Exhibit 6

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REVISED SITE SUMMARY

ID # - 8857 EXXON SERVICE STATION #31310

Livingston Township, Essex County, New Jersey

Prepared on behalf of:

New Jersey Department of Environmental Protection (NJDEP)

The Commissioner of the NJDEP

The Administrator of the New Jersey Spill Compensation Fund

For:

The Office of the Attorney General of New Jersey

and

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ACRONYMS AND ABBREVIATIONS

AG	Attorney General
AMSL	above mean sea level
bgs	below ground surface
BTEX	benzene, toluene, ethyl benzene, and total xylenes
BWA	Bureau of Water Allocation
CO	carbon monoxide
COCs	chemicals of concern
EDR	Environmental Data Resources
F	Fahrenheit
FS	Feasibility Study
GWP&T	groundwater pump and treat
GWQS	groundwater quality standard
i	gradient
IAS	indoor air sampling
IASL	indoor air screening level
IGWSCC	Impact to Groundwater Soil Cleanup Criteria
K	hydraulic conductivity
kg	kilograms
L	Liter
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
LPH	liquid phase hydrocarbon
MCL	maximum contaminant level
µg	micrograms
µg/kg	micrograms per kilogram
µg/L	micrograms per Liter
$\mu g/m^3$	micrograms per meter cubed
mg	milligrams
mg/kg	milligrams per kilogram
MTBE	methyl tertiary-butyl ether
n_e	porosity
NAAQS	National Ambient Air Quality Standards
NFA	No Further Action
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
NOD	Notice of Deficiency
O_2	oxygen
PA/SI	Preliminary Assessment/Site Investigation
PCE	tetrachloroethene
%	percent
PID	photo ionization detector
ppb	parts per billion
PSW	Public Supply Well
RASR	Remedial Action Selection Report

RAW	Remedial Action Workplan
RAWA	Remedial Action Workplan Addendum
RDCSRS	Remedial Direct Contact Soil Remediation Standards
RFG	Reformulated Gasoline
RIR	Remedial Investigation Report
RIW	Remedial Investigation Workplan
SCM	site conceptual model
SGSL	soil gas screening level
SRRA	Site Remediation Reform Act
SRS	sensitive receptor survey
State	State of New Jersey
STP	submersible turbine pump
SVE	soil vapor extraction
TBA	tert-butyl alcohol
TCE	trichloroethene
TIC	Tentatively Identified Compound
TPHg	total petroleum hydrocarbons gasoline
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
VIIW	Vapor Intrusion Investigation Workplan
VOCs	volatile organic compounds
WOF	Wintertime Oxygenated Fuel
WSW	Water Supply Well

1.0 INTRODUCTION

The State of New Jersey (the State) is blessed with precious and invaluable water resources - both surface water and groundwater. These resources are held in trust, and used in many ways, for the benefit of the people of the State. They also provide a safe, reliable, and sustainable water supply for industrial, agricultural, and domestic purposes. In addition, these resources sustain vibrant and valuable ecological habitats and have an inherent aesthetic value.

There are numerous facilities throughout the State that refine, store, or sell petroleum products. Many of these facilities have documented releases of these products to the environment. In many cases, these releases have polluted water resources.

In general, petroleum products, such as gasoline, are a mix of many individual chemical compounds. The chemicals in gasoline are predominantly aliphatic and aromatic hydrocarbon compounds (comprised of carbon and hydrogen atoms) derived from the refining of crude oil. In addition, other chemicals are then added to gasoline to improve its performance.

Most of the hydrocarbon compounds in gasoline have a relatively limited impact on water resources due to their fate and transport properties; that is, they do not migrate very far in the environment and naturally biodegrade. However, due to its fate and transport properties (see section 8.1), methyl tertiary butyl ether (MTBE) has a significant impact on water resources when gasoline containing the chemical is released to the environment.

Given the widespread historical use of MTBE in gasoline in the State of New Jersey and the propensity of the systems that store gasoline to leak, significant MTBE contamination of water resources exists throughout the State. In particular, MTBE has been detected in numerous public and private water supply wells (WSWs) across the State.

The State, notably the Department of Environmental Protection (NJDEP), has the authority and responsibility to manage, protect and, where necessary, restore water resources in the State in the interests of present and future citizens. The NJDEP directs those parties responsible for pollution of water resources to implement programs to investigate and remediate their contaminant releases.

Given the magnitude of the damage to water resources from MTBE contamination, and the ongoing threat this contamination poses, the State Office of the Attorney General (AG) filed a lawsuit on behalf of the people of the State against various companies considered responsible for the contamination.

The AG retained the following outside counsel to support them in this ligation: Miller, Axline & Sawyer; the Law Offices of John K. Dema; Berger & Montague; and Cohn Lifland Pearlman Herrmann & Knopf (collectively referred to herein as Plaintiff counsel).

Contamination by MTBE and tert-butyl alcohol (TBA) has been detected at thousands of facilities throughout the State. Addressing all of these facilities in one trial is impractical; therefore, a finite number of "trial sites" have been selected by the defendants and plaintiffs to be the subject of the first phase of litigation in this matter. The trial sites include 19 facilities and defined areas in the immediate vicinity of the facilities where contamination is, or may be, present.

1.1 Project Objectives

Amongst other things, the litigation brought by the State against the parties responsible for MTBE contamination seeks to recover damages; that is, money or equitable relief, to restore water resources impacted by MTBE and TBA.

Aquilogic has been retained by Plaintiff counsel to conduct the following:

1. Review available information about the 19 trial sites including, but not limited to, files from the NJDEP and information provided by defendants;
2. Review available information for public and private WSWs in the vicinity of the trial sites including, but not limited to, pumping records and chemical analyses;
3. Summarize available information and data for the above;
4. Analyze release history, hydrogeology, and contaminant presence at the trial sites;
5. Evaluate the nature, magnitude, and extent of contamination;
6. Develop a site conceptual model (SCM) that considers contaminant sources, pathways, and receptors;
7. Identify data gaps and other deficiencies in the investigation and remediation programs implemented at the trial sites;
8. Evaluate the programs needed to restore water resources impacted by releases at the trial sites to their pre-impacted condition;
9. Develop costs to implement these restoration programs; and
10. Proffer opinions at trial related to the above.

Therefore, the ultimate objective of our work is to develop costs (i.e. damages) to implement programs to restore water resources contaminated by MTBE and TBA at the trial sites.

This report addresses items 1 through 7 above, and presents opinions related to that work. Supplemental documents (e.g. remediation feasibility studies [FS], restoration costs) address items 8 and 9.

1.2 History of MTBE Use in New Jersey

MTBE usage in New Jersey began in the late 1970s (NJDEP, 2001). It was used as an octane enhancer throughout the 1980s at low concentrations, primarily in high-octane grade gasoline (NJDEP, 2001). During this time, concentrations of MTBE in premium grade gasoline ranged from 2% to 8%; regular grade gasoline contained a lower percentage (NJDEP, 2001).

