand pack around the screened interval, a two-foot thick bentonite seal, and cement-bentonite grout around the riser pipe. The location of the designated measuring point on the inner casing was marked for surveying and water level measurements. Each well was secured with a pressure cap and locked. Finally, each well was completed as a flush-mount design (due to vehicle traffic). Each off-site well was fitted with a special lid cover to prevent any vandalism.

Following installation, the new monitoring wells were developed to a turbid-free discharge by purging a minimum of three well volumes from the well. A New Jersey licensed surveyor

determined the vertical and horizontal locations of each new well. The horizontal coordinates were surveyed per location in terms of latitude and longitude or New Jersey State Plane Coordinates, and the vertical elevations were surveyed relative to the National Geodetic Vertical Datum (NGVD). The surveyor surveyed the elevations of the designated measuring point on the inner casing, the top of the outer casing and ground surface. Form A and Form B well completion forms were prepared and will be submitted to the New Jersey Bureau of Water Allocation (See Attachment C).

AOC 36 Groundwater Gauging Event on 1/27/06

Chevron gauged thirty-one wells (including the 8 new permanent monitoring wells) in the southern portion of the Central Yard Area, on the Conrail property, and on the State Street properties on January 27th, 2006 (See Attachment E). Based on this data, a groundwater contour map was developed by hand (See Figure 3). The pattern of groundwater contours in the Central Yard Area was consistent with previous gauging events (a southeasterly flow direction). However, the groundwater contour pattern on most of the State Street properties indicates a much more southerly flow direction than originally projected. The exception is the groundwater flow direction on the FM Sylvan, Inc. property, which is to the east across most of their property. Chevron suspects that the southerly flow direction is indicative of the sand channel pinching out in those areas and the presence of a thick sequence of glacial clay that borders the southern sand channel to the southeast as depicted in Chevron's geostatistical model contained in the AOC 36 Report.

Sampling and Analysis of Additional Permanent Monitoring Wells

Groundwater samples were collected from all newly installed permanent monitoring wells in AOC 36 between December 7th, 2005 and January 23rd, 2006. In addition, all existing permanent monitoring wells in AOC 36 were sampled during approximately the same period as part of Chevron's quarterly monitoring program (See Attachment D).

A peristaltic pump and tubing were used to collect filtered samples for TAL metals and ferrous iron analyses using a low-flow sampling method. Each well was then purged of three volume equivalents using the peristaltic pump and tubing. Wells were allowed sufficient time (next day, but less than 24 hours from the purge end time) to recharge to levels suitable for sampling. Unfiltered samples for TCL VOC, TCL SVOC, sulfate, nitrate/nitrite, chloride, methane, carbon dioxide, ethane, ethene, and alkalinity analyses were collected using a dedicated disposable bailer. Finally, each well was monitored for stabilized in-situ groundwater quality parameters (pH, temperature, specific conductivity, salinity, turbidity, total dissolved solids, dissolved oxygen, and oxidation/reduction potential) using a Horiba U-22 down-hole water quality meter.

Based on the analytical data in Tables 4 and 5, several CVOCs and other VOCs were evident in groundwater samples above the Full RFI Screening Criteria. In most cases, the analytical results were consistent with previous results from nearby temporary well points. For example, the groundwater sample collected at the north end of the Sylvan property at MW-232 on January 24, 2006 was consistent with that of G1859 collected on November 13, 2004, both were non-detect for VOCs. In some cases, the results from the new permanent wells exhibited more or fewer CVOCs than that of nearby historical temporary wells. For example, the groundwater sample

collected along the northern perimeter of the southern portion of the Central Yard Area at MW-220 (December 16, 2005) exhibited more CVOCs than those found in S1962 which exhibited only TCA (27 µg/L) collected on February 18, 2005. The sample from MW-220 exhibited concentrations of PCE (1J µg/L), TCE (10 µg/L), TCA (7 µg/L), VC (14 µg/L), chloroethane (65 µg/L), DCE (99 µg/L), DCA (150 µg/L), and cis-DCE (5 µg/L). However these concentrations are lower than those exhibited at MW-216 on December 1, 2005 (e.g., PCE – 6 µg/L, TCA – 57 µg/L, and TCE – 22 µg/L), which is the nearest permanent perimeter monitoring well located approximately 60 feet to the south of MW-220 (see Figure 4).

Based on this latest information, the extent of the CVOC southern sand channel plume has been confirmed by the analytical results from MW-224 and MW-225 and the supportive historical temporary well data from the off-site properties. The extent of the CVOC northern sand channel plume on the FM Sylvan property has been confirmed by MW-221 and MW-232. In addition, the analytical results from MW-222 and the recent temporary well and soil sampling data contained herein (CVOCs found in soil borings H0977 and H0978) supports Chevron's position that a non-Chevron CVOC source area exists on the FM Sylvan, Inc. property.

At this time, Chevron plans to continue to monitor these new permanent monitoring wells and the rest of the AOC 36 wells over the next three quarters. Chevron will provide the EPA and NJDEP the results of these subsequent sampling events. Should you require any additional information, please contact me at (732) 738-2207.

Sincerely,

Robert Lavorerio

Attachments

cc: Mr. Anthony Cinque, NJDEP, 3 copies
Mr. Ken Siet, TRC Raviv
Mr. Mike Bolen, SAIC

Table 4. New Permanent Monitoring Wells - CVOC Data Summary

CVOC	RFI Screening Criteria (µg/L)	MW-219 (CYA)	MW-220 (CYA)	MW-221 (Sylvan)	MW-222 (Sylvan)	MW-223 (Celauro)	MW-224 (Celauro)	MW-225 (Dave's)	MW-226 (Dave's)	MW-232 (Sylvan)
PCE	1	0.8U	1J	0.8U	2U	0.8U	0.8U	0.8U	0.8U	0.8U
TCE	1	51	10	35	1,800	1U	1U	1U	7	1U
1,1,1-TCA	30	14	0.8U	0.8U	2U	0.8U	0.8U	0.8U	0.8U	0.8U
1,1,2-TCA	3	0.8U	7	0.8U	2J	0.8U	0.8U	0.8U	0.8U	0.8U
DCA	70	160	150	1U	1U	1U	1U	1U	1U	1U
DCE	2	44	99	0.8U	15	0.8U	0.8U	0.8U	0.8U	0.8U
Cis-DCE	10	1J	5	110	1500	7	0.8U	0.8U	2J	0.8U
Trans-1,2-DCE	100	0.8U	0.8U	1J	16	1J	0.8U	0.8U	0.8U	0.8U
VC	5	1J	14	3J	43	9	1U	1U	1U	1U
Chloroethane	100	48	65	1U	2U	1U	1U	1U	1U	1U
Chloroform	6	0.8U	0.8U	0.8U	2U	0.8U	7	0.8U	0.8U	0.8U

Notes:

J - Estimated value

U - Below the shown method detection limit

Shaded values are above the RFI Screening Criteria

Table 5. New Permanent Monitoring Wells - Other VOC Data Summary

VOC	RFI Screening Criteria (µg/L)	MW-219 (CYA)	MW-220 (CYA)	MW-221 (Sylvan)	MW-222 (Sylvan)	MW-223 (Celauro)	MW-224 (Celauro)	MW-225 (Dave's)	MW-226 (Dave's)	MW-232 (Sylvan)
Benzene	1	2J	6	0.5U	3J	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	800	1U	1U	1U	2U	1U	1U	1U	1U	1J
Methylcyclohexane	100	1U	2J	1U	8J	1U	1U	1U	1U	1U
Methyl tert-butyl ether	70	0.5U	0.5U	1J	1U	0.5U	16	0.7J	370	6
Toluene	1000	0.7U	0.9J	0.7U	1U	0.7U	0.7U	0.7U	0.7U	0.7U

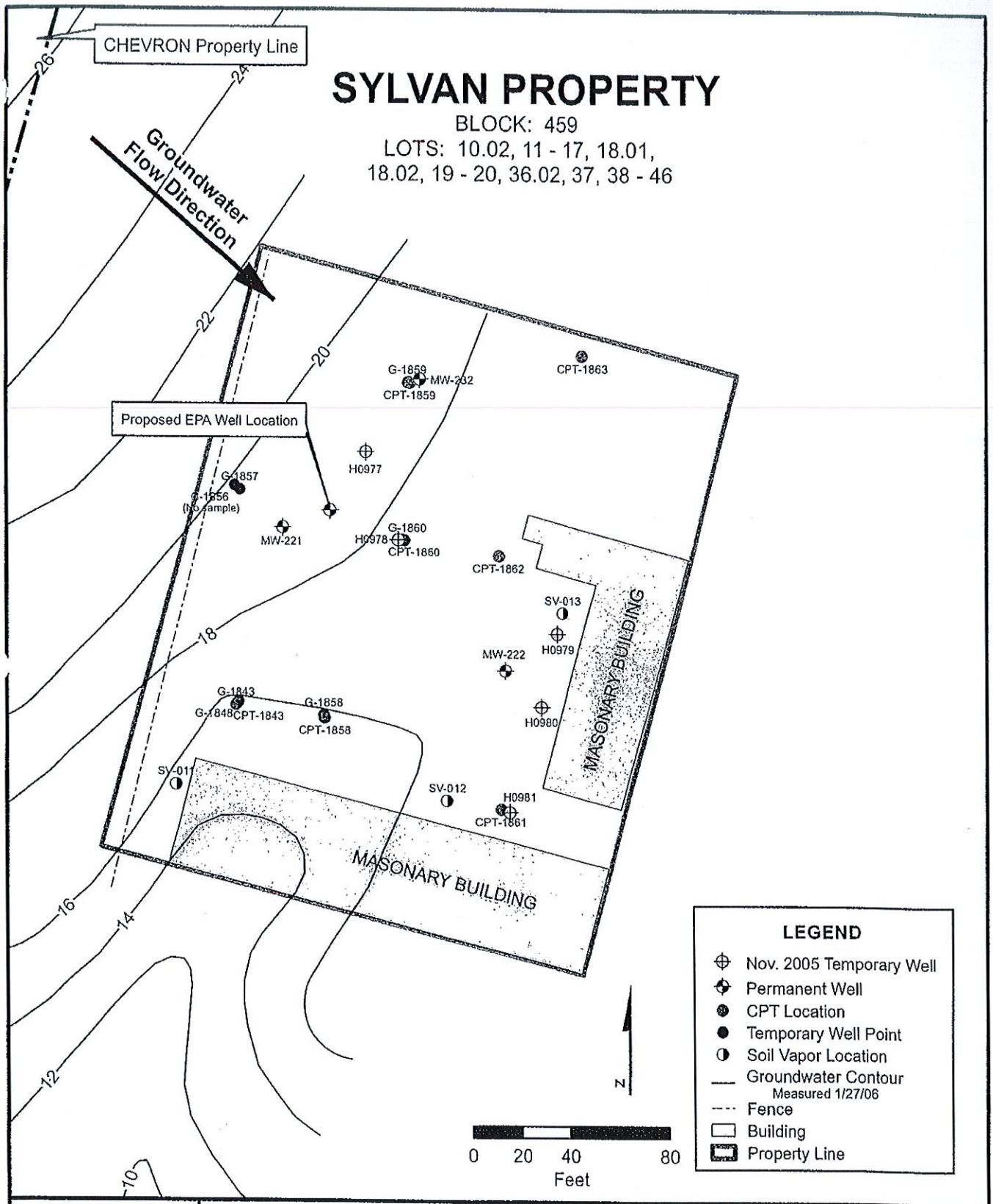
Notes:

J - Estimated value

U - Below the shown method detection limit

Shaded values are above the RFI Screening Criteria

Figure 1 – Sylvan Map



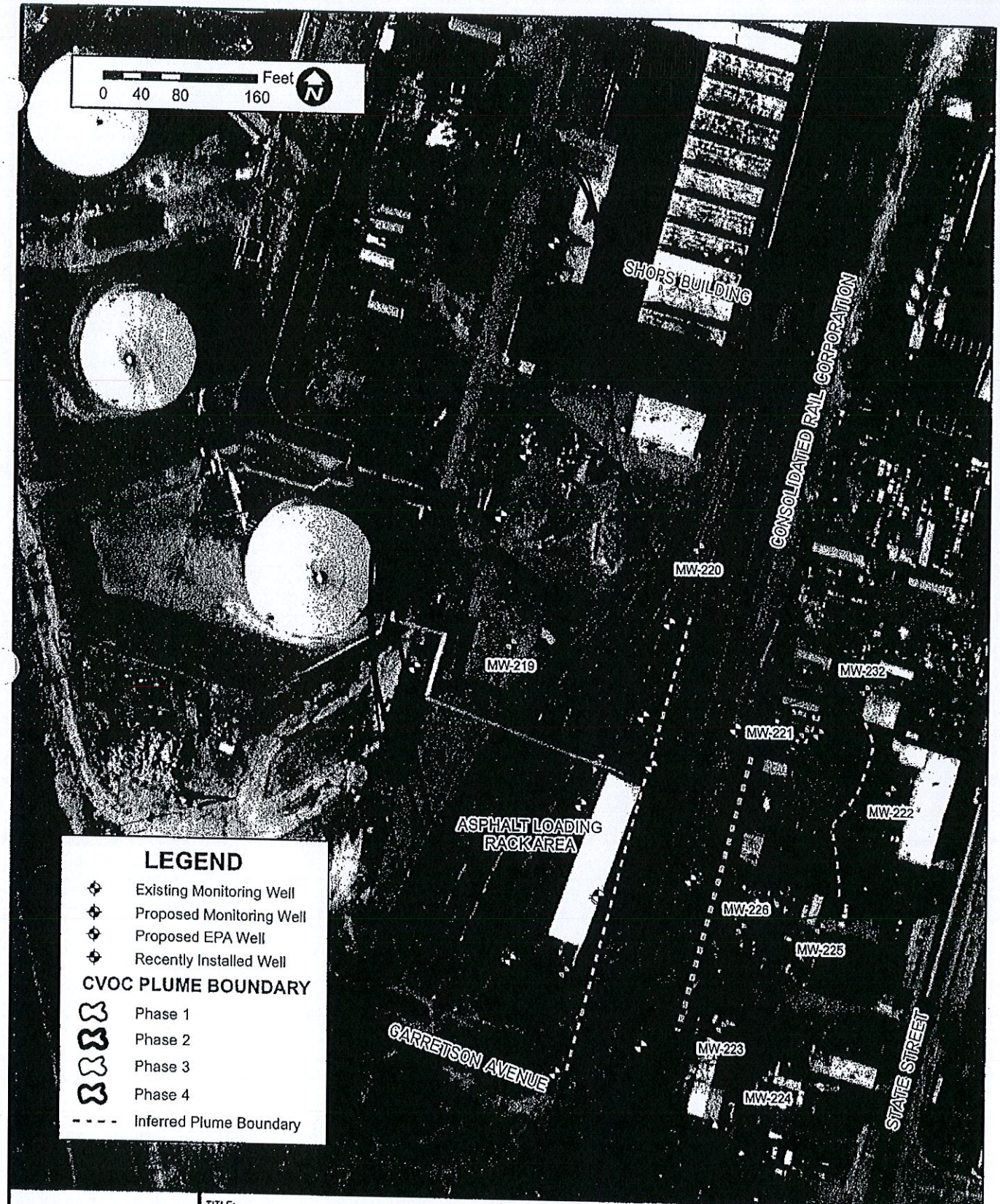
Chevron
Asphalt
Perth Amboy

TITLE:
OFF-SITE GROUNDWATER INVESTIGATION
999, 1013, 1015 STATE STREET, TILE PLACE
SYLVAN PROPERTY - PERTH AMBOY, NJ 08861
NOVEMBER, 2005 - JANUARY, 2006

DWN: MTK
CHKD: MB
DATE: 2/16/2006

FILE NAME: Sylvan_Property5
FIGURE NO: 1

Figure 2 - New Well Location Map



Chevron
Asphalt
Perth Amboy

TITLE:
AOC 36 CHLORINATED PLUME INVESTIGATION
PROPOSED WELL LOCATIONS

DWN: MTK	PROJECT NO: Prop_Wells4
CHKD: MMB	FIGURE NO: 2
DATE: 12/6/05	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

MAY - 8 2006

Mr. Robert Lavorario
Environmental Projects Manager
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Status of Supplemental Investigation and Response to Comments for Area of Concern (AOC) 36, Chevron USA Products Company, Perth Amboy, Middlesex County, New Jersey, EPA ID Number NJD081982902

Dear Mr. Lavorario:

The U.S. Environmental Protection Agency (EPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP) have completed a review of a response letter from Chevron dated March 6, 2006 concerning AOC 36 investigations. Enclosed please find a letter from NJDEP dated April 20, 2006, providing their review. The response is acceptable with the following conditions:

- As proposed, Chevron will continue the monitoring of the AOC 36 wells for the next three quarters, and provide EPA and NJDEP with the results upon available.

- Chevron must provide EPA and NJDEP with appropriate documentation to show that the owner(s) and/or operator(s) of the FM Sylvan property have been notified of the results and conclusions concerning the contaminated soil and groundwater at the property.

- In our December 7, 2005 e-mail, EPA and NJDEP also requested Chevron to provide additional groundwater information relating to a potential for discharge of into surface water bodies and other requested information. Please be advised that the information needs to be reviewed as part of our ongoing Groundwater Environmental Indicator (CA750) review.

If you have any questions or require more information, please contact me at 212-637-4184 or at park.andy@epa.gov.

Sincerely yours,

Andrew Park
New Jersey Section
RCRA Programs Branch

Enclosure

cc: Anthony Cinque, BCM, NJDEP, w/o encl.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

APR 20 2006

Re: Chevron Products Company, a Division of Chevron USA, Inc.
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902

Dear Mr. Park:

The New Jersey Department of Environmental Protection (NJDEP or Department) has completed a review of the document titled "Status of Supplemental Investigation and Response to Comments for Area of Concern 36" dated March 6, 2006. This document was prepared by Chevron Environmental Management Company (Chevron). The NJDEP finds the document to be acceptable as submitted.

It is noted that Chevron has completed additional groundwater investigation. These new data support the contention that a secondary source likely exists on the FM Sylvan property that is unrelated to the Chevron groundwater plume. Based on the supplemental data, the NJDEP has concluded that Chevron has delineated the contaminated groundwater plume. The limits of the plume do not appear to represent a vapor intrusion risk to any offsite properties.

In addition, this matter will be referred to the NJDEP's Bureau of Risk Management, Initial Notice & Case Assignment section for evaluation and appropriate action.

Should you have any questions please contact me at (609) 633-1416.

Sincerely,

Anthony Cinque, Case Manager
Bureau of Case Management

C: Anne Pavelka, BGWPA
John Boyer, BEERA

Chevron

Robert Lavorerio
Environmental Projects
Manager

Chevron Environmental Management Company
1200 State Street
Perth Amboy, NJ 08861
Tel 732-738-2207
Fax 732-738-2039
rlav@chevron.com

July 31, 2006

Andrew Park
US EPA Region 2
290 Broadway, Floor 22
New York, NY 10007-1866

Re: Chevron Corporation
Perth Amboy, Middlesex County, New Jersey
EPA ID# NJD081982902
USEPA Comment Letter on Full RFI Report dated January 21, 2005

Dear Mr. Park:

As agreed at our last RFI Team meeting on July 13th, 2006 with you and Anne Pavelka from the NJDEP, Chevron has grouped most of the RCRA waste management units in the Main Yard/ North Field Area to conduct further investigations more efficiently. These eight new groupings are identified as *Areas of Investigation* (AOI) across the North Field/Main Yard Area as presented in Attachments A and B. These eight AOIs were identified by our ongoing data visualization activities which were reviewed in detail with you during our meeting. To assist you in the review of this new information, Attachment C contains all the comments from the USEPA Comment Letter dated January 21st, 2005 that focused on the RCRA waste management units that compose the eight AOIs in the North Field/Main Yard Area.

To address the USEPA Comment Letter, additional RFI soil borings and monitoring wells are proposed and presented on Attachment B. At this time, we propose forty three (43) soil borings as presented in Attachment D. In addition, we propose the addition of three (3) shallow and seven (7) deep groundwater monitoring wells. Since these investigations will be part of a dynamic process, the number and location of proposed boring and well locations presented herein are subject to change as additional data is gathered, modeled, and analyzed for each AOI and/or for the entire North Field/Main Yard Area.

Chevron plans to implement our additional investigations of the North Field/Main Yard Area in September 2006. Two weeks prior to the initiation of field activities, Chevron will notify you and the NJDEP Case Manager of our intentions.

If you have any questions or concerns, please contact me at (732) 738-2207.

Sincerely,

R. Lavorerio

Attachments

cc: Mr. Andy Park, USEPA
Mr. Anthony Cinque, NJDEP (3)
Mr. K. Siet
Mr. R. Blauvelt
Mr. J. Vorbach
Mr. M. Bolen

2/15/2008

Attachment A
Chevron PAMNJ
Main Yard/North Field Area

RFI - Eight Areas of Investigation

MY1

AOC 33
AOC 34
PAOC 38
PAOC 39
PAOC 42
PAOC 86
SWMU 51

MY2

AOC 10
PAOC 81
PAOC 83
PAOC 84
SWMU 44

MY3

AOC 1
AOC 18
AOC 19
AOC 19 – LNAPL
PAOC 8
PAOC 79
PAOC 87

NF2

AOC 9B
PAOC 22
PAOC 36
PAOC 37
PAOC 38
PAOC 40
PAOC 41
PAOC 43
SWMU 22
SWMU 43
SWMU 53
Area NF2 - LNAPL

NF3A

AOC 6A
PAOC 6
PAOC 10
PAOC 44
PAOC 45
PAOC 46
PAOC 73
SWMU 19
SWMU 35
Area NF3 - LNAPL

NF3B

AOC 9A
PAOC 73
SWMU 20
SWMU 43

NF5

AOC 23
PAOC 32
SWMU 17
SWMU 18
SWMU 24
SWMU 31
SWMU 41

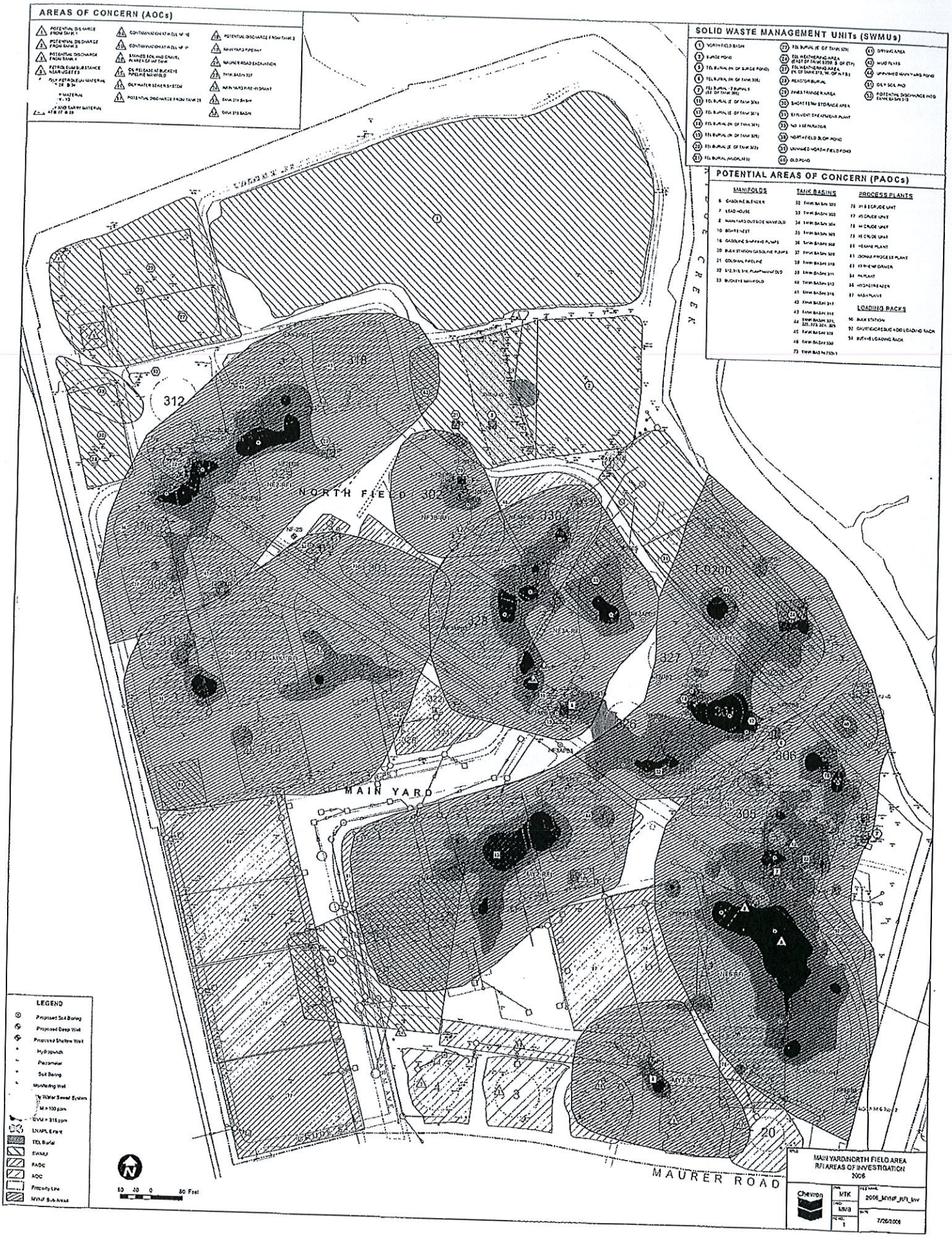
NF6

AOC 8
AOC 8 – NF6 – LNAPL
AOC 15
PAOC 7
PAOC 16
PAOC 23
PAOC 35
PAOC 76
PAOC 79
PAOC 92
SWMU 6
SWMU 7
SWMU 16
SWMU 40
Area NF5 - LNAPL

Attachment B

Chevron Perth Amboy Refinery

<u>2006 RFI Areas of Investigation</u>


AREAS OF CONCERN (AOCs)
SOLID WASTE MANAGEMENT UNITs (SWMUs)
POTENTIAL AREAS OF CONCERN (PAOCs)
MANIFOLDS
TANK BASINS
PROCESS PLANTS
LOADING RACKS
NORTH FIELD
MAIN YARD
MAURER ROAD
CREEK
312
318
302
330
328
327
306
305
20
LEGEND
Proposed Soil Boring
Proposed Deep Well
Proposed Shallow Well
Hydropunch
Piezometer
Soil Boring
Monitoring Well
Water Sewer System
M > 100 ppm
LNAPL Extent
TEL Burial
SWMU
PAOC
AOC
Property Line
MYNF Sub-Areas
50 40 0 50 Feet
MAIN YARD/NORTH FIELD AREA
RFI AREAS OF INVESTIGATION
2006
Chevron
MTK
MWB
1
2006_MYNF_RFI_Inv
7/26/2006

Attachment C

RFI Comments – Main Yard Area

General MY/NF Comments

- RFI Comment #2 (Sitewide) – Vertical delineation of soil and groundwater contamination is not completed
- RFI Comment #102 (NF/MY) – All groundwater contamination (e.g., more persistent or more mobile chemicals present) must be considered during the CMS and not just focused on benzene.

MY1

- RFI Comment #23 (SWMU 51) – Chevron has concluded that the Oily Soil Pad (SWMU 51) does not require action per Module III of the HSWA Permit. While that may or may not be true, this potential area of concern does require investigation under the New Jersey Technical Requirements for Site Remediation (7:26E).
- RFI Comment #107 (AOC 33/34) – Delineate the extent of groundwater contamination north of well MW-179 and install permanent monitoring wells to monitor the plume.

MY2

- RFI Comment #116 (SWMU 44) - Chevron states "regardless of flow direction, MW-39 is surrounded by clean wells". The Department does not concur as according to figure 8-16, MW-137 has 280 ug/L benzene. It is noted that MW-137 is over 200 feet from MW-0039. Chevron shall characterize the extent of groundwater contamination between MW-0039 and MW-137. After the extent of contamination has been determined, Chevron shall install permanent monitor wells in this area to monitor contaminant trends.

MY3

- RFI Comment #27 (AOC 19) - Chevron's request for no further action in the aforementioned investigative areas cannot be accepted at this time. Chevron shall address the potential for soil sources of groundwater contamination for each of these areas.
- RFI Comment #51 (AOC 19) - Chevron indicates that M133A1 was installed side gradient from the LNAPL area. This well later developed trace amounts of LNAPL. LNAPL has not been satisfactorily delineated in this area. Chevron must continue delineating free and residual NAPL in the area surrounding MW-133.
- RFI Comment #52 (AOC 19) - Chevron indicates that the lateral extent of LNAPL at AOC 19 has been delineated. The Department cannot concur with this

determination at this time. Additional delineation is required in the area surrounding MW-133 and A19TP7.

- RFI Comment #54 (AOC 19) - Chevron indicates that an additional piezometer will be installed south of MW-133 if only NAPL detection persists. The NJDEP cannot concur. A boring program shall be instituted to delineate the extent of free and residual NAPL in this area at this time. The Department is particularly concerned that this NAPL is found adjacent to the refinery sewer system. This may be a preferential pathway for NAPL and dissolved contaminant migration.
- RFI Comment #113 (AOC 19) - Chevron proposes to continue monitoring this contamination. This proposal is acceptable. The Department withholds comment concerning delineation of this area until a large-scale map of the area, as required above, is submitted showing sampling results and ground water flow direction. According to figure 8-10, it appears that inadequate sampling has been performed to the north. However, ground water contours for the immediate area surrounding MW-133 are not shown, and no water level measurement is available.

NF2

- RFI Comment #26 (AOC 16) – Determine potential source areas in soil upgradient of NF2 sample locations H0312, H0316, and H0458.
- RFI Comment #55 (AOC 16) – Chevron must complete delineation of the horizontal and vertical extent of a dissolved plume located downgradient of AOC 16/NF2 area (Well NF-11 and H03010).
- RFI Comment #49 (SWMU 43) – Further LNAPL delineation is required once decontamination pad is removed.
- RFI Comment #8 (SWMA 3) - Chevron has elected to defer further investigation of SWMA 3 due to the ongoing activities associated with the closure of the North Field Basin (SWMU 1) and Surge Pond (SWMU 2). This is currently acceptable, however Chevron shall provide to the Department a projected timeframe for implementation of the investigation at SWMA 3.