In 1990, Congress passed amendments to the Clean Air Act (CAA) that mandated the use of reformulated gasoline (RFG) and wintertime oxygenated fuel (WOF) in areas that had failed to reduce ambient air quality to the National Ambient Air Quality Standards (NAAQS) (NJDEP, 2001). Specifically, the use of WOF during winter months was mandated for 39 urban areas (including 2 areas comprising 21 counties in New Jersey) throughout the country to limit emissions of carbon monoxide (CO), and RFG was mandated for 9 urban areas (including all but 2 counties in New Jersey) to limit emissions of contaminants that lead to the formation of ozone (NJDEP, 2001). These fuels require the presence of oxygen at 2.7% by weight for WOF and 2% by weight for RFG (NJDEP, 2001). MTBE was the primary gasoline additive used to meet the mandated oxygen percentage (NJDEP, 2001). To meet the weight requirements, MTBE would need to account for 15% by volume of WOF (almost 2.5 cups per gallon) and 11% by volume of RFG (about 1.75 cups per gallon) (NJDEP, 2001).

The use of RFG was required beginning January 1, 1995. Although two counties were exempted from this requirement, New Jersey mandated its use statewide in order to streamline gasoline distribution (NJDEP, 2001).

The WOF program was established in the winter of 1992-1993 in both northern and southern New Jersey (NJDEP, 2001). In 1995, southern New Jersey attained the NAAQS for CO and discontinued the WOF program (NJDEP, 2001). In 1997, the NJDEP submitted requests to the United States Environmental Protection Agency (USEPA) to suspend the WOF program in northern New Jersey, citing findings of MTBE risk to water supplies and citizen concerns about the use of MTBE in gasoline (NJDEP, 2001). In 1999, the request was approved with the condition that RFG would be sold during all months throughout New Jersey (NJDEP, 2001).

Upon initiating the WOF program, the state of New Jersey received numerous complaints regarding MTBE (NJDEP, 2001). In 1995, citizens claimed that they felt sick when exposed to the

15% MTBE WOF gasoline in fall and winter, and felt “great” during spring and summer months when 11% MTBE RFG gasoline was used (NJDEP, 2001).

In 1996, the New Jersey drinking water, health-based Maximum Contaminant Level (MCL) for MTBE of 70 micrograms per Liter (µg/L) was established (NJDEP, 2001). An MCL of 70 µg/L is also used for groundwater and surface water contamination (NJDEP website, 2012).

MTBE was first detected in a drinking WSWs in the 1980s (NJDEP, 2001). Sampling of public WSWs collected during 1985 and 1986 indicated MTBE concentrations as high as 81 µg/L (NJDEP, 2001). Regular sampling of public WSWs for MTBE commenced in 1997 upon establishing the drinking water MCL (NJDEP, 2001). A survey conducted from 1997 to 1998 of New Jersey water supplies indicated the presence of MTBE in 15% of the systems sampled (NJDEP, 2001). Many individuals can smell and/or taste MTBE in drinking water at levels well below 70 parts per billion (ppb) (NJDEP, 2007).

A survey of private drinking water supplies conducted in four areas of New Jersey in 1998 indicated the presence of MTBE in 35% of the wells sampled (NJDEP, 2001). Concentrations ranged from 0.10 µg/L to 30.2 µg/L (NJDEP, 2001).

Studies conducted from 1994 to 1999 by the United States Geological Survey (USGS) indicated the regular detection of MTBE in streams and lakes throughout New Jersey, with concentrations ranging from 0.2 µg/L to 30 µg/L, all below the MCL (NJDEP, 2001).

In 2001, New Jersey estimated the number of gasoline underground storage tanks (USTs) in the state to be around 34,000 (NJDEP, 2001). With an average capacity of 5,000 gallons (NJDEP, 2001) and a required 11% by volume of MTBE in RFG gasoline, this would account for 18,700,000 gallons of MTBE in USTs at any given time in 2001. New Jersey further reports that half of the USTs closed in the state result in a reported discharge of hazardous substances and half of the discharges impact groundwater (NJDEP, 2001). In 2001, MTBE was present at concentrations above the MCL in 80% of the leaking UST cases in which groundwater had been impacted (NJDEP, 2001).

In 2005, the New Jersey Legislature passed legislation banning the sale of gasoline that contains more than 0.5% MTBE (NJDEP website, 2012). This law was effective January 1, 2009. Since 2006, most gasoline refiners have switched to using ethanol to increase oxygen percentage in order to meet RFG standards (NJDEP website, 2012).

Reportedly, TBA has not been added to RFG, but is present in RFG as a bi-product of the MTBE refining process (0.02% on average) (EIA website, 2012), and as a breakdown product of MTBE.

2.0 REGIONAL SETTING

The Livingston Exxon Service Station (the Site) is located at 38 East Mount Pleasant Avenue, in Livingston Township, Essex County, New Jersey. The Site is within the Piedmont Physiographic Province of New Jersey (Pristas, 2002). This province is a 1,600 square mile region bordered to the northwest by the Highlands Province of New Jersey, to the northeast by the State of New York and the Hudson River, to the southeast by the Coastal Plain Province of New Jersey, and to the southwest by the state of Pennsylvania. The Site is approximately 15 miles west of Manhattan, New York.

2.1 Geologic Setting

Bedrock geology of the Piedmont Physiographic province is characterized by normal-faulted and moderately dipping Late Triassic to Early Jurassic sedimentary rocks of the Newark Supergroup. Locally, these strata are gently warped and broken by a few large faults and many small ones. Newark Basin sediments mostly dip about 5 to 25 degrees to the northwest (Olsen, 1980). The sedimentary rocks of the Newark Supergroup are fluvial and lacustrine deposits that in places exceed 20,000 feet in thickness. Typical rock types include red conglomerate, sandstone, arkose siltstone, shale, and argillite (Kleinfelder, 2010A,). The uppermost bedrock beneath the Livingston Exxon Site is part of the Towaco Formation (NJDEP/NJGS, 2009), which is Lower Jurassic in age and occurs in the middle of the Brunswick Group stratigraphic sequence (NJGS, 1990).

Paul E. Olsen, who is quoted on the Bedrock Geologic Map of the Caldwell Quadrangle of Essex and Morris Counties, New Jersey, describes the lithology of the Towaco Formation as *"reddish-brown to brownish-purple sandstone, buff, olive-tan, or light olive-gray, fine- to medium-grained, micaceous sandstone, siltstone, silty mudstone in fining-upward sequences 3 to 10 feet thick… Siltstone is commonly planar laminated or bioturbated and indistinctly laminated to massive."* Olsen's published paper on the Triassic and Jurassic Formations of the Newark Basin, details this formation as consisting of "*laterally continuous symmetrical sedimentary cycles about three to ten feet thick consisting of red, black, and gray sedimentary rocks with a central black or gray microlaminated calcareous siltstone bound above and below by gray sandstone and siltstone beds arranged in fining-upwards cycles. Siltstone is commonly planar laminated or bioturbated, but can be indistinctly laminated to massive" (Olsen, 1980)*. The regional siltstones generally strike N45E with dips from 7 to 12 degrees and commonly have vertical fractures and horizontal partings along bedding plains (Drake et al., 1996).

The unconsolidated surficial sediment at the Site is mapped as Late Wisconsinan glacial lacustrine-fan deposits of Pleistocene age (NJDEP/NJGS, 2009). The Surficial Geology Map for the Caldwell Quadrangle (Stanford, 2005) identifies these deposits as fine- to coarse- sand and pebble-to-cobble gravels, with minor fines, deposited during the Moggy Hollow stage of Lake Passaic. Regionally, these deposits are up to 110 feet thick, but beneath the Site they range from 25 to 50 feet thick, as described in Section 5.0.