NF3A

- RFI Comment #16 (SWMU 19) - Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. Based on the quality of the site map and other data gaps, it is difficult to verify if this assessment is correct as it relates to volatile organic compounds (VOCs) in SWMU 19.
- RFI Comment #18 (SWMU 19) - Further delineation may be necessary for VOCs (benzene being the primary indicator) after review of the supplemental information for SWMU 19.
- RFI Comment #20 (SWMU 35) - There is no discussion about investigating or delineating contamination that may be associated with the feeder ditch that is

located off the southwest comer of the separator footprint. Chevron should clarify this issue.

- RFI Comment #24 (AOC 6A) - Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to VOCs and SVOCs in AOC 6A. Chevron should verify that the current berm and road configuration existed during the times that the No. 4 Separator operated. Further delineation may be necessary for VOCs (benzene being the primary indicator) and SVOCs (benzo(a)pyrene being the primary indicator).

NF3B

- RFI Comment #101 (AOC 9/SWMU 20) - Chevron states "MW-180 is a deeper well screened in the first water bearing zone beneath the fill/native interface". The concentrations of VOCs in this well indicate that vertical delineation has not been accomplished in the North Field/Main Yard. Chevron shall complete vertical delineation of contamination to complete the RFI.
- RFI Comment #109 (AOC 9/SWMU 20) - Chevron indicates that groundwater contamination was found in deep monitor well MW-180. The horizontal and vertical extent of this contamination must be delineated.
- RFI Comment #110 (AOC 9/SWMU 20) - Chevron indicates that groundwater flow is towards Tank Basin 302 and 330 in this area potentially due to a sump. In addition to this possibility, Chevron shall determine if there is a downward vertical gradient between monitor well MW-10 and MW-180.
- RFI Comment #111 (AOC 9/SWMU 20) - Chevron indicates that additional investigation will be conducted for the groundwater contamination found in monitor well MW-180. Chevron indicates that a report will be submitted after this investigation is completed. The proposal is acceptable.
- RFI Comment #19 (SWMU 20) - Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP cannot concur with this assessment as it relates to lead and TEL/TOL in SWMU 20. Chevron should verify that the current berm configuration existed at the time the source material was placed in this area. Further delineation may be necessary for lead and TEL/TOL along all sides.
- RFI Comment #26 (AOC 16) - As previously noted in the Department's review of the Chevron Phase II OWSS Report, the sampling strategy for the Phase II OWSS Investigation was modified to emphasize groundwater as the primary media to assess contaminant impact. The Department agreed to this approach due to the random nature of soil contamination associated with miles of pipeline where a potential source is unknown. Groundwater is a more accurate indicator of a release in a broad area of concern. On a number of the investigation areas, significantly high contaminant levels were detected in ground water, indicating a likely source of groundwater contamination upgradient of the sample location. Therefore, a soil investigation of the potential source areas must be undertaken

and reflected in the recommendation sections of the Report. These investigation areas include: NF3 – H0319 (volatiles, semi-volatiles, lead)

- RFI Comment #49 (SWMU 43) - Chevron indicates that the LNAPL at SWMU 43 does not extend beyond the decontamination pad. Additional delineation is required in this area beneath the pad. Chevron shall complete delineation after the decontamination pad is removed.
- RFI Comment #8 (SWMA 3) - Chevron has elected to defer further investigation of SWMA 3 due to the ongoing activities associated with the closure of the North Field Basin (SWMU 1) and Surge Pond (SWMU 2). This is currently acceptable, however Chevron shall provide to the Department a projected timeframe for implementation of the investigation at SWMA 3.

NF5

- RFI Comment #11 (SWMU 17) - The discussion on SWMU 17 does not make reference to the significance of the elevated benzene concentrations in soils. Chevron should clarify whether this is related to an unknown source.
- RFI Comment #12 (SWMU 17) - Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to volatile organic compounds (VOCs) in SWMU 17. Further delineation is necessary for VOCs (benzene being the primary indicator) along the western and northern sides.
- RFI Comment #13 (SWMU 18) - The discussion on SWMU 18 does not make reference to the significance of the elevated benzene concentrations in soils. Chevron should clarify whether this is related to an unknown source.
- RFI Comment #14 (SWMU 18) - Chevron concludes in Section 6 (page 129) that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to volatile organic compounds (VOCs) in SWMU 18. Further delineation is necessary for VOCs (benzene being the primary indicator) along the western and southern sides.
- RFI Comment #48 (SWMU 41) - Chevron indicates that the LNAPL area at SWMU 41 does not pose a threat to Woodbridge Creek. Chevron shall install a permanent monitor well at the location of H0903 and include this well in the monitoring program to confirm dissolved constituents are not migrating to the Woodbridge Creek.
- RFI Comment #129 (SWMU 41) - The groundwater NFA request for SWMU 41 in Table ES-1 cannot be accepted at this time. Groundwater monitoring and remediation will be required in this area since LNAPL has been found.

NF6

- RFI Comment #50 (AOC 8) - Chevron indicates that "no indications have been found that would suggest AOC8-NF6 is receiving LNAPL from ongoing or upgradient sources". Chevron shall detail the potential sources (tanks, crude unit etc.) of the NAPL found in this area. Chevron shall indicate if any of the potential sources are currently in use. This information is required to confirm that there are no potential ongoing sources of NAPL in the area.
- RFI Comment #53 (AOC 8) - Chevron indicates that piezometer A19TP7 is located upgradient from the AOC8-NF6 NAPL area. However, according to figure 7-6, it appears that this piezometer is located downgradient from the NAPL area. The statement should be revised. Additional delineation of this NAPL is required both downgradient from A19TP7 and between the AOC8-NF6 area and this piezometer.
- RFI Comment #128 (SWMU 7) Chevron states that lead was detected in groundwater samples collected at H0442 but was not detected in samples collected from monitor well MW-127 collected via low flow purge methods. The Department notes that MW-127 is located approximately 40 feet from the location of the TEL burial. The request for no further investigation concerning groundwater cannot be accepted at this time. A groundwater sample shall be collected from the area of worst-case soil contamination.
- RFI Comment #10 (SWMU 16) - The discussion on SWMU 16 does not make reference to the significance of the elevated benzene concentrations in soils. Chevron should clarify whether this is related to the LNAPL plume or if there is another source.
- RFI Comment #22 (SWMU 40) - Samples were collected from only one location within the footprint of the former surface impoundment at SWMU 40 and analyzed for full parameters. One additional location was sampled from the rectangular area and analyzed for full parameters. The results from these two locations fail to properly characterize this area. The NJDEP reserves judgement on the appropriateness of moving on to the CMS pending the discussion on the proposed corrective measure for SWMU 40.
- RFI Comment #45 (SWMU 40) - Chevron indicates that the extent of LNAPL has been defined using piezometers and permanent wells. According to figure 7-2, the most downgradient permanent monitor well (MW-33) contained LNAPL. Therefore, Chevron shall propose to install additional permanent monitor wells downgradient from MW-33 and HP-0001-P. The purpose of these wells will be to monitor for the presence of NAPL and to monitor groundwater quality. While a boring program was completed along Woodbridge Creek and no NAPL was detected, there is a need to regularly monitor groundwater quality as it discharges to the Woodbridge Creek located close to this AOC.
- RFI Comment #46 (SWMU 40) - Chevron indicates that the lateral delineation of LNAPL at SWMU 40 was completed with NFTP2, MW-124, MW-125 and MW-126. The distance between LNAPL delineation points at SWMU 40 is large considering that LNAPL is found in discontinuous pockets and lenses. The spacing of the sampling grid should match the expected size of the LNAPL

pockets. For example, according to figure 7-2, it can be determined that LNAPL ends somewhere between HP-0001-P and monitor well MW-126, a distance of approximately ninety feet. In order to evaluate potential corrective measures at this SWMU, it will be necessary to have a better grasp on the lateral extent of the contamination and the location of additional pockets of LNAPL.

- RFI Comment #47 (SWMU 40) - Chevron indicates that the lack of VOCs above the groundwater criteria suggest that the NAPL does not pose a threat to groundwater or any nearby sensitive receptors. The Department notes that semi-volatile organic compounds have been detected in H0840. These compounds may have an impact on the Woodbridge Creek. This potential needs additional evaluation. Chevron shall propose to collect sediment samples from the Woodbridge Creek at a location downgradient from SWMU 40.
- RFI Comment #26 (AOC 16) - As previously noted in the Department's review of the Chevron Phase II OWSS Report, the sampling strategy for the Phase II OWSS Investigation was modified to emphasize ground water as the primary media to assess contaminant impact. The Department agreed to this approach due to the random nature of soil contamination associated with miles of pipeline where a potential source is unknown. Groundwater is a more accurate indicator of a release in a broad area of concern. On a number of the investigation areas, significantly high contaminant levels were detected in groundwater, indicating a likely source of groundwater contamination upgradient of the sample location. Therefore, a soil investigation of the potential source areas must be undertaken and reflected in the recommendation sections of the Report. These investigation areas include:
    - NF5 – H0325 (volatiles), H0326 (volatiles), H0327 (volatiles), H0328 (lead), H0443 (volatiles)
- RFI Comment #58 (AOC 16) - Figure 7-10 shows groundwater flow direction toward the Woodbridge Creek. This is contradicted by figure 8-10, which shows that ground water flow direction is toward an area between Tanks 327 and 301. Groundwater flow direction and hence contaminant fate may be influenced by subsurface utilities. Chevron must more accurately determine the fate of contamination from AOC 16 Investigation Area NF5. Chevron shall install two monitor wells to more accurately determine local groundwater flow direction. The wells shall be installed at the locations of NF5TP5 and NF5TP4. If it is found that local ground water flow is significantly different from that depicted on figure 7-10, then Chevron shall propose additional sampling to delineate contamination in the direction of groundwater flow.

ATTACHMENT D
PROPOSED ADDITIONAL RFI BORINGS

Investigation Area NF2			
Proposed ID	**Samples**	**Parameters**	**Purpose**
NF2PB1	Fill & Native	VOCs	Characterize most impacted zone and vertically delineate VOCs
NF2PB2	Fill & Native	VOCs	Characterize most impacted zone and vertically delineate VOCs
NF2PB3	Fill & Native	VOCs	Characterize most impacted zone and vertically delineate VOCs
NF2PB4	Fill & Native (1)	VOCs	Characterize most impacted zone if necessary and horizontally delineate VOCs
NF2PB5	Fill & Native (1)	VOCs	Characterize most impacted zone if necessary and horizontally delineate VOCs
NF2PB6	Fill & Native (1)	VOCs	Characterize most impacted zone if necessary and horizontally delineate VOCs
NF2PB7	Fill	VOCs	Horizontally delineate VOCs
NF2PB8	Fill & Native	VOCs	Charectarize most impacted zone if necessary and horizontally delineate VOCs
NF2PB9	Fill & Native	VOCs	Characterize most impacted zone if necessary and horizontally delineate VOCs
NF2PB10	Fill & Native	VOCs	Characterize most impacted zone if necessary and horizontally delineate VOCs
Investigation Area NF3A			
Proposed ID	**Samples**	**Parameters**	**Purpose**
NF3APB1	Fill & Native	RFI	Characterize location with RFI parameters
NF3APB2	Fill & Native	RFI	Characterize location with RFI parameters
NF3APB3	Fill & Native	Contingent on RFI samples	Characterize most impacted zone and vertically delineate COCs
NF3APB4	Fill & Native	RFI	Characterize location with RFI parameters
NF3APB5	Fill & Native	VOCs, SVOCs & Arsenic	Characterize most impacted zone and vertically delineate COCs
NF3APB6	Fill & Native	Contingent on RFI samples	Characterize most impacted zone and vertically delineate COCs
NF3APB7	Fill & Native	RFI	Characterize location with RFI parameters
NF3APB8	Fill & Native	VOCs, Arsenic	Characterize most impacted zone and vertically delineate COCs
NF3APB9	Fill & Native	VOCs, Contingent Arsenic	Characterize most impacted zone and vertically delineate COCs
NF3APB10	Fill & Native	VOCs, SVOCs	Characterize most impacted zone and vertically delineate COCs
NF3APB11	Native	VOCs, SVOCs, Arsenic	Vertically delineate COCs

Notes:
(1) = Will collect native sample if field screen data indicates it is necessary
(2) = Additional COCs contingent on samples analyzed for RFI parameters
COCs = Contaminants of Concern
RFI = TCL VOCs+10, TCL SVOCs+20 & TAL Metals

ATTACHMENT D
PROPOSED ADDITIONAL RFI BORINGS

Investigation Area NF3B			
Proposed ID	**Samples**	**Parameters**	**Purpose**
NF3BPB1	Fill & Native	Lead & TOL	Delineate lead exceedances at SWMU 20
NF3BPB2	Fill & Native	Lead & TOL	Delineate lead exceedances at SWMU 20
NF3BPB3	Fill & Native	Lead & TOL	Delineate lead exceedances at SWMU 20
NF3BPB4	Fill & Native	Lead & TOL	Delineate lead exceedances at SWMU 20
NF3BPB5	Fill & Native	Lead & TOL	Delineate lead exceedances at SWMU 20
Investigation Area NF5			
Proposed ID	**Samples**	**Parameters**	**Purpose**
NF5PB1	Native	VOCs, Arsenic & Lead	Vertical delineation for COCs
NF5PB2	Fill & Native	VOCs, Arsenic & Lead	Characterize most impacted zone and vertically delineate COCs
NF5PB3	Fill & Native	VOCs, Arsenic & Lead	Characterize most impacted zone and vertically delineate COCs
NF5PB4	Fill & Native	VOCs, SVOCs, Arsenic & Lead	Characterize most impacted zone and vertically delineate COCs
NF5PB5	Native	VOCs, Arsenic & Lead	Vertical delineation for COCs
NF5PB6	Native	VOCs, Arsenic & Lead	Vertical delineation for COCs
NF5PB7	Fill & Native	VOCs, Arsenic & Lead	Characterize most impacted zone and vertically delineate COCs
Investigation Area NF6			
Proposed ID	**Samples**	**Parameters**	**Purpose**
NF6PB1	Fill & Native	RFI	Characterize location with RFI parameters
NF6PB2	Fill	VOCs (2)	Horizontally delineate VOCs
NF6PB3	Fill	VOCs & Lead (2)	Horizontally delineate VOCs and Lead
NF6PB4	Fill	VOCs (2)	Horizontally delineate VOCs
NF6PB5	Fill	VOCs (2)	Horizontally delineate VOCs
NF6PB6	Fill & Native	VOCs (2)	Charectarize most impacted zone and vertically delineate VOCs
NF6PB7	Fill & Native	RFI	Characterize location with RFI parameters
NF6PB8	Fill & Native	VOCs & Arsenic (2)	Charectarize most impacted zone and vertically delineate VOCs & Arsenic
NF6PB9	Fill & Native	RFI	Characterize location with RFI parameters
NF6PB10	Fill & Native	RFI	Characterize location with RFI parameters

Notes:
(1) = Will collect native sample if field screen data indicates it is necessary
(2) = Additional COCs contingent on samples analyzed for RFI parameters
COCs = Contaminants of Concern
RFI = TCL VOCs+10, TCL SVOCs+20 & TAL Metals

Rec'd 11/9/06

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

NOV - 2 2006

Mr. Robert Lavorario
Environmental Project Manager
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Chevron Products Company, a Division of Chevron U.S.A., Inc. (Chevron)
Perth Amboy, Middlesex County, New Jersey, NJD081982902
Letter from Chevron dated July 31, 2006 responding to USEPA's Comment Letter on Full RFI Report dated January 21, 2005

Dear Mr. Lavorario:

The U.S. Environmental Protection Agency (EPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP) have reviewed the letter cited above. Enclosed please find a letter from NJDEP dated September 27, 2006. Please provide to EPA and NJDEP by November 30, 2006 a response and all of the information and documents requested in the NJDEP September 27 comment letter.

The identification and investigation of all Solid Waste Management Units (SWMUs) and Areas of Concerns (AOCs) at the Chevron, Perth Amboy, New Jersey facility have been addressed since the issuance of the HSWA permit in 1994. In July 2002, Chevron identified Potential Areas of Concern (PAOCs) in response to NJDEP's request. The PAOCs however, have not yet been investigated under the HSWA Permit because they were not formally designated as SWMUs or AOCs as defined in the HSWA Permit. However, during the July 13, 2006 meeting, Chevron presented a proposal to group all SWMUs, AOCs, and PAOCs, except a few, located across North Field/Main Yard Area into eight (8) Areas of Investigation (AOIs). This proposal is generally acceptable to EPA as long as the investigations result in identification of the full scope of constituents of concern at each of the AOIs and delineate the full extent of contamination, vertically and horizontally. Furthermore, EPA does not object if Chevron includes investigations of PAOCs into the corrective action process, as required pursuant to the HSWA Permit.

In addition, please be advised that some of the comments in the the enclosed NJDEP September 27 letter are related to NJDEP-specific requirements, such as the Tech Rules. Your response to these comments should be addressed directly to NJDEP since they are not requirements of the EPA HSWA Permit.

In a letter to Chevron dated August 31, 2006, NJDEP determined that the East Yard Basin and the North Field Basin at the facility were protective filers. Nevertheless, the units are subject to the corrective action requirements of the HSWA Permit. Please provide EPA and NJDEP with an approach and schedules to address the corrective action for these units as required under the HSWA permit.

If you have any questions or require more information, please contact me at 212-637-4184 or at park.andy@epa.gov.

Sincerely yours,

Andrew Park
New Jersey Section
RCRA Programs Branch

Enclosure

cc: Anthony Cinque, NJDEP, w/o encl.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

September 27, 2006

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

NOTICE OF DEFICIENCY

Re: Chevron Products Company, a Division of Chevron U.S.A., Inc. (Chevron)
Perth Amboy, Middlesex County, New Jersey
EPA ID #NJD081982902
USEPA Comment Letter on Full RFI Report dated January 21, 2005
SRP PI# 003621

Dear Mr. Park:

The Department acknowledges receipt on August 4, 2006 of the USEPA Comment Letter on Full RFI Report dated January 21, 2005 submitted pursuant to the HSWA Permit executed by Chevron and the Technical Requirements for Site Remediation at N.J.A.C. 7:26E.

Deficiencies

The Department has determined that the above referenced document reflects the following deficiencies:

Source Characterization - Soils, Chapter 6: As previously specified, arsenic was detected in excess of the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) in approximately 15% of the soil samples collected at the Chevron site. Chevron claims that the elevated arsenic is resulting from either natural background or anthropogenic, off-site sources. Thus, Chevron has concluded that arsenic is not a facility-related chemical.

While the NJDEP concurs that natural background concentrations have been found in the State of New Jersey in excess of the 20 parts per million (ppm) RDCSCC, Chevron has not shown that this is the case. The Technical Regulations for Site Remediation (N.J.A.C. 7:26E) provide a mechanism to establish natural background in N.J.A.C. 7:26E-3.10. If Chevron wants to assert natural background, the appropriate procedures must be employed. Chevron's request to exclude arsenic from the list of site contaminants is not acceptable to the NJDEP at this time.

Overview of Waste Management Practices, Section 2.3: As previously specified, numerous wastewater discharge points are reported along Woodbridge Creek related to waste management practices prior to 1976. This includes separators, ponds, and mudflats (as further discussed in Section 6.1.3 of the Full RFI Report). Pursuant to N.J.A.C. 7:26E-3.1(c)1, the locations of these discharges shall be noted on a site map and targeted as part of the surface water and sediment investigation.

Potential Areas of Concern: The Full RFI Report did not address the Potential Areas of Concern (PAOCs) identified separately by the NJDEP. Therefore, there were no technical comments in the Full RFI Report on the PAOCs.

In the response to comments, Chevron has decided to include the PAOCs as part of the newly defined Areas of Investigation (AOI). This is unacceptable to the NJDEP.

The original comments from the USEPA and the NJDEP on the RFI Report did not consider the potential contamination associated with these PAOCs. The Full RFI did not include investigative approaches and sampling targeted to these PAOCs. Thus, to include these new areas within the supplemental investigation is inappropriate. In addition, these PAOCs have not gone through an initial investigative phase.

Chevron shall first respond to the Department's technical comments on the list of PAOCs submitted by Chevron in July 2002. Once the PAOCs are properly identified, Chevron shall provide a remedial investigation work plan, consistent with N.J.A.C. 7:26E-4 to address the PAOCs independent of the RFI process.

AOC 19, MY3: As previously specified, Chevron concludes in the Full RFI Report that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP does not concur with this assessment as it relates to SVOCs in AOC 19. Further delineation pursuant to N.J.A.C. 7:26E-4.1(b) may be necessary for SVOCs (benzo(a)pyrene being the primary indicator). This was not addressed in the Response Letter.

SWMA 3, NF2: As previously specified, Chevron chose to defer further investigation of SWMA 3 due to the ongoing activities associated with the closure of the North Field Basin (SWMU 1) and Surge Pond (SWMU 2). At the time, the NJDEP found this approach generally acceptable. However, the closure has now been completed. Pursuant to N.J.A.C. 7:26E-4.2(a) and 4.2(b)1 Chevron shall provide to the Department a projected timeframe for implementation of the investigation at SMWA 3.

SWMU 19, NF3A: As previously specified the site map for SWMU 19 in the Full RFI Report is very difficult to read. There are many sample points labeled on the map, to the point that the numbers overlap each other and make the map difficult to read. Chevron shall utilize maps at a greater scale than 1"=50' when the sample points and their labels are too tightly compressed together. Pursuant to N.J.A.C. 7:26E-4.2(b)7 Chevron shall provide a new map to address this issue.

Figure 6-2 of the Full RFI Report defines the limits of exceedances for VOCs based on what appears to be elevated roadways. The NJDEP is unclear as to whether Chevron considers the roadways justification. Without knowing the source of the soil contamination, it is difficult for the Department to conclude that the proposed boundaries are appropriate without clean verification samples outside the limits. Pursuant to N.J.A.C. 7:26E-4.1(b) Chevron shall clarify these issues.

SWMU 35, NF3A: There is no discussion in the Full RFI Report about investigating or delineating contamination that may be associated with the feeder ditch that is located off the southwest corner of the separator footprint. Likewise, the Response Letter fails to address this deficiency. Pursuant to N.J.A.C. 7:26E-4.1(b) Chevron shall propose an investigation for this area.

AOC 6A, NF3A: As previously specified, Chevron concludes in the Full RFI Report that vertical and horizontal delineation of soil exceedances of COCs on an area or site-wide basis has been achieved. The NJDEP disagrees with this assessment as it relates to VOCs and SVOCs in AOC 6A. (i.e. Chevron must verify that the current berm and road configuration existed during the times that the No. 4 Separator operated). Pursuant to N.J.A.C. 7:26E-4.1(b) further delineation may be necessary for VOCs (benzene being the primary indicator) and SVOCs (benzo(a)pyrene being the primary indicator).

SWMU 40, NF6: As previously specified, Chevron shall clarify the relationship of the former surface impoundment (circular structure on Figure 6-14 of the Full RFI Report) with the rectangular configuration adjacent to the south of the former surface impoundment. The NJDEP is unclear to whether this is the oil/water separator. Pursuant to N.J.A.C. 7:26E-3.1(c)1 this issue must be clarified.

Samples were collected from only one location within the footprint of the former surface impoundment at SWMU 40 and analyzed for full parameters. One additional location was sampled from the rectangular area and analyzed for full parameters. The results from these two locations fail to properly characterize this area. Pursuant to N.J.A.C. 7:26E-4.1(b) additional samples shall be collected from these areas to better characterize them.

AOC 16, Section A.2.31: As previously noted in the Department's review of the Chevron Phase II OWSS Report and the Full RFI Report, the sampling strategy for the Phase II OWSS Investigation was modified to emphasize ground water as the primary media to assess contaminant impact. The Department agreed to this approach due to the random nature of soil contamination associated with miles of pipeline where a potential source is unknown. Ground water is a more accurate indicator of a release in a broad area of concern.

On a number of the investigation areas, significantly high contaminant levels were detected in ground water, indicating a likely source of ground water contamination upgradient of the sample location. Therefore, pursuant to N.J.A.C. 7:26E-4.3(a) a soil investigation of the potential source areas must be undertaken.

These investigation areas not addressed in the Response Letter include:

- MY3 – H0303 (volatiles), H0452 (metals)
- NF4 – H0324 (benzene), H0423 (benzene)
- NF5 – H0325 (volatiles), H0326 (volatiles), H0327 (volatiles), H0328 (lead), H0443 (volatiles)
- NF6 – H0442 (lead), H0444 (volatiles), H0465 (volatiles)

Corrective Actions

The NJDEP requests that Chevron address the noted corrective actions by revising and resubmitting the above referenced document. Note that deficiencies included herein which are not addressed to the Department's satisfaction within the specified time period will be subject to the provisions at N.J.A.C. 7:26C-10 and N.J.A.C. 7:26C-3.3(c)2-4. To determine whether the uncorrected deficiencies will be non-minor violations subject to penalty or MOA termination, or minor violations allowed a grace period for correction, Chevron may refer to the table at N.J.A.C. 7:26C-10.4(c).

If Chevron requires copies of Departmental Guidance Documents or applications, many of these are available on the internet at www.state.nj.us/dep/srp. If you have any questions regarding this matter please contact me at (609) 633-1416 prior to the date indicated.

Sincerely,

Anthony Cinque, Case Manager
Bureau of Case Management

c: John Boyer, BEERA
Anne Pavelka, BGWPA

New Jersey Department of Environmental Protection
Site Remediation and Waste Management
September 18, 2006

NOTICE

The Department has amended subchapter 10 of the Department Oversight of the Remediation of Contaminated Sites Rule, N.J.A.C. 7:26C (Oversight Rule), to set forth penalties for violations of portions of the Underground Storage Tank Rule, N.J.A.C. 7:14B (UST Rule), the Industrial Site Recovery Act Rule, N.J.A.C. 26B (ISRA Rule), the Oversight Rule, and the Technical Requirements for Site Remediation Rules, N.J.A.C. 7:26E (Technical Requirements). Through the amendments the Department has identified these violations as either minor or non-minor in accordance N.J.S.A. 13:1D-125 et seq, commonly known as the Grace Period Law. In addition, the Department has amended Subchapter 3 of the Oversight Rules regarding the Memoranda of Agreement (MOA) application and termination process, establishing a period of time, consistent with the grace period applicable for non-MOA cases, for the correction of deficiencies prior to MOA termination. The rule adoption was published in the New Jersey Register on September 18, 2006, and the rule became effective on that date.

The Department has made some policy and procedural changes to facilitate implementation of this rule amendment. In summary, parties responsible for conducting remediation will receive a Notice of Deficiency (NOD) in lieu of the comment or deficiency letter formerly issued in response to deficient submittals. An opportunity will be afforded to correct deficiencies before they are considered to be minor or non-minor violations subject to the rule provisions included in N.J.A.C 7:26C-10. Correspondence related to a party's failure to comply with their obligations under a rule or oversight document, including failure to comply with the Technical Requirements at N.J.A.C. 7:26E, will be relayed to the party who is obligated to comply rather than to their designated agent, consultant or attorney. Conditional approvals will no longer be issued. Full compliance with the Technical Requirements and the Department's comments is required prior to the approval of submittals related to remediation. Please consult the attached fact sheet for more detail.

New Jersey Department of Environmental Protection
Site Remediation and Waste Management
September 18, 2006

Implementation of the Grace Period Rule

The Department has amended subchapter 10 of the Department Oversight of the Remediation of Contaminated Sites Rule, N.J.A.C. 7:26C (Oversight Rule), to set forth penalties for violations of the Underground Storage Tank Rule, N.J.A.C. 7:14B (UST Rule), the Industrial Site Recovery Act Rule, N.J.A.C. 26B (ISRA Rule), the Oversight Rule, and the Technical Requirements for Site Remediation Rules, N.J.A.C. 7:26E (Technical Requirements). Through the amendments the Department has identified these violations as either minor or non-minor in accordance N.J.S.A. 13:1D-125 et seq, commonly known as the Grace Period Law. In addition, the Department has amended Subchapter 3 of the Oversight Rules regarding the Memoranda of Agreement (MOA) application and termination process, establishing a period of time, consistent with the grace period applicable for non-MOA cases, for the correction of deficiencies prior to MOA termination. The rule adoption was published in the New Jersey Register on September 18, 2006, and the rule became effective on that date.

The adoption of the Grace Period rule necessitates some policy and procedural changes for SRWM that will affect parties responsible for conducting remediation, as summarized below.

Notices of Deficiencies

The Department currently relays the results of its review of remediation-related submittals and activities in the form of comment or deficiency letters to the person responsible for conducting remediation or their designee. The Department intends to modify this process slightly by changing the name and form of this communication. Instead of a comment or deficiency letter the Department will issue a Notice of Deficiency (NOD) to the person responsible for conducting remediation that details the deficiencies that need to be addressed. The NOD will link each deficiency to the related regulatory requirement. The party must address each deficiency in accordance with the timeframe established in the NOD. Failure to address deficiencies will result in the Department's issuance of a Notice of Violation (NOV), or a Notice of Intent to Terminate (NOIT) for MOA cases. Non-compliance with the NOV or NOIT, or the occurrence of a non-minor violation, will lead to assessment of penalties prescribed by the Grace Period Rule or the termination of the MOA.

Note that if a party fails to submit a required document at all the Department will issue a NOV, for those designated as minor, instead of a NOD since no submittal will have been made for the Department to evaluate. Basically the party who fails to submit a document by the required date forfeits the benefit of Department review prior to being subject to the application of grace period requirements. When it is made the submittal must fully comply with the Technical Requirements and if it does not a NOV or NOIT will be

issued, instead of a NOD, and penalties or termination will be initiated for non-minor violations.