2.2 Hydrogeologic Setting

Groundwater is supplied to the region from the Brunswick Aquifer and is stored and transmitted within fractures in the Passaic, Towaco, Feltville, and Boonton formations (Herman et al., 1998). The consolidated rocks of the Brunswick Aquifer contain both primary and secondary porosity; however, the majority of the Brunswick Group has permeability due to secondary porosity (Sloto et. al., 1995). Well-sorted and poorly cemented beds have the highest primary porosity; whereas, poorly-sorted and well cemented units have greatly reduced primary porosity. This cementing causes the beds to be hard and brittle and contributes to the development of fractures and joints (secondary porosity) (Kleinfelder, 2010A; SITE213-008978).

The interbedded shales and sandstones of the Brunswick Aquifer are relatively impermeable except where secondary porosity is present. Consequently, the interbedded shales and sandstones have a low storativity and transmissivity. The fractures and joints that contribute to this porosity constitute a small fraction of the total volume of rock, but are generally believed to provide the principal conduits for groundwater flow (Kleinfelder, 2010A; SITE213-008978).

"Fractured shales of the Brunswick Formation provide a major aquifer in the most industrialized region of New Jersey. Numerous cases of ground water contamination have been documented in this formation. However, effectiveness of monitoring and remediation efforts is often hampered by the use of inappropriate concepts regarding ground water flow controls in this complex aquifer system. One such concept presumes that near-vertical fractures parallel to the strike of beds provide principal passages for the flow and produce an anisotropic response to pumping stress. Field evidence presented… confirms that the Brunswick Formation hosts a gently dipping, multiunit, leaky aquifer system that consists of thin water-bearing units and thick intervening aquitards. The water-bearing units are associated with major bedding partings and/or intensely fractured seams. Layered heterogeneity of such a dipping multiunit aquifer system produces an anisotropic flow pattern with preferential flow along the strike of beds….The commonly used hydrogeologic model of the Brunswick as a one-aquifer system, sometimes with vaguely defined "shallow" and "deep" zones, often leads to the development of inadvertent cross-flows within monitoring wells. If undetected, cross-flows may promote contaminant spread into deeper units

and impair the quality of hydrogeologic data. Hydrogeologic characterization of the Brunswick shales at any given site should be aimed primarily at identification of the major water-bearing and aquitard units" (Michalski, 1990). This model is based on the concept that hydraulic connection occurs predominantly along more fractured stratigraphic units, i.e. discrete zones controlled by bedding (Carswell and Rooney, 1976; Michalski, 1990; Hewitt, 1990).

A leaky multi-unit aquifer system fits the flow patterns and heterogeneity of the individual beds more closely than a one-aquifer system with shallow and deep zones. The major bedding partings and/or intensely fractured seams are the water bearing units within the system and are separated by thick intervening aquitards (Kleinfelder, 2010A; SITE213-008978).

2.3 Topography

The Site is situated at an elevation of approximately 325 feet above mean sea level (AMSL) within a north-south trending valley, between the second Watchung Ridge (elevation of about 600 feet AMSL) approximately two miles east of the Site, and a lower ridge (elevation about 450 feet AMSL) 0.7 miles to the west. The Site is located within the Upper Passaic River watershed (Kleinfelder, 2010A; SITE213-008978). Canoe Brook, which trends northeast to southwest near the Site, is the nearest surface water at 800 feet to the southeast to 1,200 feet to the south (USGS, 2011).

2.4 Climatic Setting

New Jersey has a moist, temperate climate with temperature variations throughout the year of below 0 degrees Fahrenheit (F) to 100 degrees F or above. The northwestern Valley and Ridge Physiographic Province will generally be slightly cooler due to its high altitude, while the densely populated Piedmont Physiographic Province, where this Site is located, is slightly warmer due to its lower elevation and urban heat island effects. The coldest regions in the state (the Northern Highlands) have an average of 163 freeze free days, while the mild coastal regions have 217 freeze free days. Most regions in New Jersey receive between 43 and 47 inches of precipitation annually. Although the Fall is the driest season in New Jersey, nor'easter low pressure systems often form offshore, move up the coast, and inundate New Jersey with flooding rains and high winds that can lead to considerable property damage and power outages between October and April. Intense thunder storms and occasional tornadoes also occur in the spring and summer (Rutgers University website, 2012).

2.5 Groundwater Quality and Use

The groundwater from the Brunswick Aquifer is generally fresh, hard, slightly alkaline, and non-corrosive (Herman et al., 1998) and the local Livingston Township Water Department is currently using 1,000,014,000 gallons of groundwater and 392,859,000 gallons of imported water from NJ American (aquilogic, personal communication, September 12, 2012). Therefore, approximately 72% of water being used by the Livingston Township Water Department is from local groundwater and 28% is imported.

A well search for the vicinity of the Site identified a public supply well (PSW), Livingston Well #11 (screened 54 to 423 feet below ground surface (bgs)), located approximately 1,750 feet to the west-northwest of the Site (Figure 1). A maximum MTBE concentration of 28.7 µg/L was detected at this well on November 19, 2009. MTBE was not detected in subsequent samples through May 2011 (Table 3). In addition, the closest commercial supply well is approximately 700 feet southwest of the Site at 19 South Livingston Avenue. A maximum MTBE concentration of 14.5 µg/L was detected on October 28, 2004 at this well. The water in this well is used for commercial cooling purposes. The well is screened from 28 to 298 feet bgs. There is also a domestic supply well within 1,000 feet of the Site located at 35 N. Livingston Avenue, though it is not currently in service as the owners of the well are using publicly provided water (Kleinfelder, 2010A; SITE213-008969).

3.0 SITE SETTING

3.1 Site Description

The Site is an active Exxon Service Station with automotive repair services. The Site is located in a mixed commercial and residential area of Livingston, New Jersey (Figure 1). The service station is on a 0.39 acre parcel and consists of a service station building with garage bays, two dispenser islands, and three USTs. Currently there is one 8,000-, one 10,000-, and one 12,000-gallon single-walled fiberglass gasoline USTs located on the eastern portion of the station (Kleinfelder, 2010A; SITE213-008977 and SITE213-008502).

3.2 Site Location

The Site is located at 38 East Mount Pleasant Avenue in Essex, New Jersey on the southwestern corner of East Mount Pleasant and Sherbrooke Parkway (Figure 2). Commercial properties are located to the east and west of the Site along East Mount Pleasant Avenue and residential properties are located to the south. The area to the north of the Site across East Mount Pleasant is a mix of commercial properties and residential condominiums. The notable commercial property to the north of the Site is the Livingston Town Center (formerly known as Livingston Manor and Park Plaza). Adjacent properties include a Prudential Insurance office building to the east, residential properties to the south, and a retail strip mall to the west, containing a shoe repair store, toy store, children's clothing store, and cellular service store (Kleinfelder, 2010A; SITE213-008977 to -008978).

3.3 Surface Cover and Drainage

The majority of the property is paved with either concrete or asphalt; however, there are a few non-paved landscaped areas located around the perimeter of the property (Kleinfelder, 2010A; SITE213-008977). There are three wide driveways connecting the Site to East Mount Pleasant Avenue and Sherbrooke Parkway. Surface water drains to the north and west off Site to the municipal storm water conveyance system along East Mount Pleasant Avenue (Kleinfelder, 2010A; SITE213-008978).