Point of Contact

Previously the Department's communication was directed to the person designated by the person responsible for conducting remediation. That may have been their attorney or consultant or registered agent. Moving forward the Department will direct all correspondence to the person responsible for conducting remediation. Other parties may be copied if requested. This change is needed for two reasons. First the Department wants to clearly place responsibility for addressing deficiencies and meeting compliance deadlines on the appropriate party. That party may be a person who committed to conduct remediation by applying for a MOA, a party who executed an ACO or Remediation Agreement, or a party who is obligated to conduct remediation by the UST or ISRA statutes. Secondly, the Department's database facilitates issuance of enforcement actions against parties who fail to meet their obligations. Since such actions are taken against the person who has the obligation, all prior correspondence will be directed to that same party to avoid a situation where a party may receive an enforcement action and claim that prior communication of requirements was not received.

Timeframes for Correction of Deficiencies

Currently the timeframes that Case Managers allow for the correction and re-submittal of a deficient document, and for the completion of field work related to remediation, varies in consideration of the scope of the project, site-specific conditions, and the oversight document or rule governing remediation. Generally these variations will continue to be allowed with some standardization. Specifically, when determining the timeframe for corrective actions included in NODs, Case Managers will consider the period of time allowed for correction in the table at N.J.A.C. 7:26C-10.4(c). This timeframe may be adjusted in consideration of additional factors including the risk posed by site conditions, the compliance history of the party, and site specific conditions that may extend or shorten the time needed to accomplish the corrective action.

Extension Requests

Parties responsible for conducting remediation are encouraged to promptly raise & resolve disputes with the CM. Time allowed for the resolution of issues will be determined by the compliance date in the NOD. Extension requests must be in writing, must specify which corrective action the extension request applies to, how long is needed and why, and must be received at least 7 days prior to the compliance date in the NOD or approved applicable schedule. Extension requests will be granted or denied in consideration of the details provided in the request and the risks posed by site-specific conditions.

Note that the above only applies to extensions to compliance dates in the NOD or approved applicable schedule. It does not apply to compliance dates included in an enforcement document such as a NOV. The extension request procedures which apply once an enforcement action is issued are included in the Grace Period Rule at N.J.A.C.

7:26C-10.3(d)4. These procedures limit extension approvals to a single extension of up to 90 days.

Extensions to compliance dates included in a NOD or a NOV/NOIT that are requested due to processing delays on the part of the Department shall be granted (e.g. well search request backlog).

Rejectable Document Policy

The Policy on Document Rejection, which has been posted for several years on SRWM's web site, put forth the SRWM's procedure for handling submittals which are missing key required components, or that depart substantially from providing the technical information required to allow for meaningful Department review. The adoption of the Grace Period Rule makes this policy obsolete so it has been removed from the web site and is no longer an effective SRWM policy. Submittals, which would have previously been rejected under this policy, will now be the subject of a NOD. Because these documents depart so significantly from the requirements of the Technical Requirements that review is not possible or meaningful, the NOD will necessarily be lacking in details. The submittal sent in response to the NOD must be fully compliant with the Technical Requirements or a NOV or NOIT will be issued. Basically, when a party submits a document of such poor quality they have wasted their opportunity to gain meaningful Department input prior to becoming subject to the Grace Period requirements.

Technical Review Panel

The Department established the Technical Review Panel (TRP) as a forum to resolve site-specific technical disputes. With the adoption of the Grace Period Rule clarification is needed regarding the role of the TRP. First, note that the TRP is not an option for issues that are the subject of an enforcement action. This means that a party may not submit a request for TRP review of an issue that has been included in a NOV, AONOCAPA or other enforcement action, and if such a request is received it will be denied. To further clarify, requests must be received prior to the compliance date specified in a NOD or applicable schedule. If a TRP request is received just prior to a compliance date, and if the TRP decides that if will not consider the issue, the TRP will establish a new compliance date the duration of which will not exceed the original corrective action timeframe in the NOD or applicable schedule. If the TRP agrees to consider the issue raised, and if a stay was requested as part of the request, the TRP will hold the compliance date in abeyance and enforcement action will not proceed until such time that a new compliance date is exceeded. The TRP's decision will be issued in writing and a new compliance date will be established.

Variance Requests

Requests for variances from the requirements of the Technical Requirement should be included in submittals for Department approval before implementation whenever possible. If a submittal that is made in response to a NOD includes a variance request as a means to address a deficiency noted by the Department, and if the Department is not able to approve the requested variance, the deficiency will become a violation and

included in a NOV or NOIT. A grace period will be allowed for the correction of minor violations prior to the assessment of penalties.

Minor and Non-minor Violations

The process of submittal review and comment that currently occurs is being replaced by a similar process that includes the issuance of NODs, prior to the application of the Grace Period Rule. This convention is being continued in acknowledgement that professional judgement comes into play when implementing the Technical Requirements. Parties responsible for conducting remediation should evaluate each deficiency included in a NOD against the violations table at N.J.A.C. 7:26C-10.4(c). Deficiencies included in a NOD that are not adequately addressed within the specified timeframe will become violations. Whether they will be minor or non-minor violations can be determined by reference to this table. Minor violations included in a NOV or NOIT will be afforded a grace period for correction. Non-minor violations will be subject to penalty or MOA termination. This means that some deficiencies included in a NOD may immediately warrant a penalty assessment or termination of a MOA if not corrected pursuant to the NOD.

Conditional Approvals

In order to efficiently implement the Grace Period Rule the Department has determined that it must move away from issuing conditional approvals. Conditional approvals blur the line between compliance and non-compliance, cast doubt upon the date that a violation may have occurred, and place the Case Manager in the difficult position of enforcing conditions of approval after the fact. The Department therefore expects that parties conducting remediation will submit documents that can be approved unconditionally. Prior to approving a submittal the Department will seek written agreement from the party responsible for conducting remediation that it accepts and incorporates all Department requirements into the subject work plan or report. Depending upon the scope and nature of the deficiencies a new submittal may be required, an amendment or addendum may be required, or simply a letter documenting correction of the deficiency may suffice. The consequence of not addressing noted deficiencies within the specified timeframe would be the issuance of a NOV or a NOIT for MOA cases. Non-compliance with the NOV or NOIT will lead to assessment of penalties prescribed by the Grace Period Rule or the termination of the MOA.

Chevron

Robert Lavorerio
Environmental Projects
Manager

Chevron Environmental Management Company
1200 State Street
Perth Amboy, NJ 08861
Tel 732-738-2207
Fax 732-738-2039
rlav@chevron.com

November 30, 2006

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

SUBJECT: Chevron Perth Amboy Refinery
Perth Amboy, Middlesex County, New Jersey
EPA ID #NJD081982902
USEPA Comment Letter on Full RFI Report dated November 2, 2006

Dear Mr. Park:

Chevron has prepared this response to the comment letter cited above, concerning our July 31, 2006 response to USEPA's comments on the Full RFI Report for the Perth Amboy Refinery dated January 21, 2005. The USEPA November 2, 2006 letter included additional comments prepared by the NJDEP (September 27, 2006 letter from Anthony Cinque, NJDEP to Andrew Park, USEPA). The two agencies additional comments on Chevron's Full RFI Report concern two main issues: (1) finalizing the investigation of the Solid Waste Management Units (SWMUs); and Areas of Concern (AOCs) identified as part of the HSWA permit and (2) evaluation of Potential Areas of Concern (PAOCs) identified at the request of the NJDEP.

As you know, Chevron is in the process of completing additional field investigation tasks related to the SWMU's and AOCs, including the installation of additional soil borings and monitoring wells. This on-going field work including the installation of approximately 80 additional soil borings, 25 additional monitoring wells and 10 temporary wells, is scheduled to be completed by the end of December 2006. The newly installed permanent wells will then be sampled and gauged in January 2007 and again in April 2007 in order to obtain two quarters of groundwater quality data.

To address the PAOC issue, Chevron intends to submit a PAOC Report in April 2007. Chevron had previously identified approximately 40 units as PAOCs. In 2003, preliminary investigations were conducted for all 40 PAOCs. In a February 13, 2004 letter to USEPA, Chevron identified

thirteen PAOCs which were deemed to be AOCs. A copy of this letter is attached. These initial PAOCs were identified as AOCs 37 through 49 under the provisions of Module III, Section C of the HSWA permit. Site Assessment Reports (SARs) have been prepared for each of these thirteen new AOCs. The SARs are undergoing internal review and will be submitted to USEPA in mid-January 2007. The proposed PAOC Report which will be submitted in April 2007 will provide the results of our evaluation of the remaining PAOCs.

Chevron plans to submit a Supplemental RFI Report in June 2007, which will detail the results of this on-going work. This additional field investigation work should provide the additional data necessary to address the relevant USEPA/NJDEP comments related to the SWMUs and AOCs. Therefore, Chevron is proposing to provide its detailed response to the SWMU, AOC and non-PAOC related comments identified in the USEPA's November 2, 2006 comment letter in the Supplemental RFI Report.

An updated copy of the refinery map which shows all SWMUs, AOCs and PAOCs is also attached for your files. Please feel free to contact me if you have any questions.

Sincerely,

R. Lavorerio
Environmental Projects Manager

cc: Mr. Anthony Cinque, NJDEP, 3 copies
Mr. Ken Siet, TRC Raviv
Mr. Michael Bolen, SAIC

Rec'd
2/26/07
AP

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

February 9, 2007

Andrew Park, Environmental Engineer
Hazardous Facilities Branch
United States Environmental Protection Agency, Region II
290 Broadway, 22nd Floor
New York, NY 10007-1866

Re: USEPA Comment Letter on Full RFI Report dated November 2, 2006
Chevron Products Company, a Division of Chevron U.S.A., Inc. (Chevron)
Perth Amboy, Middlesex County, New Jersey
SRP PI# 003621

Dear Mr. Park:

The New Jersey Department of Environmental Protection (Department) has completed a review of the response to comment letter titled "USEPA Comment Letter on Full RFI Report dated November 2, 2006" received on December 5, 2006. The Department has determined that the above referenced response to comment letter is in compliance with the Technical Requirements for Site Remediation, N.J.A.C. 7:26E and other applicable requirements. The Department hereby approves the response to comment letter effective the date of this letter.

Pursuant to the schedule applicable to the site the additional reports summarizing the additional on-site activities will be submitted in February 2007 and April 2007, respectively. For your convenience, the regulations concerning the Department's remediation requirement can be found at www.state.nj.us/dep/srp.

Thank you for your cooperation in this matter. If you have any questions concerning this approval, please feel free to contact me at (609) 633-1416.

Sincerely,

Anthony Cinque, Case Manager
Bureau of Case Management

C: Health Department
Municipal Clerk
John Boyer, BEERA
Anne Pavelka, BGWPA

Rec'd 3/06/07
RS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

FEB 30 2007

Mr. Robert Lavorario
Environmental Project Manager
Chevron Environmental Management Company
1200 State Street
Perth Amboy, New Jersey 08861

Re: Chevron Products Company, a Division of Chevron U.S.A., Inc. (Chevron)
Perth Amboy, Middlesex County, New Jersey, NJD081982902
Letter from Chevron dated November 30, 2006 Responding to USEPA's Comment Letter on Full RFI Report dated November 2, 2006

Dear Mr. Lavorario:

The U.S. Environmental Protection Agency (EPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP) have reviewed the letter cited above. Enclosed please find a letter from NJDEP dated February 9, 2007. Chevron's Novemebr 30 letter is acceptable to EPA. Please provide EPA and NJDEP with the reports mentioned in the letter in accordance with the schedules. In addition, please provide an update on the Site Assessment Reports (SARs) which was scheduled to be submitted in mid-January 2007, but has not yet been received.

If you have any questions or require more information, please contact me at 212-637-4184 or at park.andy@epa.gov.

Sincerely yours,

Andrew Park
New Jersey Section
RCRA Programs Branch

Enclosure

cc: Anthony Cinque, NJDEP w/o encl.

Chevron

Robert Lavorerio
Area Manager Refining,
U.S East

Chevron Environmental Management Company
1200 State Street
Perth Amboy, NJ 08861
Tel 732-738-2207
Fax 732-738-2039
rlav@chevron.com

October 23, 2007

Mr. Adolph Everett
US EPA Region 2
290 Broadway, Floor 22
New York, NY 10007-1866

Re: Chevron Corporation
Perth Amboy, Middlesex County, New Jersey
HSWA Permit EPA ID# NJD081982902
Project Manager Change Notification

Dear Mr. Everett:

In regard to the Chevron HSWA Permit cited above, Chevron Environmental Management Company (CEMC) is submitting this notification that all project management responsibilities for the Perth Amboy Refinery have been transferred to Mr. Robert Mancini, Project Manager, CEMC. Please direct all future HSWA Permit Corrective Action correspondence and requests to Mr. Mancini. Mr. Mancini's mailing address is CEMC at 1200 State Street, Perth Amboy, NJ 08861. His phone number is 732-738-2023 and his email address is remn@chevron.com.

If you have any concerns, please contact me at (732) 738-2207.

Sincerely,

R. Lavorerio
Area Manager Refining, U.S. East

cc: Mr. Barry Tornick, USEPA Region 2
Mr. Andrew Park, USEPA Region 2
Mr. Anthony Cinque, NJDEP, 3 copies

bcc: R. Mancini
K. Siet, TRC Raviv
M. Bolen, SAIC
J. Vorbach, URS
P. Poplai, Parsons

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APPENDIX B

APPENDIX B

Sediment Core Logs

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER

SED-02-A

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/21/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 5.9 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 6.5 Feet
COORDINATES: X: 621083.9 Y: 558903.1
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							5.9' Water Column; Tide: 4.5'
		52.9		1	GLEY 2 2.5/5B	SM	0 to 6.5' - Dark gray SILT; trace organics. Very soft, wet, odors and black staining.
1							
2		27.2					
3							
	28	17.1					
4							
5		34.3					
6							
		73.4	SED-02-A/6.0-6.5				
7							Refusal at 6.5 feet
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-02-B

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/21/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 6.8 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 8 Feet
COORDINATES: X: 621062.8 Y: 558846.4
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							6.8' Water Column; Tide: 4.7'
		4.6		1	GLEY 2 2.5/5B	SM	0 to 8.0' - Dark gray SILT; trace organics. Very soft, wet, odor and black staining.
1		18.1					
2		34.4					
		16.4					
3		24.8					
4	72	49.1	SED-02-B/3.5-4.0				
		16.5					
5		44.6					
6		22.6					
		20.9					
7		3.5					
8		14.6					
							Refusal at 8 feet.
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-03-B

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/20/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 6.8 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 6 Feet
COORDINATES: X: 621883.7 Y: 557989.3
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							6.8' Water Column; Tide: 3.1'
		1.6		1	GLEY 2 2.5/5B	SM	0 to 6.0' - Dark gray SILT; trace fine sand and organics. Very soft, wet, odor, sheen and black staining.
1		0.9					
2		1.2	SED-03-B/1.5-2.0				
3	42	7.3					
4		20.2					
5		302	SED-03-B/4.5-5.0				
6		26					
							Refusal at 6 feet
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER

SED-03-C

PROJECT NAME: Former Chevron Facility Woodbridge Creek

Location: Perth Amboy, New Jersey

PROJECT NO.: 194098.0000.0000

Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/20/14**

DRILLER: **A.J. Mottola**

LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"