4.0 SITE HISTORY

4.1 Operational History

Historical records and the Essex County Assessor's office indicate that the Site operated as a gasoline service station since at least 1934 (Kleinfelder, 2010B; SITE213-009190). A 1934 Sanborn map indicates that the Site consisted of an eastern and western lot and three USTs were located on the eastern parcel along East Mount Pleasant Avenue. The 1950 and 1962 Sanborn Maps indicate the Site still served as a gasoline station; however, the number and locations of the USTs were not shown. In 1994, the township of Livingston updated their property lot and block numbers and these two lots were combined into the current Block and Lot number for this Site (Kleinfelder, 2010B; SITE213-009200).

An Environmental Data Resources (EDR) City Directory search identified the Site as an Exxon Service Station from at least 1975 (Kleinfelder, 2010B; SITE213-009191). An ExxonMobil record from 1979 indicated a total of six 4,000-gallon steel gasoline USTs in the approximate location of the current gasoline UST field, and a 1986 record showed three fiberglass USTs proposed for the same location (Kleinfelder, 2010B; SITE213-009193). The records suggest that the six steel tanks were removed in October 1986 and were replaced with the three single-walled (NJDEP, 2004B; SITE213-008782) fiberglass gasoline USTs (one 8,000-, one 10,000- and one 12,000-gallon) on January 1, 1987. According to NJDEP records, these three gasoline tanks are still in use at the Site (Figure 2a). (Kleinfelder, 2010B; SITE213-009200).

In March of 2004, five 1,000-gallon gasoline USTs that were previously abandoned-in-place were identified and removed from the Site (Kleinfelder, 2010B; SITE213-009200).

4.2 Environmental Investigation and Remediation Chronology

The following is a chronology of investigation and remediation activities that have been conducted at the Site. Summaries of Site operations and characterization/remedial actions are illustrated on Figure 3. Well construction details are summarized in Table 1, a summary of depth to water for Site associated wells in Table 2, and regional well data is in Table 3. Analytical results for Site associated wells are provided in Appendix A (by Well) and Appenidx B (by Date).

Date/Period	Activity
October 1986	Six 4,000-gallon steel unleaded gasoline USTs were reportedly removed from the Site and replaced with three fiberglass gasoline USTs (one 8,000-

Date/Period	Activity
	gallon, one 10,000-gallon, and one 12,000-gallon). These three USTs are currently in use at the Site. Based on review of historical documents, it is believed that the current fiberglass USTs were installed in the same location as the six 4,000-gallon steel USTs (Kleinfelder, 2010A; SITE213-008969).
December 1993	A 1,000-gallon fiberglass waste oil UST was removed under closure # C93-2553 (Kleinfelder, 2010A; SITE213-008969).
February 1995	A UST Closure Assessment Report was submitted to the NJDEP on February 23, 1995 for the December 1993 removal of a 1,000-gallon waste oil UST (Kleinfelder, 2010A; SITE213-008969).
May 1995	A letter from the NJDEP dated May 8, 1995 granted No Further Action (NFA) for the former waste oil UST that was removed on December 7, 1993 under closure # C93-2553. The NFA was based on analytical results of the soil samples collected at the time of the UST removal. This letter referenced NJDEP case # 94-12-09-1551. The details of this NJDEP case number are not known (Kleinfelder, 2010A; SITE213-008969).
May 2001	A drive-off at the regular dispenser occurred at the Site. *"Less than one gallon of gasoline was discharged to the pavement and to the pea gravel beneath the dispenser island. The NJDEP was notified and case # 01-05-04-1325-59 was assigned to the Site"* (Kleinfelder, 2010A; SITE213-008969). The NJDEP Communication Center Notification Report noted a customer drive off and a resulting spill of an unknown quantity and the presence of soil contamination.
November 2001	A release of unknown quantity was reported when the 8,000-gallon gasoline UST was found to be leaking. Case # 01-11-13-0846-55 was assigned (McCusker et al., 2005; SITE213-008513). Repairs were conducted on the flex line for the 10,000-gallon UST. Approximately one ton of pea gravel was removed from around the flex line and hauled off Site for disposal (Kleinfelder, 2010A; SITE213-008969).
December 2001	Site investigation activities commenced at the Site with the advancement of 14 geoprobe soil borings (SB-1 through SB-14) around the UST field and dispenser islands. Results of the soil sampling indicated that benzene was detected at concentrations exceeding the NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) in soil samples collected from soil borings SB-8, SB-9, and SB-13 (Kleinfelder, 2010A; SITE213-008969). These borings

Date/Period	Activity
	were terminated due to refusal between 10 and 20 feet bgs, and no groundwater was encountered.
January 2002	To characterize groundwater conditions at the Site, three monitoring wells (MW-1, MW-2, and MW-3) were installed using an air rotary rig in the locations of geoprobe borings SB-8, SB-13, and SB-4, respectively (Kleinfelder, 2010A; SITE213-008969). Groundwater was sampled on January 29, 2002. MTBE was detected at concentrations of 153,000 µg/L (MW-1), 187,000 µg/L (MW-2), and 11,000 µg/L (MW-3).
February 2002	Light non-aqueous phase liquids (LNAPL) was detected in monitoring well MW-1 (0.09 feet) located north of the current tank pit (Kleinfelder, 2010A; SITE213-008969).
	Although LNAPL was not measured in MW-2, benzene concentrations in excess of 10,000 µg/L were detected in groundwater indicating the likely presence of LNAPL to the south of the current tank pit.
	As part of redevelopment activities at the property called Livingston Manor (currently called Livingston Town Center), located northwest across Mount Pleasant Avenue, three bedrock groundwater monitoring wells MW-1 through MW-3 were installed to total depths ranging from approximately 108.5 to 141 feet bgs. For purposes of this report, we have renamed these wells as LMW-1 through LMW-3 to avoid confusion with on-site wells MW-1, MW-2, and MW-3.
March 2002	A NJDEP Bureau of Water Allocation (BWA) well search (March 2002) and a 1,000-feet radius manual well canvass (August 2002) were conducted as part of a sensitive receptor survey (SRS) (Kleinfelder, 2010A; SITE213-008969). Several sensitive receptors were identified, including a total of five public supply wells and two commercial supply wells within one mile of the Site, and one domestic supply well within 1,000 feet of the Site. The nearest public supply well, Livingston Well #11, is located 1,750 feet to the northwest of the Site and screened from 54 to 423 feet bgs. *"Based on discussions with the property owner, the domestic supply well, located to the northwest of the Site at 35 North Livingston Avenue, is not in service, and the property is connected to public water."* The closest commercial supply well is located approximately 700 feet southwest of the Site at 19 South Livingston Avenue and is an active commercial supply well used for machinery cooling purposes. This well is completed to a depth of 298