WATER DEPTH: 5.7 feet

BORING METHOD: Vibracore

PENATRATION DEPTH: 8 Feet

COORDINATES: X: 621821.2 Y: 557981.6

BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							5.7' Water Column; Tide: 3.4'
		1.5		1	GLEY 2 2.5/5B	SM	0 to 8.0' - Dark gray SILT; trace fine sand and organics. Very soft, wet, odor, sheen and black staining.
1		10.6					
2		24.4	SED-03-C/1.5-2.0				
3		54.3					
4	60	49.3					
5		110					
		170					
6		278	SED-03-C/6.0-6.5				
7		186					
8		127					
							Refusal at 8 feet
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER

SED-04-C

PROJECT NAME: Former Chevron Facility Woodbridge Creek

Location: Perth Amboy, New Jersey

PROJECT NO.: 194098.0000.0000

Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/20/14**

DRILLER: **A.J. Mottola**

LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"

WATER DEPTH: 7.6 feet

BORING METHOD: Vibracore

PENATRATION DEPTH: 5 Feet

COORDINATES: X: 622085.2 Y: 557864.3

BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							7.6' Water Column; Tide: 3.8'
1	60	ND	SED-04-C/1.5-2.0	1	GLEY 2 2.5/5B	SM	0 to 5.0' - Dark gray SILT; trace fine sand and organics. Very soft, wet, odors.
		1					
		ND					
2		1.8					
		2.4					
3		10.5					
		5.4					
4		3					
		2.4					
5		0.6					
6							Refusal at 5 feet
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-06-B

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/20/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 6.5 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 8 Feet
COORDINATES: X: 622819.7 Y: 557543.7
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							6.5' Water Column; Tide: 4.0'
		ND		1	GLEY 2 2.5/5B	SM	0 to 8.0' - Dark gray SILT; trace fine sand and organics. Very soft, wet, odors, slight sheen.
1		2.2					
2		1.2					
		0.2					
3		2.4					
4	58	3.1	SED-06-B/4.0-4.5				
5		0.5					
6		ND					High organic content 6 to 8'.
7		0.8					
8		16.3					
							Refusal at 8 feet
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-09-A

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/20/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 6.8 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 5 Feet
COORDINATES: X: 623996.8 Y: 556504.0
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							6.8' Water Column; Tide: 4.6'
1	55	ND	SED-09-A/3.0-3.5	1	GLEY 2 2.5/5B	SM	0 to 5.0' - Dark gray SILT; trace fine sand and organics. Very soft, wet, odors.
2		1.4					
3		44.7					
4		35.5					
5		15.6					
6		33.4					
7		67.8					
8		19.2					
9		8.9					
10		33.4					
11							Refusal at 5 feet
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-09-C

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/20/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 4.8 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 5 Feet
COORDINATES: X: 624032.2 Y: 556472.4
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							4.8' Water Column; Tide: 4.5'
		ND		1	GLEY 2 2.5/5B	SM	0 to 5.0' - Dark gray SILT; trace fine sand and organics. Very soft, wet, odors.
1		ND					
2		ND					
	39	ND					
3		4.7					
4		4.5					Some organics and visible sheen @ 4'.
5		133	SED-09-C/4.5-5.0				
							Refusal at 5 feet.
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-19-B

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/21/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 9.5 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 7.5 Feet
COORDINATES: X: 621827.8 Y: 559652.8
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							9.5' Water Column; Tide: 5.0'
		0.9		1	GLEY 2 2.5/5B	SM	0 to 7.5' - Dark gray SILT; trace organics and fine sand. Very soft, wet, odors and black staining.
1		1.4					
2		3.8					
		11.6					
3		2.2					
4	58	6					
5		26.7					
		39.4					
6		107	SED-19-B/6.0-6.5				Little gravel and rock fragments @ 6 to 7.5'.
7		102					
8							Refusal at 7.5 feet
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Woodbridge Creek Subaqueous Sediments

BORING NUMBER SED-19-C

PROJECT NAME: Former Chevron Facility Woodbridge Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: Aqua Survey, Inc.

DATE DRILLED: **03/21/14**
DRILLER: **A.J. Mottola**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Core Barrel/4"
WATER DEPTH: 0.5 feet
BORING METHOD: Vibracore
PENATRATION DEPTH: 9 Feet
COORDINATES: X: 621774.9 Y: 559679.1
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							0.5' Water Column; Tide: 4.9'
	75	5.2		1	GLEY 2 2.5/5B	SM	0 to 9.0' - Dark gray SILT; trace organics. Very soft, wet, odors and black staining.
1		35.1					
2		17.8					
3		22.2					
4		38.6					
5		15.8					
6		11.3					
7		48.9					
8		136					
9		43.8					
		189	SED-19-C/7.5-8.0				
		68.6					
10							Refusal at 9 feet
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Spas Creek Subaqueous Sediments

BORING NUMBER

SED-20-A

PROJECT NAME: Former Chevron Facility Spas Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: NA

DATE DRILLED: **02/28/14**
DRILLER: **NA**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Macrocore/1"
WATER DEPTH: 1.5 feet
BORING METHOD: Hand Driven Split Spoon
PENATRATION DEPTH: 0.5 Feet
COORDINATES: X: 622461.7 Y: 555411.0
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							1.5' Water Column
	6	ND	SED-20-A/0.0-0.5	1	7.5YR 6/6	SW	0 to 0.5' - Fine to coarse, brown SAND, little silt.
1							End of Boring 0.5 feet
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC **Environmental Corporation**

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Spas Creek Subaqueous Sediments

BORING NUMBER

SED-20-C

PROJECT NAME: Former Chevron Facility Spas Creek
Location: Perth Amboy, New Jersey
PROJECT NO.: 194098.0000.0000
Contractor: NA

DATE DRILLED: **02/28/14**
DRILLER: **NA**
LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Macrocore/1"
WATER DEPTH: 1.5 feet
BORING METHOD: Hand Driven Split Spoon
PENATRATION DEPTH: 0.5 Feet
COORDINATES: X: 622461.7 Y: 555411.0
BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							1.5' Water Column
	6	ND	SED-20-C/0.0-0.5	1	7.5YR 6/6	SW	0 to 0.5' - Fine to coarse, brown SAND, little silt.
1							End of Boring 0.5 feet
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Spas Creek Subaqueous Sediments

BORING NUMBER

SED-21-A

PROJECT NAME: Former Chevron Facility Spas Creek

Location: Perth Amboy, New Jersey

PROJECT NO.: 194098.0000.0000

Contractor: NA

DATE DRILLED: **02/28/14**

DRILLER: **NA**

LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Macrocore/1"

WATER DEPTH: 1.5 feet

BORING METHOD: Hand Driven Split Spoon

PENATRATION DEPTH: 0.5 Feet

COORDINATES: X: 622377.3 Y: 555283.1

BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							1.5' Water Column
	6	ND	SED-21-A/0.0-0.5	1	7.5YR 6/6	SW	0 to 0.5' - Fine to coarse, brown SAND, little silt.
1							End of Boring 0.5 feet
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation

41 Spring Street, New Providence, NJ 07974 (908)988-1700

Spas Creek Subaqueous Sediments

BORING NUMBER

SED-21-C

PROJECT NAME: Former Chevron Facility Spas Creek

Location: Perth Amboy, New Jersey

PROJECT NO.: 194098.0000.0000

Contractor: NA

DATE DRILLED: **02/28/14**

DRILLER: **NA**

LOGGED BY: **J. Lenhart**

SAMPLER TYPE/DIA.: Macrocore/1"

WATER DEPTH: 1.5 feet

BORING METHOD: Hand Driven Split Spoon

PENATRATION DEPTH: 0.5 Feet

COORDINATES: X: 622377.3 Y: 555283.1

BOTTOM TYPE: Mud

DEPTH FROM SEDIMENT SURFACE (FEET)	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	HORIZON #	SED. COLOR (MUN.)	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS
0							1.5' Water Column
	6	ND	SED-21-C/0.0-0.5	1	7.5YR 6/6	SW	0 to 0.5' - Fine to coarse, brown SAND, little silt.
1							End of Boring 0.5 feet
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-1-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.53849
RECOVERY (FT)	4.5	LONGITUDE (W):	74.25824
MEAN LOW WATER DEPTH (FT):	-1.9	ESTIMATED ERROR POSITION (FT):	17

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-1-A\0-6	ND	0-6.0' Black clay. Staining and odors.
1	SED-1-A\6-12	72.1	
		62.6	
2		41.1	
		88.4	
3		230	
		80.6	
4		73.5	
		111	
5			
6			
			END OF CORE @ 6 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-1-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5	LATITUDE (N):	40.53854
RECOVERY (FT)	2	LONGITUDE (W):	74.25799
MEAN LOW WATER DEPTH (FT):	6	ESTIMATED ERROR POSITION (FT):	17

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-1-B\0-6	ND	0-5.0' Black clay, soft. Staining and odors throughout.
1	SED-1-B\6-12	2.4	
		4.2	
2		24.9	
3			
4			
5			
			END OF CORE @ 5 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-1-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5	LATITUDE (N):	40.53883
RECOVERY (FT)	3.5	LONGITUDE (W):	74.25796
MEAN LOW WATER DEPTH (FT):	2.5	ESTIMATED ERROR POSITION (FT):	14

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-1-C\0-6	ND	0-5.0' Black clay with organics, moist. Staining and odors throughout.
1	SED-1-C\6-12	2.4	
		30.8	
2		31.8	
		15.4	
3		ND	
		ND	
4			
5			
			END OF CORE @ 5 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-2-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.53878
RECOVERY (FT)	4	LONGITUDE (W):	74.26063
MEAN LOW WATER DEPTH (FT):	N/A	ESTIMATED ERROR POSITION (FT):	13

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-2-A\0-6	21.8	0-6.0' Dark gray to black silt with organics throughout, moist. Moderate staining and odors. Distinct meadowmat layer from 38-39".
1	SED-2-A\6-12	25	
		19	
2		16.5	
		13.5	
3		44.3	
		210	
4		257	
5			
6			
			END OF CORE @ 6 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-2-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.53861
RECOVERY (FT)	4.5	LONGITUDE (W):	74.26053
MEAN LOW WATER DEPTH (FT):	8.4	ESTIMATED ERROR POSITION (FT):	14

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-2-B\0-6	ND	0-1.0' Fine to medium sand and silt with shell fragments, loose. Slight staining and odors.
1	SED-2-B\6-12	ND	1.0-6.0' Brown clayey silt with black staining at 17-18", 26-27" and 40-48". Strong staining and odors from 40-48".
		30	
2		22	
		20	
3		25	
		33	
4		49	
5			
6			
			END OF CORE @ 6 ft
			* Duplicate sample collected.

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-2-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.53851
RECOVERY (FT)	4.5	LONGITUDE (W):	74.26062
MEAN LOW WATER DEPTH (FT):	-0.3	ESTIMATED ERROR POSITION (FT):	27

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-2-C\0-6	25.2	0-0.5' Black silt with organics. Staining and odors.
1	SED-2-C\6-12	9.9	0.5-6.0' Gray brown clayey silt with trace organics throughout. Shell fragments at 4.0'. Black staining to 2.0'.
		49.9	
2		13.5	
		13.7	
3		12.1	
		12.7	
4		12.2	
		11.2	
5			
6			
			END OF CORE @ 6 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-3-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54035
RECOVERY (FT)	4.25	LONGITUDE (W):	74.26269
MEAN LOW WATER DEPTH (FT):	2.6	ESTIMATED ERROR POSITION (FT):	18

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-3-A\0-6	14.6	0-2.25' Black silt, very very soft, very moist to saturated. Staining and odors present throughout. Sheen on water.
1	SED-3-A\6-12	3.3	
		39.7	
2		3.2	2.25-6.0' Brown silty clay, very soft, moist. No staining, slight odor.
		4.7	
3		3.7	
		3.3	
4		3.8	
		2.1	
5			
6			
			END OF CORE @ 6 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-3-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54033
RECOVERY (FT)	4.25	LONGITUDE (W):	74.26289
MEAN LOW WATER DEPTH (FT):	2.6	ESTIMATED ERROR POSITION (FT):	18

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-3-B\0-6	1.9	0-2.25'	Black silt with some sand and shell fragments. Moderate staining and odors througout.
1	SED-3-B\6-12	56.1		
		38.2		
2		7.6		
		10.7	2.25-3.0'	Sand and silt with organics, loose. Strong staining and odors.
3		100		
		55	3.0-6.0'	Dark gray clay, soft.
4		54		
		51		
5				
6				
			END OF CORE @ 6 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-3-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54023
RECOVERY (FT)	5	LONGITUDE (W):	74.26299
MEAN LOW WATER DEPTH (FT):	2.7	ESTIMATED ERROR POSITION (FT):	23

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-3-C\0-6	72.2	0-6' Black silt. Strong odors and staining. Free visual product.
1	SED-3-C\6-12	57.1	
	SED-3-C\12-18	1064	
2		44.4	
		605	
3	SED-3-C\30-36	658	
		745	
4		305	
		359	
5		281	
6			
			END OF CORE @ 6.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-4-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54101
RECOVERY (FT)	4.5	LONGITUDE (W):	74.26343
MEAN LOW WATER DEPTH (FT):	1.2	ESTIMATED ERROR POSITION (FT):	17

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-4-A\0-6	10.8	0-2.75'	Silt with trace organics, very very soft. Staining and odors. Sheen on water.
1	SED-4-A\6-12	4.5		
		5		
2		9.3		
		97.1		
3		12.6	2.75-3.0'	Brown meadowmat
			3.0-3.25'	Black stained meadowmat.
	SED-4-A\39-45	55.5	3.25-4.0'	Black product stained well sorted fine sand with some silt, organics present throughout.
4		26.5		
		3.7	4.0-6.0'	Red-brown to brown silty clay, soft.
5				
6				
			END OF CORE @ 6.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-4-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	1	LATITUDE (N):	40.54097
RECOVERY (FT)	0.75	LONGITUDE (W):	74.26343
MEAN LOW WATER DEPTH (FT):	3.2	ESTIMATED ERROR POSITION (FT):	11

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-4-B\0-6	1.7	0-1.0' Dark brown fine to medium sand with a little silt, some organics and shell fragments, loose, moist. Minor patches of staining throughout.
1	SED-4-B\6-12	2.1	
			REFUSAL @ 1.0 ft In tip of core: dense sand - cannot vibrate through - refusal.