Date/Period	Activity
	feet with a screen interval from 28 to 298 feet bgs (Kleinfelder, 2010A; SITE213-008969). Livingston Town Center bedrock monitoring wells LMW-1 to LMW-3 were analyzed for benzene and a concentration of 21 µg/L was detected in LMW-3. The wells were not analyzed for MTBE during this sampling event.
May, June, and September 2002	LNAPL bailing events were conducted in May, June, and September 2002 to address the LNAPL measured in MW-1 (Kleinfelder, 2010A; SITE213-008969). A total of 3.5 gallons of LNAPL were removed during these events (Geologic Services Corporation, 2004A; SITE213-001128).
January 2003	Six soil borings (SB-15 through SB-20) were advanced to further delineate soil contamination detected at soil borings SB-8 (MW-2), SB-9 and SB-13 (MW-2). Results of the soil sampling indicate that benzene, ethylbenzene, and/or total xylenes were detected at concentrations above the NJDEP IGWSCC or Remedial Direct Contact Soil Remediation Standards (RDCSRS) in soil samples collected from soil borings SB-15 through SB-18 and SB-20. Three monitoring wells (MW-4 through MW-6) were installed to further characterize groundwater conditions beneath the Site (Kleinfelder, 2010A; SITE213-008970). The Site soil data table is provided in Appendix D, herein.
February 2003	Livingston PSW #11 (screened from 54 to 423 feet bgs and located approximately 1,750 feet west of the Site), was restarted by the Livingston Water Department (Kleinfelder, 2010A; SITE213-008970).
March 2003	LNAPL was detected in monitoring wells MW-4 (0.17 feet) and MW-6 (0.10 feet) (Kleinfelder, 2010A; SITE213-008970). **MW-4 is located approximately 33 feet northwest of MW-1 near the northeast corner of the property. MW-6 is located on the western Site property line, 146 feet southwest (down-gradient) of MW-1 and MW-4. Well MW-6 is approximately 124 feet west of MW-2. Therefore, it is likely that LNAPL was present under much of the Site at this time.** Due to detections of benzene in LMW-3 during the previous well sampling at this Site, the property owner of Livingstone Manor, located across East Mount Pleasant Avenue, installed additional wells MW-4 and MW-5. For purposes of this report these wells have been renamed as LMW-4 and LMW-5.

Date/Period	Activity
April 2003	Groundwater samples from Livingston Manor wells LMW-1 through LMW-5 were analyzed for benzene, MTBE, and TBA. Three wells had MTBE and TBA detections: LMW-1 (screened 84 to 107 feet bgs), LMW-2 (screened 110 to 135 feet bgs), and LMW-3 (screened 115 to 141 feet bgs). The highest concentrations were detected in Well LMW-3: 5,500 µg/L MTBE and 1,800 µg/L TBA (EcolSciences, 2003; SITE213-003506). LMW-3 was located 350 feet down-gradient (to the northwest) of Exxon well MW-5 in the direction of Livingston PSW #11. Well LMW-2 was located 400 feet down-gradient of MW-5; that is, 50 feet further down gradient from LMW-3. 3,300 µg/L MTBE and 1,100 µg/L TBA were detected at LMW-2. Although a former gasoline service station was located on the Livingston Manor property at the corner of North Livingston Avenue and East Pleasant Avenue, it only operated until the 1940's. MTBE was introduced to gasoline in the late 1970's (NJDEP, 2005; SITE790-000347). Therefore, the MTBE and TBA detected in groundwater cannot be associated with a release of gasoline at this former station. No other sources for MTBE were identified on the Livingston Manor property (NJDEP, 2005; SITE790-000347). ExxonMobil received notification that the Livingston PSW #11 was brought back on-line. ExxonMobil then initiated weekly gauging and bailing events on the Site monitoring wells (Kleinfelder, 2010A; SITE213-008970). During the weekly LNAPL removal events, between April of 2003 and April 2004, a total of 358 gallons of a mixture of LNAPL and groundwater was removed from the Site. During the initial LNAPL removal event at MW-4, a maximum of 1.18 feet of LNAPL was measured (4/30/2003).
May 2003	A dual-phase extraction (DPE) pilot test was conducted at the Site to determine if DPE was an appropriate remedial technology for the Site (Kleinfelder, 2010A; SITE213-008970). Groundwater pump and treat (GWP&T) and soil vapor extraction (SVE) feasibility tests were conducted on May 6, 2003 and June 11, 2003 to evaluate the effectiveness of GWP&T and SVE as remedial technologies for the Site (Kleinfelder, 2010A; SITE213-008970). Rising head slug testing was conducted using unconsolidated sediment monitoring wells MW-1, MW-3, and MW-6 as the test wells. The average

Date/Period	Activity
	hydraulic conductivity for the unconsolidated sediment aquifer was calculated to be 3.805 feet per day (Kleinfelder, 2010A; SITE213-008970).
June 2003	Bedrock monitoring well MW-5D was installed to further characterize groundwater conditions at the Site (Kleinfelder, 2010A; SITE213-008970). MTBE was detected at 21,000 µg/L at MW-5D (screened 55 to 70 feet bgs) during the initial sampling on July 1, 2003. This concentration is higher than the maximum concentration ever detected in neighboring unconsolidated sediment well MW-5 (screened 25 to 45 feet bgs).
July 2003	Unconsolidated sediment monitoring wells MW-7 and MW-8 were installed to delineate hydrocarbon and oxygenate impacted groundwater on-Site and for use in conjunction with the future GWP&T and SVE systems (Kleinfelder, 2010A; SITE213-008970). LNAPL was detected in MW-7 during groundwater sampling and LNAPL bailing events. The maximum thickness of LNAPL detected in this well was 0.25 feet (8/19/2003). Although LNAPL was not detected in MW-8, a maximum benzene concentration of 13,100 µg/L (9/3/2003) was detected, indicating that LNAPL was also likely present in the vicinity of this well. Both MW-7 and MW-8 are located on-site, down-gradient of MW-1, MW-2, and MW-4 and up-gradient of MW-6.
September 2003	Up-gradient well MW-9 was installed in Sherbrooke Parkway.
November 2003	General Air Permit # GEN030001 was obtained from the NJDEP Environmental Regulation, Air Permitting Program on November 13, 2003 (Kleinfelder, 2010A; SITE213-008970).
March 2004	From March 19 to 30, 2004, five 1,000-gallon gasoline USTs that were previously abandoned-in-place were identified and removed from the Site (Kleinfelder, 2010A; SITE213-008970). Bedrock monitoring well MW-5D2 (screened 80 to 101 feet bgs) was installed to further characterize deep groundwater conditions beneath the Site. MW-12D (screened 80 to 101 feet bgs) was installed to the northwest of the Site across East Mount Pleasant Avenue on the Former Livingston Manor property, in the direction of Livingston PSW #11. (Kleinfelder, 2010A; SITE213-008970).