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-4-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54090
RECOVERY (FT)	3.5	LONGITUDE (W):	74.26351
MEAN LOW WATER DEPTH (FT):	3.5	ESTIMATED ERROR POSITION (FT):	12

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-4-C\0-6	28.5	0-6.0' Olive gray to gray clay with organics present throughout, very soft. No staining, slight odors.
1	SED-4-C\6-12	44.3	
		169	
2		70.4	
		38.8	
3		60.4	
		4.5	
4			
5			
6			
			END OF CORE @ 6.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-5-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54160
RECOVERY (FT)	3.5	LONGITUDE (W):	74.26424
MEAN LOW WATER DEPTH (FT):	0.8	ESTIMATED ERROR POSITION (FT):	13

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-5-A\0-6		0-2.0'	Dark brown to black fine to medium sand, loose, moist. No staining nor odors.
	SED-5-A\6-12	1.3		
1		2.5		
		1		
2				
		56.1	2.0-2.25'	Black silt with staining and odors.
			2.25-2.5'	Brown silt with organics.
		38.7	2.5-6.0'	Red-brown to brown silty clay, soft. Minor staining and odor.
3		7.6		
4				
5				
6				
			END OF CORE @ 6.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-5-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5	LATITUDE (N):	40.54161
RECOVERY (FT)	2	LONGITUDE (W):	74.26438
MEAN LOW WATER DEPTH (FT):	2.2	ESTIMATED ERROR POSITION (FT):	12

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-5-B\0-6	ND	0-1.75'	Gravelly sand with some rounded pebbles and shell fragments, loose, saturated. No staining nor odors.
1	SED-5-B\6-12	ND		
		ND	1.75-5.0'	Light gray clay, soft with medium plasticity, moist.
2		ND		
3				
4				
5				
			END OF CORE @ 5.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-5-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54156
RECOVERY (FT)	3.5	LONGITUDE (W):	74.26453
MEAN LOW WATER DEPTH (FT):	0.5	ESTIMATED ERROR POSITION (FT):	12

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-5-C\0-6	1.4	0-2.0'	Black silt with organic material, very soft, saturated with water. Sheen present on water surface.
1	SED-5-C\6-12	2.1		
		2.4		
2		1.7	2.0-6.0'	Light gray silty clay, soft, medium plasticity.
		ND		
3		ND		
		ND		
4				
5				
6				
			END OF CORE @ 6.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-6-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	4	LATITUDE (N):	40.54299
RECOVERY (FT)	2	LONGITUDE (W):	74.26441
MEAN LOW WATER DEPTH (FT):	3.3	ESTIMATED ERROR POSITION (FT):	12

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-6-A\0-6	2	0-4.0' Gray clay with trace sand and shell fragments, some organic material, soft, moist.
1	SED-6-A\6-12	6.3	
		21.9	
2		78.8	
		43.2	
3			
4			
			END OF CORE @ 4.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-6-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5.5	LATITUDE (N):	40.54299
RECOVERY (FT)	4.25	LONGITUDE (W):	74.26454
MEAN LOW WATER DEPTH (FT):	3.3	ESTIMATED ERROR POSITION (FT):	14

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-6-B\0-6	1.1	0-0.75'	Brown medium to coarse sand, loose. No staining nor odors.
1	SED-6-B\6-12	13.7	0.75-3.0'	Brown silt with trace organics. Black staining and odors throughout.
		6.3		
2		5.2		
		17.8		
3		56.1		
			3.0-3.25'	Meadowmat. Black stained.
		41.3	3.25-6.0'	Black silty clay with organics throughout, soft, moist. Staining and odors throughout.
4		49.9		
		13.4		
5		10.9		
6			END OF CORE @ 5.5 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-6-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54301
RECOVERY (FT)	4.25	LONGITUDE (W):	74.26471
MEAN LOW WATER DEPTH (FT):	0.3	ESTIMATED ERROR POSITION (FT):	14

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-6-C\0-6	17.6	0-1.75' Black organic silt, saturated. Staining and odors throughout.
1	SED-6-C\6-12	63.3	
		54.5	1.75-2.5' Meadowmat, moist. Minor staining, moderate odors.
2		43.9	
		59.8	2.5-3.25' Dark grey to black silty clay with organics, soft, moist. Odors.
3		58.2	3.25-6.0' Dark brown well sorted sand, moist to very moist. No staining nor odors.
		24.6	
4		35.9	
		20.6	
5			
6			
			END OF CORE @ 6.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-7-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	4	LATITUDE (N):	40.54413
RECOVERY (FT)	4	LONGITUDE (W):	74.26811
MEAN LOW WATER DEPTH (FT):	0.6	ESTIMATED ERROR POSITION (FT):	13

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-7-A\0-6	***	0-3.25' Olive gray/brown highly organic silt, moist. Black staining and slight odor at 11-12".
		32.6	
	SED-7-A\6-12		
1		45.4	
		13.7	
2		90.2	
		33.3	
3		33.5	
			3.25-3.5' Brown meadowmat, moist. No staining nor odors.
		106	3.5-4.0' Gray/brown clay with some to a little fine sand, little organics throughout, moist. No staining nor odors.
4		29.7	
		***	END OF CORE @ 4 ft
			*** Background PID = 30 ppm. Cleaned sensor afterwards.

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-7-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	3.5	LATITUDE (N):	40.54412
RECOVERY (FT)	2.5	LONGITUDE (W):	74.26808
MEAN LOW WATER DEPTH (FT):	1.9	ESTIMATED ERROR POSITION (FT):	18

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-7-B\0-6	ND	0-0.5' Gray clay, soft. No staining nor odors.
	SED-7-B\6-12		0.5-1.5' Brown meadowmat, moist. No staining nor odors.
1		4.2	
		ND	1.5-3.5' Gray sandy clay with organics, soft, moist. No staining nor odors.
2		3.1	
		ND	
3			
4			END OF CORE @ 3.5 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-7-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	3	LATITUDE (N):	40.54411
RECOVERY (FT)	2.5	LONGITUDE (W):	74.26810
MEAN LOW WATER DEPTH (FT):	0.1	ESTIMATED ERROR POSITION (FT):	18

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-7-C\0-6	44.2	0-3.0' Brown meadowmat, moist. No staining nor odors.
1	SED-7-C\6-12	226	
		188	
2		225	
		268	
3			
			END OF CORE @ 3.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-8-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5.5	LATITUDE (N):	40.54344
RECOVERY (FT)	2.5	LONGITUDE (W):	74.27031
MEAN LOW WATER DEPTH (FT):	-1.7	ESTIMATED ERROR POSITION (FT):	18

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-8-A\0-6	ND	0-2.0' Brown meadowmat, moist. No staining nor odors.
1	SED-8-A\6-12	ND	
		ND	
2		ND	
		ND	2.0-5.5' Gray clay with some organics, moist, soft. No staining nor odors.
3			
4			
5			
			END OF CORE @ 5.5 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-8-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5.5	LATITUDE (N):	40.54341
RECOVERY (FT)	2	LONGITUDE (W):	74.27027
MEAN LOW WATER DEPTH (FT):	-2.9	ESTIMATED ERROR POSITION (FT):	27

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
1	SED-8-C\0-6 SED-8-C\6-12	ND	0-5.5' Brown meadowmat, dry. No staining nor odors.
2		17.9	
3		58.8	
4		15.4	
5			
6			END OF CORE @ 5.5 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-9-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54628
RECOVERY (FT)	5	LONGITUDE (W):	74.26833
MEAN LOW WATER DEPTH (FT):	2.2	ESTIMATED ERROR POSITION (FT):	13

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-9-A\0-6	2.8	0-1.0'	Brown silt with trace sand and organics, soft, moist. Minor staining, no odors.
1	SED-9-A\6-12	1.2	1.0-3.25'	Brown clayey silt, trace organics throughout. Black staining present from 1-2'.
		18.2		
2		97.3		
		30.1		
3		42.7		
		266	3.25-3.5' 3.5-6.0'	Black meadowmat. Staining and odors. Brown clay with organics throughout, soft. No staining nor odors.
4		67		
5		21.8		
		20.8		
6			END OF CORE @ 6.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-9-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6.5	LATITUDE (N):	40.54623
RECOVERY (FT)	4.25	LONGITUDE (W):	74.26859
MEAN LOW WATER DEPTH (FT):	1.1	ESTIMATED ERROR POSITION (FT):	13

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-9-B\0-6	ND	0-0.5'	Brown well sorted fine sand with a little silt, moist.
1	SED-9-B\6-12	5.2	0.5-1.75'	Dark brown to black organic silt. Staining and odors. 1-inch distinct meadowmat layer at 26-27"
		2.1	1.75-6.5'	Brown to grey-brown silty clay, soft. No staining nor odors.
2		1.9		
		ND		
3				
		2.1		
4		9.1		Distinct well sorted sand layer at 43-46 inches. Moist, saturated with staining and slight odors.
5		20.2		
6		6.9		
			END OF CORE @ 6.5 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-9-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54636
RECOVERY (FT)	5	LONGITUDE (W):	74.26860
MEAN LOW WATER DEPTH (FT):	-1.1	ESTIMATED ERROR POSITION (FT):	13

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-9-C\0-6	0.5 13.7	0-2.75'	Black silt with organics, saturated, staining and odors.
	SED-9-C\6-12	1		
1		15.8		
		1.5 41.7 2		
2		30.8		
		2.5 28.8		
	SED-9-C\33-39	3	2.75-3.0'	Distinct meadowmat layer with product globules, strong staining and odors.
3		189		
		3.5 263 4	3.0-4.0'	Gray silty clay with organics, moist, staining and odors.
4		523		
		4.5	4.0-6.0'	Black organic silty clay, very soft, staining and odors.
5		501		
		5		
6		218		
			END OF CORE @ 6.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-10-A PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5	LATITUDE (N):	40.55490
RECOVERY (FT)	4	LONGITUDE (W):	74.26707
MEAN LOW WATER DEPTH (FT):	-0.2	ESTIMATED ERROR POSITION (FT):	17

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-10-A\0-6	ND	0-0.75'	Brown medium to coarse sand, loose, moist. No staining nor odors.
	SED-10-A\6-12			
1		1	0.75-1.0'	Brown fine sand and silt, moist. Slight odor and staining.
			1.0-2.25'	Brown to dark brown clayey silt with trace fine sand. No staining nor odors.
		ND		
2		38.8		
			2.25-2.5'	Brown well sorted sand, loose, moist. No staining nor odors.
		5.6		
			2.5-5.0'	Gray/brown clay with a little organics,soft, moist.
3				
		5.6		
4		4.8		
		1.6		
5				
			END OF CORE @ 5.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-10-B PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	4.5	LATITUDE (N):	40.55488
RECOVERY (FT)	2.75	LONGITUDE (W):	74.26712
MEAN LOW WATER DEPTH (FT):	-0.3	ESTIMATED ERROR POSITION (FT):	17

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-10-B\0-6	1.2	0-1.0' Brown medium to coarse sand, loose, moist. No staining nor odors.
1	SED-10-B\6-12	1.3	
			1.0-1.25' Brown fine sand with some silt. No staining nor odors.
		1.9	1.25-4.5' Brown to dark brown clayey silt. No staining nor odors.
2		1.9	
		4.2	
3			
4			
			END OF CORE @ 4.5 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-10-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/19/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	5	LATITUDE (N):	40.55476
RECOVERY (FT)	2	LONGITUDE (W):	74.26718
MEAN LOW WATER DEPTH (FT):	-1.2	ESTIMATED ERROR POSITION (FT):	14

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-10-C\0-6	ND	0-0.75' Brown medium to coarse gravelly sand, loose, saturated with water.
	SED-10-C\6-12	ND	0.75-1.25' Brown silt, moist. No staining nor odors.
1		ND	1.25-1.75' Black organic silt, moist. Petroleum odor.
		ND	1.75-5.0' Brown to dark brown well sorted sand, trace silt, moist. No staining nor odors.
2		ND	
		ND	
3		ND	
		ND	
4		ND	
		ND	
5		ND	
			END OF CORE @ 5.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-11-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/20/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Rose Tripodi

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40.54263
RECOVERY (FT)	4.5	LONGITUDE (W):	74.27082
MEAN LOW WATER DEPTH (FT):	-2.3	ESTIMATED ERROR POSITION (FT):	15

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-11-C\0-6	ND	0-6.0' Olive gray silty clay w/ some organics throughout. Brown well sorted sand lense at 48".
1	SED-11-C\6-12	ND	
		ND	
2		ND	
		ND	
3		ND	
		ND	
4		ND	
		ND	
5			
6			
			END OF CORE @ 6.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-13-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/17/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Chris Hoen

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	8	LATITUDE (N):	40° 32.233'
RECOVERY (FT)	8	LONGITUDE (W):	74° 15.238'
MEAN LOW WATER DEPTH (FT):	21.8		

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-13-C\0-6	ND	0 - 8.0' Dark grey silt and clay, very moist to wet, very soft. Stiffens slightly with depth. Faint petroleum odor throughout.
1	SED-13-C\6-12	ND	
		ND	
2		ND	
		ND	
3		ND	
		ND	
4		ND	
		ND	
5		ND	
		ND	
6		ND	
		ND	
7		ND	
		ND	
8		ND	
			END OF CORE @ 8.0 ft
			* Duplicate sample collected.

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-14-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/17/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Chris Hoen

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6.5	LATITUDE (N):	40° 32.174'
RECOVERY (FT)	6	LONGITUDE (W):	74° 15.228'
MEAN LOW WATER DEPTH (FT):	29.9		

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-14-C\0-6	1.9	0 - 6.5' Dark grey silt and clay, trace to little root, no odor. Wet, very soft at top grading to firmer at bottom.
1	SED-14-C\6-12		
		1.7	
2			
		1.3	
3			
		ND	
4			
		2.6	
5			
		1.8	
6			
		ND	
			REFUSAL @ 6.5 ft
7			

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-15-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/17/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Chris Hoen

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	8	LATITUDE (N):	40° 31.979'
RECOVERY (FT)	7.75	LONGITUDE (W):	74° 15.176'
MEAN LOW WATER DEPTH (FT):	11.4		

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-15-C\0-6	ND	0 - 8.0' Dark grey silt and clay, trace rootlets, organic odor. Very moist to wet, soft.
1	SED-15-C\6-12	7.6	
		1.5	
2		ND	
		ND	
3		1.2	
		ND	
4		ND	
		ND	
5		ND	
		ND	
6		ND	
		ND	
7		ND	
		ND	
8		ND	
			END OF CORE @ 8.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-16-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/17/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Mary Gwynn

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	6	LATITUDE (N):	40° 32.798'
RECOVERY (FT)	3.5	LONGITUDE (W):	74° 15.231'
MEAN LOW WATER DEPTH (FT):	12.3		

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS	
	SED-16-C\0-6	2.3	0 - 6.0'	Dark grey to black clayey silt, trace shell fragments, slight organic odor. Wet, very soft at top grading to firmer at bottom.
1	SED-16-C\6-12	12.8		Stronger organic odor at 1.5'
		1.3		
2		1		
		1.2		
3		7		
4				
5				
6				
			END OF CORE @ 6.0 ft	

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-17-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/17/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Chris Hoen

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	8	LATITUDE (N):	40° 31.842'
RECOVERY (FT)	8	LONGITUDE (W):	74° 15.105'
MEAN LOW WATER DEPTH (FT):	NA		

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-17-C\0-6	1	0 - 6.0' Dark grey to black clayey silt, wet, soft with minor layers of gray clay/silt.
1	SED-17-C\6-12	1	
2		4	
3		ND	
4		ND	
5		ND	
6		4	
7		ND	6.0 - 8.0' Grey silty clay.
8		1	
		ND	
		ND	END OF CORE @ 8.0 ft

TRC Environmental Corporation 41 Spring Street, New Providence, NJ 07974 (908)988-1700	VIBRACORE LOG	CORE NUMBER SED-18-C PAGE No. 1 OF 1

PROJECT NAME:	Chevron	Location:	Perth Amboy, New Jersey	DATE CORED:	12/17/02
				OPERATOR:	Jeff Shelkey
PROJECT NO.:	03C2269	Contractor:	EEA, Inc.	LOGGED BY:	Chris Hoen