Date/Period	Activity
	During the April 2004 sampling event, MTBE concentrations were detected at 2,810 µg/L in MW-5D2 and at 1,070 µg/L in MW-12D.
	On March 25, 2004, the NJDEP issued a letter requiring ExxonMobil to install at least eight additional groundwater monitoring wells to delineate the horizontal and vertical extent of contamination in groundwater (NJDEP, 2004A; SITE213-008899).
April 2004	Semi-annual sampling of the commercial supply well (screened 28 to 298 feet bgs) located at the Bottle King liquor store (19 South Livingston Avenue, 700 feet southwest of the Site) was initiated (Kleinfelder, 2010A; SITE213-008970). Benzene and MTBE were detected during this first sampling event at 0.26 µg/L and 13.9 µg/L, respectively.
	Semi-annual vapor surveys began for subsurface utilities surrounding the Site. Utility manholes and vaults were monitored for vapor organic carbons (VOCs), % oxygen (O_2), and % of lower explosive limit (LEL). (Kleinfelder, 2010A; SITE213-002038). In April of 2006, these surveys became monthly events until at least November 2006 where it appears that they became less periodic. Further reporting of these events seem to be sporadic. Data indentified for these activities is found in Appendix E.
May 2004	A field violation was issued by the NJDEP noting: "*inaccurate registration*", *"liquid/free product in spill bucket"*, and *"Other: Delivery Ban. Do not fill tanks. Contaminated soil found… run enhanced tracer test for UST system."* (McCusker et al., 2005; SITE213-008522)
	"On May 26, 2004 Salomone Bros. Inc. conducted a visual inspection of all Submersible Turbine Pump (STP) heads. Including the regular STP swift check. The system was shut-down and restarted for various portions of the inspection. No visible spraying of liquid was observed at any STP. A weep was observed at the regular STP swift check. A loose fitting was tightened and the weeping ended… Less than one cubic foot of pea gravel was removed during this work" (Drake, 2004; SITE213-008910)
June 2004	At the request of the homeowner of 16 Sheerbrooke Parkway located directly to the south of the Site, seven surface soil samples (Vitulli-1 through Vitulli-7) were collected at the residential property. The surface soil sample analytical results indicated that the compounds analyzed were not detected at or above their laboratory method detection limits (Kleinfelder,

Date/Period	Activity
	2010A; SITE213-008970).
	A soil data table indicated that all seven samples were collected from 0.5 to 1.0 feet bgs (Kleinfelder 2010C, SITE213-009133).
July 2004	A New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Storm Sewer Permit request was submitted to the NJDEP - Division of Water Quality to discharge treated groundwater from the proposed GWP&T system (Kleinfelder, 2010A; SITE213-008970).
	A last round of groundwater samples were collected from five monitoring wells on the former Livingston Manor property prior to their abandonment for the re-development of the Site. MTBE was detected at concentrations of 1,950 µg/L and 752 µg/L at wells LMW-2 and LMW-3, respectively. TBA was detected at concentrations of 1,210 µg/L and 278 µg/L at wells LMW-2 and LMW-3, respectively.
	No wells were ever installed down-gradient of LM-3 in the direction of Livingston PSW #11.
	The SVE system was installed and started using groundwater monitoring wells MW-1 through MW-8 (Kleinfelder, 2010A; SITE213-008970). The SVE system was still operating as of September 2010. As of that time, a total of 12,475 lbs of hydrocarbons had been removed from the Site.
August 2004	Three indoor air samples were collected from 16 Sherbrooke Parkway using 24-hour flow regulated summa canisters. Two air samples were collected from inside the residential home, and one was collected from outside the residential home. Results of the indoor air sampling indicate that MTBE was detected above the NJDEP Indoor Air Screening (IAS) value. (Kleinfelder, 2010A; SITE213-008970).
September 2004	The NJPDES B4B permit was approved by the NJDEP - Division of Water Quality (Kleinfelder, 2010A; SITE213-008970).
	A NJDEP letter was received requesting additional indoor air sampling, sampling of the water within the basement sump, and a soil and groundwater investigation at 16 Sherbrooke Parkway (Kleinfelder, 2010A; SITE213-008970).
	Up-gradient off-site bedrock monitoring well MW-9D (screened 55 to 80

Date/Period	Activity
	feet bgs) was installed in Sherbrooke Parkway and on-site bedrock monitoring well MW-5D3 (screened 112 to 121 feet bgs) was installed. Well MW-5D3 was the deepest bedrock monitoring well ever installed, as part of investigations at the Site. During the first sampling of MW-5D3 (10/28/2004), MTBE was detected at a concentration of 24.2 µg/L in deep bedrock groundwater on-site. A year later, the maximum MTBE concentration detected in this well was 512 µg/L.
October 2004	A geophysical investigation, including a down-hole camera survey of the open-hole intervals within bedrock monitoring wells MW-5D, MW-5D2, MW-5D3, MW-9D, and MW- 12D, was conducted to characterize bedrock geology at the Site (Kleinfelder, 2010A; SITE213-008971). **The limited data collected was inadequate to explain the hydrogeologic conditions beneath the site; however, this study did note some high-angle fractures and an abundance of low-angle "hairline fractures".** MTBE and benzene were detected at 14.5 µg/L and 0.39 µg/L , respectively, at the private well at 19 South Livingston Avenue, located approximately 700 feet to the southwest of the Site. These were the maximum contaminant detections at this well. As requested within the September 8, 2004 NJDEP letter, five air samples were collected from 16 Sherbrooke Parkway utilizing 24-hour flow regulated summa canisters. Results of the indoor air sampling indicate that MTBE was detected above the NJDEP Indoor Air Sampling (IAS) value in the air samples collected from the basement, basement crawl space, the first floor, sub-slab and outside the house (Kleinfelder, 2010A; SITE213-008971). A water sample was collected from the basement sump of 16 Sherbrooke Parkway. "*The water sample analytical results indicated that targeted compounds analyzed were either not detected at or above the laboratory method detection limits or were detected at concentrations below the NJDEP* (Groundwater Quality Standard) *GWQS"* (Kleinfelder, 2010A; SITE213-008971).
November 2004	The Therm-Tech CATVAC 25E catalytic-oxidation (Cat-Ox) SVE unit was shut down due to a mechanical failure (Kleinfelder, 2010A; SITE213-008971). *"A soil and groundwater investigation commenced at 16 Sherbrooke*

Date/Period	Activity
	Parkway but was not completed due to encountered subsurface conditions." Soil samples for SB-22 and SB-23 were collected. The soil sample from SB-23 had detections of ethylbenzene and xylenes between 14.5 to 15 feet bgs. (Kleinfelder, 2010A; SITE213-008971).
December 2004	The GWP&T system was activated utilizing eight groundwater monitoring wells as extraction wells at a maximum pumping rate of two gallons per minute (Kleinfelder, 2010A; SITE213-008971). Groundwater was recovered from MW-1 through MW-8 utilizing submersible pumps**.** All unconsolidated sediment monitoring wells were converted to groundwater extraction wells and no dedicated groundwater monitoring wells were ever reinstalled.
	A drive-off at a dispenser and a 5-gallon release occurred at the Site. The NJDEP was notified and case # 04- 12-15-1558-52 was assigned (Kleinfelder, 2010A; SITE213-008971).
January 2005	A Falco 300 Cat-Ox unit was installed and started (Kleinfelder, 2010A; SITE213-008971).
	A NJDEP letter was received requesting additional investigation of the indoor air quality at 16 Sherbrooke Parkway (Kleinfelder, 2010A; SITE213-008971).
March 2005	A soil and groundwater investigation at 16 Sherbrooke Parkway was conducted. Fourteen soil samples were collected from soil borings SB-24 through SB-30. The soil quality analytical results indicated that soil sample SB-25 (13.5-14.0) was above the NJDEP IGWSCC for total xylenes. A temporary passively-placed, narrow diameter point was installed in soil boring SB-24 to collect a groundwater sample. The groundwater analytical results indicated that benzene, total xylenes and tentatively identified compounds (TICs) were detected at concentrations above the NJDEP GWQS. (Kleinfelder, 2010A; SITE213-008971).
April 2005	As requested within the January 28, 2005 NJDEP letter, five indoor air samples were collected from 16 Sherbrooke Parkway. Results of the air analysis indicate that benzene was detected above the IAS value in the air samples collected from the basement. MTBE was detected above the NJDEP IAS value in the air samples collected from the bathroom, and PCE was detected above the NJDEP IAS value in the air samples collected from the bathroom and the basement (4.4 micrograms per meter cubed ($\mu g/m^3$))

Date/Period	Activity
	(Kleinfelder, 2010A; SITE213-008971 to-008972).
May 2005	A packer test was conducted on bedrock monitoring well MW-5D2 to determine the integrity of the seal between the steel casing and the bedrock that extended to approximately 80 feet bgs. *"Groundwater samples were collected from above and below the packer to compare groundwater quality concentrations. Results of the packer test indicated that historical groundwater samples collected from MW-SD2 may not be representative of the groundwater quality from the open hole section of the well and may be the result of the mixing of water leaking from the steel casing and water entering the well from the vertical fracture at 95 to 97 feet below grade"* (Kleinfelder, 2010A; SITE213-008972). **Although the groundwater may have been leaking from the upper casing, it cannot be necessarily concluded that the groundwater traveling through the vertical fracture at 95 to 97 is not impacted. In order to prove that the water in the vertical fracture is not contaminated, a new well screened in this interval must be installed properly. No well was reinstalled in this area with the screen interval capturing the vertical fracture from 95 to 97 feet bgs.**
August 2005	Monitoring wells MW-10 (screened 8 to 30 feet bgs), MW-10D (screened 50 to 72), MW-11 (screen 9 to 30 feet bgs) and MW-11D (screened 50 to 75) were installed at 20 East Mount Pleasant Avenue to further characterize groundwater conditions (Kleinfelder, 2010A; SITE213-008972). Although these wells were installed down-gradient of known impacted wells, none of these new wells were screened deep enough to delineate lateral MTBE concentrations detected in MW-5D2 (screened 80 to 101 feet bgs) or MW-5D3 (112 to 121 feet bgs). Except for three monitoring events in MW-10, both MW-10 and MW-11 were consistently dry.
September 2005	Monitoring well MW-13 was installed on the property located at 16 Sherbrooke Parkway to further characterize groundwater conditions to the south of MW-2 (Kleinfelder, 2010A; SITE213-008972). MW-13 was successful in delineating shallow groundwater contamination in unconsolidated sediments cross-gradient of the Site to the south. However, as vertical delineation in the vicinity of MW-2 and MW-13 had not been demonstrated, bedrock groundwater contamination is not delineated to the

Date/Period	Activity
	south of the Site.
December 2005	On December 8, 2005, a meeting was held between representatives of the NJDEP, ExxonMobil, and Kleinfelder. ExxonMobil and the NJDEP agreed that additional monitoring wells would be installed along strike and down dip from the Site and that indoor air monitoring would be conducted at the commercial property to the west of the Site (Kleinfelder, 2010A; SITE213-008972).
April 2006	The NJDEP Bureau of Emergency Response prepared a report regarding a request for assistance. A Bell fiber optic cable box was reported to have 50% LEL readings in the area of a gas station located at 38 East Mount Pleasant Avenue. A map showing these concentrations is included in Appendix E. UST system upgrade activities were conducted, including replacement of the dispensers and product piping to the top of the USTs. A total of 122.33 tons of soil were removed from the Site. A total of 14 soil samples (DI-1 through DI-6 and PP-1 through PP-8) were collected from beneath the dispensers and product piping (Kleinfelder, 2010A; SITE213-008972].
May 2006	Indoor air screening, utilizing a portable photo ionization detector (PID), was conducted in the basements of the commercial properties located at 20 and 24 East Mount Pleasant Avenue. Results of the air screening indicate that VOCs were not detected above background levels in either basement (Kleinfelder, 2010A; SITE213-008972).
August 2006	*"Representatives of the NJDEP, Kleinfelder, and Verizon, conducted a Site visit on August 23, 2006 to investigate the Verizon utility/manholes (MH-3 through MH-6). Manholes MH-3 through MH-6, MH-11 and MH-12 were screened for percent LEL. LEL readings for each manhole were 0%. In addition, water samples were collected from each manhole and analyzed for VO+10. Based on the results of the manhole water sampling, the compounds analyzed in each manhole water sample were not detected at or above their laboratory method detection limits"* (Kleinfelder, 2010A; SITE213-008972).
October 2006	Bedrock monitoring well MW-5D2 (screened from 80 to 100 feet bgs) was abandoned due to the integrity of the grout seal around the steel casing. Bedrock monitoring well MW-5D2R (screened 70 to 85 feet bgs) was

Date/Period	Activity
	installed to replace MW-5D2 (Kleinfelder, 2010A; SITE213-008972). **The casing of MW-5D2 was determined to have been leaking since May 2005; however, it was not abandoned until October of 2006. If indeed the casing was leaking groundwater from shallower zone into the screen interval, Well MW-5D2 could have been functioning as a conduct for contaminant migration into the deeper aquifer for up to 31 months (well abandoned). In addition, when MW-5D2R was replaced, the screen interval was different and did not capture the vertical fracture between 95 and 97 which was noted during the packer test as a potentially transmissive interval for groundwater flow. No fluid logging or other in-well tests were conducted to determine groundwater occurrence prior to bedrock well installation.** Monitoring well MW-15S (screened 10 to 30 feet bgs) and bedrock monitoring well MW-15D (screened 40 to 65 feet bgs) were installed at 6 West Mount Pleasant Avenue (Federated Church of Livingston) to further characterize groundwater conditions off-site to the west. Soil boring SB-31 was advanced in Sherbrooke Parkway to complete horizontal delineation of the adsorbed-phase hydrocarbon contamination to the east of former soil boring SB-25. (Kleinfelder, 2010A; SITE213-008972).
January 2007	*"Step-drawdown and constant-rate pumping tests, using MW-5D as the extraction well, were conducted on January 15 and 16, 2007, respectively. Results of the pumping tests indicate the maximum sustainable pumping rate for MW-5D was 2.5 gallons per minute and that the water-bearing fractures in monitoring wells MW-5D* (screened 55 to 70 feet bgs)*, MW-9D* (screened 55 to 80 feet bgs) *and MW-11D* (screen 50 to 75 feet bgs) *exhibited connectivity. Hydraulic conductivity and specific storage for the bedrock aquifer fractures were estimated to be 0.9378 foot per day and 6.88E-12 per foot, respectively, and hydraulic conductivity and specific storage for the bedrock aquifer matrix were estimated to be 9.678E-6 foot per day and 2.837E-8 per foot, respectively. Monitoring well MW-5D3* (screened 112-121 feet bgs) *did not exhibit a water level response during the pumping test and the fractures in this well do not appear to be connected to those in MW-5D* (screened 55 to 70 feet bgs). *Data collected from monitoring wells MW-5, MW-5D2R, MW-10D, MW-12D and MW-15D*