SAMPLER/DIAMETER (IN):	4" soft plastic sleeve	ELEVATION REFERENCE:	water surface
PENETRATION (FT):	8	LATITUDE (N):	40° 32.093'
RECOVERY (FT)	7.5	LONGITUDE (W):	74° 15.220'
MEAN LOW WATER DEPTH (FT):	19.1		

DEPTH FROM TOP OF SEDIMENT (FEET)	SAMPLE DESIGNATION	PID (ppm)	LITHOLOGIC CLASSIFICATION AND COMMENTS
	SED-18-C\0-6	1.5	0 - 8.0' Dark grey to black clayey silt, no odor. Wet, very and very soft.
1	SED-18-C\6-12		
		1.5	
2			
		1.6	
3			
		ND	
4			
		ND	
5			
		ND	
6			
		ND	
7			
		ND	
8			
			END OF CORE @ 8.0 ft

APPENDIX C

APPENDIX C

Unionized Ammonium Nitrogen Calculation Sheets

Un-Ionized Ammonia Nitrogen Calculator

Arthur Kill - Ground Water within 200 ft
Former Chevron Facility - Perth Amboy, New Jersey

Date	Sample No.	Sample TAN (ppm)	Un-Ionized NH3 (ppm)	Sample TEMP C	Sample pH	(f)NH3	pK	Acute	Chronic
1/20/2010	SB-17	0	0.0000	12.3	5.78	0.0001	9.65	0.018828	0.005058
1/22/2010	SB-14	1.1	0.0001	12.3	5.78	0.0001	9.65	0.018828	0.005058
1/22/2010	SB-15	0	0.0000	12.3	5.78	0.0001	9.65	0.018828	0.005058
2/5/2010	MW-156	0.68	0.0001	12.3	5.78	0.0001	9.65	0.018828	0.005058
2/5/2010	MW-155	0	0.0000	12.3	5.78	0.0001	9.65	0.018828	0.005058
2/18/2010	MW-149	0.96	0.0001	12.3	5.78	0.0001	9.65	0.018828	0.005058
3/18/2010	MW-144	7	0.0009	12.3	5.78	0.0001	9.65	0.018828	0.005058
4/13/2010	SB-15	0	0.0000	12.3	5.78	0.0001	9.65	0.018828	0.005058
4/15/2010	SB-14	0.43	0.0001	12.3	5.78	0.0001	9.65	0.018828	0.005058
4/15/2010	SB-17	3	0.0004	12.3	5.78	0.0001	9.65	0.018828	0.005058
10/21/2010	SB-17	0.59	0.0000	19.8	4.77	0.0000	9.41	0.011368	0.003054
10/21/2010	SB-15	12.6	0.0048	18.4	6.03	0.0004	9.45	0.034348	0.009228
1/24/2011	SB-17	0	0.0000	8.42	4.5	0.0000	9.78	0.004458	0.001198
2/24/2011	SB-17	0.97	0.0000	8.42	4.5	0.0000	9.78	0.004458	0.001198
2/8/2011	MW-252	38.6	**0.0300**	14.5	6.47	0.0008	9.58	0.0412	0.011069
2/17/2011	SB-15	0.75	0.0003	8.98	6.41	0.0004	9.76	0.027975	0.007516
4/7/2011	MW-149	0.36	0.0074	9.68	8.06	0.0204	9.74	0.138508	0.037211
4/7/2011	MW-149	0	0.0000	9.68	8.06	0.0204	9.74	0.138508	0.037211
4/7/2011	MW-144	21	0.0095	11.93	6.32	0.0005	9.66	0.03066	0.008237
4/15/2011	MW-156	0	0.0000	8.96	6.67	0.0008	9.77	0.035715	0.009595
4/15/2011	MW-155	0.78	0.0006	8.96	6.67	0.0008	9.77	0.035715	0.009595
4/21/2011	SB-17	18.3	0.0001	10.6	4.15	0.0000	9.71	0.00365	0.000981
4/22/2011	SB-15	0	0.0000	11.3	6.83	0.0014	9.69	0.047785	0.012838
4/22/2011	SB-10	0	0.0000	12.48	6.83	0.0015	9.65	0.051283	0.013778
10/6/2011	SB-17	0	0.0000	20.98	4.16	0.0000	9.37	0.006859	0.001843
10/6/2011	SB-10	0.84	0.0015	16.66	6.75	0.0017	9.51	0.061074	0.016408
10/25/2011	MW-252	9.4	**0.0297**	18.5	6.95	0.0032	9.45	0.082356	0.022126
10/27/2011	SB-15	0	0.0000	17.55	6.47	0.0010	9.48	0.049453	0.013286
1/20/2012	SB-15	0	0.0000	11.43	7.1	0.0026	9.68	0.062141	0.016695
4/13/2012	SB-15	7.3	0.0095	12.49	6.76	0.0013	9.65	0.048033	0.012904
4/13/2012	SB-10	14.8	**0.0404**	12.87	7.07	0.0027	9.63	0.065844	0.017689
4/3/2012	SB-17	0	0.0000	11.5	4.42	0.0000	9.68	0.00497	0.001335
10/2/2012	SB-15	0	0.0000	20.44	6.42	0.0011	9.39	0.056084	0.015067
10/2/2012	SB-10	1.1	0.0048	17.66	7.12	0.0044	9.48	0.091951	0.024703
10/4/2012	SB-17	2.2	**1.4870**	21.59	9.67	0.6759	9.35	0.350377	0.094131
7/13/2010	SB-17	17.4	0.0023	12.3	5.78	0.0001	9.65	0.021731	0.00562
7/13/2010	SB-15	9.8	0.0022	19.2	5.78	0.0002	9.43	0.032846	0.008495
7/12/2011	SB-17	0.3	0.0000	21.39	4.23	0.0000	9.36	0.008668	0.002242
7/12/2011	SB-15	1.6	0.0013	20.02	6.32	0.0008	9.40	0.057439	0.014855
7/12/2012	SB-17	0.8	0.0000	22.53	4.71	0.0000	9.32	0.014601	0.003776
7/17/2012	SB-15	0	0.0000	20.96	6.26	0.0008	9.37	0.057418	0.014849

USEPA's 1999 Update of Ambient Water Quality
Criteria for Ammonia (EPA-822-R-99-014, 12/99)

Bold Indicates Concentrations above the Chronic Screening Level

Bold and Highlighted Indicates Concentrations above both the Acute and Chronic Screening Levels

NJDEP - FW2-NT SWQS Calculator
Arthur Kill - Ground Water within 200 ft
Former Chevron Facility - Perth Amboy, New Jersey

Un-inozed Ammonia Nitrogen (mg/L)
NJDEP SWQS
FW2-NT; Summer; pH<8.3

TEMP	pH	Acute	Chronic
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
12.3	5.78	0.0188	0.0051
19.8	4.77	0.0114	0.0031
18.4	6.03	0.0343	0.0092
8.42	4.5	0.0045	0.0012
8.42	4.5	0.0045	0.0012
14.5	6.47	0.0412	0.0111
8.98	6.41	0.0280	0.0075
9.68	8.06	0.1385	0.0372
9.68	8.06	0.1385	0.0372
11.93	6.32	0.0307	0.0082
8.96	6.67	0.0357	0.0096
8.96	6.67	0.0357	0.0096
10.6	4.15	0.0037	0.0010
11.3	6.83	0.0478	0.0128
12.48	6.83	0.0513	0.0138
20.98	4.16	0.0069	0.0018
16.66	6.75	0.0611	0.0164
18.5	6.95	0.0824	0.0221
17.55	6.47	0.0495	0.0133
11.43	7.1	0.0621	0.0167
12.49	6.76	0.0480	0.0129
12.87	7.07	0.0658	0.0177
11.5	4.42	0.0050	0.0013
20.44	6.42	0.0561	0.0151
17.66	7.12	0.0920	0.0247

Un-inozed Ammonia Nitrogen (mg/L)
NJDEP SWQS
FW2-NT; Winter; pH<8.3

TEMP	pH	Acute	Chronic
12.3	5.78	0.0217	0.0056
19.2	5.78	0.0328	0.0085
21.39	4.23	0.0087	0.0022
20.02	6.32	0.0574	0.0149
22.53	4.71	0.0146	0.0038
20.96	6.26	0.0574	0.0148

Un-inozed Ammonia Nitrogen (mg/L)
NJDEP SWQS
FW2-NT; Summer; pH>8.3

TEMP	pH	Acute	Chronic
21.59	9.67	0.3504	0.0941

Un-Ionized Ammonia Nitrogen Calculator

Woodbridge Creek - Ground Water within 200 ft
Former Chevron Facility - Perth Amboy, New Jersey

Sample No.	Sample TAN (ppm)	**Un-Ionized NH3 (ppm)**	Sample TEMP C	Sample pH	(f)NH3	pK	Acute	Chronic
NF13211*	218	0.0001	8.0	3.58	0.0000	9.80	0.002104	0.000544
NF13112*	9.7	0.0027	8.1	6.239231	0.0003	9.80	0.026063	0.006741
NF13110*	15	0.0016	8.3	5.823077	0.0001	9.79	0.017797	0.004603
M158B6*	16.2	0.0081	8.4	6.483846	0.0005	9.79	0.033363	0.008628
NF13111*	15.1	0.0005	10.8	5.21	0.0000	9.70	0.011577	0.002994
NF13212*	6.5	0.0000	12.0	4.208824	0.0000	9.66	0.004846	0.001253
NF13212X*	6.5	0.0010	12.5	5.84	0.0002	9.65	0.023219	0.006005
NF13311X*	15.4	0.0092	13.7	6.38	0.0006	9.61	0.041638	0.010768
NF13210**	13.9	0.0000	14.1	3.018667	0.0000	9.59	0.001546	0.000415
NF13411**	12	0.0000	14.1	3.018667	0.0000	9.59	0.001546	0.000415
NF13112X**	9.7	0.0082	15.0	6.49	0.0008	9.56	0.043132	0.011588
NF13410**	22.8	0.0073	15.4	6.055714	0.0003	9.55	0.02934	0.007882
NF13312**	20.4	**0.0851**	19.7	7.032	0.0042	9.41	0.095706	0.025712
NF13311**	15.4	0.0000	22.3	3.34625	0.0000	9.33	0.00344	0.000924
NF13310**	50.9	0.0003	22.4	4.1	0.0000	9.33	0.006808	0.001829

TAN=Total Ammonia Nitrogen
Unionized ammonia calculated pursuant to
USEPA's 1999 Update of Ambient Water Quality
Criteria for Ammonia (EPA-822-R-99-014, 12/99)
* Winter Acute and Chronic Calculated Standards
** Summer Acute and Chronic Calculated Standards

NJDEP - FW2-NT SWQS Calculator
Woodbridge Creek - Ground Water within 200 ft
Former Chevron Facility - Perth Amboy, New Jersey

Un-inozed Ammonia Nitrogen (mg/L)
NJDEP SWQS
FW2-NT; Summer; pH<8.3

TEMP	pH	Acute	Chronic
14	3.018667	0.0015	0.0004
14	3.018667	0.0015	0.0004
15	6.49	0.0431	0.0116
15	6.055714	0.0293	0.0079
20	7.032	0.0957	0.0257
22	3.34625	0.0034	0.0009
22	4.062	0.0068	0.0018

Un-inozed Ammonia Nitrogen (mg/L)
NJDEP SWQS
FW2-NT; Winter; pH<8.3

TEMP	pH	Acute	Chronic
8	3.58	0.0021	0.0005
8	6.239231	0.0261	0.0067
8	5.823077	0.0178	0.0046
8	6.483846	0.0334	0.0086
11	5.21	0.0116	0.0030
12	4.208824	0.0048	0.0013
12	5.84	0.0232	0.0060
14	6.38	0.0416	0.0108

Un-Ionized Ammonia Nitrogen Calculator

Woodbridge Creek - Ground Water within 200 ft
Former Chevron Facility - Perth Amboy, New Jersey

Sample No.	Sample TAN (ppm)	**Un-Ionized NH3 (ppm)**	Sample TEMP C	Sample pH	(f)NH3	pK	Acute	Chronic
SW-1	0.69	0.0023	2.9	7.51	0.0034	9.98	0.063385	0.016393
SW-2	0.6	0.0027	1.9	7.67	0.0045	10.01	0.069437	0.017958
SW-3	0.6	0.0020	0.5	7.58	0.0033	10.06	0.058653	0.015169
SW-4	0.54	0.0015	0.4	7.52	0.0028	10.07	0.055092	0.014248
SW-5	0	0.0000	0.4	7.53	0.0029	10.07	0.055614	0.014383
SW-6	0	0.0000	1.7	7.45	0.0027	10.02	0.055743	0.014416
SW-9	0	0.0000	1.4	7.53	0.0031	10.03	0.059046	0.01527

TAN=Total Ammonia Nitrogen
Unionized ammonia calculated pursuant to
USEPA's 1999 Update of Ambient Water Quality
Criteria for Ammonia (EPA-822-R-99-014, 12/99)
* Winter Acute and Chronic Calculated Standards
** Summer Acute and Chronic Calculated Standards

NJDEP - FW2-NT SWQS Calculator
Woodbridge Creek - Surface Water
Former Chevron Facility - Perth Amboy, New Jersey

Un-inozed Ammonia Nitrogen (mg/L)

		NJDEP SWQS FW2-NT; Winter; pH<8.3	
TEMP	pH	Acute	Chronic
3	7.51	0.0634	0.0164
2	7.67	0.0694	0.0180
1	7.58	0.0587	0.0152
0	7.52	0.0551	0.0142
0	7.53	0.0556	0.0144
2	7.45	0.0557	0.0144
1	7.53	0.0590	0.0153

Un-Ionized Ammonia Nitrogen Calculator

Spa Spring Creek - Surface Water
Former Chevron Facility - Perth Amboy, New Jersey

Sample No.	Sample TAN (ppm)	**Un-Ionized NH3 (ppm)**	Sample TEMP C	Sample pH	(f)NH3	pK	Acute	Chronic
SW-11	0.68	0.0006	7.2	6.76	0.0009	9.83	0.040391	0.010446
SW-7	0	0.0000	3.5	6.81	0.0007	9.96	0.03393	0.008775
SW-8	0	0.0000	3.5	6.65	0.0005	9.96	0.027828	0.007197

TAN=Total Ammonia Nitrogen
Unionized ammonia calculated pursuant to
USEPA's 1999 Update of Ambient Water Quality
Criteria for Ammonia (EPA-822-R-99-014, 12/99)
* Winter Acute and Chronic Calculated Standards
** Summer Acute and Chronic Calculated Standards

NJDEP - FW2-NT SWQS Calculator
Spa Spring Creek - Surface Water
Former Chevron Facility - Perth Amboy, New Jersey

Un-inozed Ammonia Nitrogen (mg/L)

NJDEP SWQS
FW2-NT; Winter; pH<8.3

TEMP	pH	Acute	Chronic
7	6.76	0.0404	0.0104
4	6.81	0.0339	0.0088
4	6.6	0.0278	0.0072

APPENDIX D

APPENDIX D

Electronic Data Deliverables