Date/Period	Activity
	were inconclusive." (Kleinfelder, 2010A; SITE213-008972 and -008973)
May 2007	*"On May 10, 2007, a meeting was held between representatives of the NJDEP, ExxonMobil, and Kleinfelder. ExxonMobil and the NJDEP agreed that additional monitoring wells would be installed along strike from the Site and an evaluation of vapor intrusion of chlorinated solvents into the commercial property to the west of the Site would be conducted"* (Kleinfelder, 2010A; SITE213-008972). *"Active remediation of the bedrock aquifer did not begin until May 2007, when monitoring well MW-5D was connected to the GWP&T system as an extraction well for the shallow bedrock aquifer."*(Kleinfelder, 2010A; SITE213-008992). An email dated November 28, 2007 from Gary A. Slater from the NJDEP asked William E. Gottobrio from Kleinfelder if they had begun "*pumping from 5D yet*?" Gottobrio responded that they had *"been pumping from MW-5D since November 8, 2007."*
July 2007	Off-site unconsolidated sediment monitoring well MW-14S and bedrock monitoring well MW-14D were installed at 53 East Mount Pleasant Avenue to further characterize groundwater conditions up-gradient (Kleinfelder, 2010A; SITE213-008973).
August 2007	A Remedial Action Workplan (RAW)/ Remedial Investigation Report (RIR)/ Remedial Investigation Workplan (RIW) was submitted to the NJDEP (Kleinfelder, 2010A; SITE213-008973).
April 2008	Two soil borings, SB-34 and SB-35, were advanced on April 29, 2008 to delineate adsorbed phase hydrocarbon contamination. Soil samples were collected at depths ranging from 11.5 to 19.0 feet bgs. The sample from SB-34 at 13 to 13.5 feet bgs had toluene concentrations above NJDEP IGWSCC (Kleinfelder, 2010A; SITE213-008973).
October 2008	The scheduled semi-annual sampling at the commercial supply well was not conducted in October 2008 due to property access issues. An amendment to the access negotiated for monitoring well installation in the Bottle King parking lot was prepared by ExxonMobil's outside legal counsel (Kleinfelder, 2010A; SITE213-008973). A voicemail was left for the NJDEP Case Manager on October 13, 2008, informing him of the access issues related to the commercial supply well

Date/Period	Activity
	sampling at the Bottle King property (Kleinfelder, 2010A; SITE213-008973).
	A meeting between representatives of the Livingston Town Center and Kleinfelder was held to initiate access for the installation of a monitoring well on the Livingston Town Center property (Kleinfelder, 2010A; SITE213-008973).
November 2008	Four bedrock monitoring wells MW-16D (screened 50 to 70 feet bgs), MW-16D2 (screened 75 to 95 feet bgs), MW-17D (screened 50 to 70 feet bgs), and MW-17D2 (screened 75 to 95 feet bgs) were installed along strike on the Bottle King property to further delineate dissolved-phase contamination down-gradient of the Site (Kleinfelder, 2010A; SITE213-008973).
	A Notice of Deficiency (NOD) dated November 13, 2008 for the RAW dated August 29, 2007, and RIR/RIWs dated August 29, 2008; August 30, 2007; March 5, 2007; September 3, 2006 and August 29, 2005 was issued by the NJDEP on November 25, 2008 (Kleinfelder, 2010A; SITE213-008973). In summary, the letter required the following: re-installation of MW-10 and MW-11, re-installation of Livingston Manor Wells MW-2 and MW-3 (LMW-2 and LMW-3), installation of vapor monitoring points to evaluate the effectiveness of the SVE system, submission of a bedrock surface contour map, a cross section of MW-11 to MW-14 with the building basement footprint, and a proposal for an acceptable remedial action for the bedrock aquifer.
December 2008	A RIW was submitted to the NJDEP on December 23, 2008 in response to the November 13, 2008 NOD (Kleinfelder, 2010A; SITE213-008973).
January 2009	A letter dated January 16, 2009 was received from the NJDEP approving the December 23, 2008 RIW (Kleinfelder, 2010A; SITE213-008973).
February 2009	Legal access to the Bottle King building to resume sampling of the commercial supply well was obtained (Kleinfelder, 2010A; SITE213-008973).
March 2009	Access to the properties located at 20-24 East Mount Pleasant Avenue for the purposes of conducting a vapor intrusion investigation, was granted on March 5, 2009 (Kleinfelder, 2010A; SITE213-008974).
	A building walkthrough of the properties located at 20 - 24 East Mount Pleasant Avenue was conducted on March 24, 2009 as part of the vapor intrusion investigation at the retail properties located adjacent to the Site

Date/Period	Activity
	to the west (Kleinfelder, 2010A; SITE213-008974).
	Two soil borings (SB-38 and SB-39) were advanced on March 27, 2009 via direct push drilling techniques to depths of 19 and 20 feet bgs, respectively, where refusal was encountered. Four soil samples were collected and submitted for laboratory analysis for VO+10 (Kleinfelder, 2010A; SITE213-008974). The analytical data for oxygenates was not reported on soil data tables and the laboratory report could not be located.
	No hydrocarbons were detected in the soil samples from SB-38. Low detections of toluene, ethylbenze, and xylenes were detected in SB-39 at 16.0 to 16.5 feet bgs.
	Monitoring wells MW-10 and MW-11 which were consistently dry since installation in August 2009, were redrilled to a depth of 49 feet bgs on March 27 and 30, 2009. Open hole intervals were verified by the NJDEP via phone conversations on March 27, 2009, prior to completion. The replacement wells are identified as MW-10R and MW-11R, respectively. MW-10R and MW-11R were not developed at the time of installation because an insufficient amount of water was present in the wells (Kleinfelder, 2010A; NJDEP-SITE213-008974).
April 2009	*"MW-10R and MW-11R were sampled on April 14, 2009. Attempts were made to develop the two monitoring wells prior to sampling, but were unsuccessful due to an insufficient amount of water in the wells, and poor recharge" (*Kleinfelder, 2010A; SITE213-008974). **It is unclear if these wells were ever properly developed**.
	Semi-annual sampling of the commercial supply well at the Bottle King resumed on April 14, 2009 (Kleinfelder, 2010A; SITE213-008974).
May 2009	Soil borings SB-36 was drilled and sampled within East Mount Pleasant Avenue. SB-37 through SB-39 were completed as vapor monitoring points VP-1 through VP-3 (Kleinfelder, 2010A; SITE213-008974). These vapor monitoring points were requested by the NJDEP to augment the monitoring of the remedial system performance on a monthly basis (Kleinfelder, 2010A; SITE213-008986).
	A RIR/ Remedial Action Selection Report (RASR)/ RIW was submitted to the NJDEP on May 21, 2009, in response to the November 13, 2008 NOD.

Date/Period	Activity
	(Kleinfelder, 2010A; SITE213-008974).
June 2009	A Vapor Intrusion Investigation Workplan (VIIW) for the properties located at 20 - 24 East Mount Pleasant Avenue was submitted to the NJDEP on June 25, 2009 (Kleinfelder, 2010A; SITE213-008974).
July 2009	A SCM report was submitted to the NJDEP based on the data collected during the 2004 down-hole geophysical logging and the results of the 2007 aquifer testing. This report summarized the three-dimensional bedrock model of the Site and surrounding areas and summarized that the bedding plane fractures recorded in MW-5D3 could be projected to intersect former wells LMW-2 and LMW-3 (Kleinfelder, 2010A; SITE213-008974). *"The current conceptual model for groundwater flow within the bedrock is predominately along strike with a lesser flow component down dip… the former LMI (Livingston Manor) wells were located down dip"* (Kleinfelder, 2009A; SITE213-003268). The report recommended the installation of groundwater monitoring wells on the former Livingston Manor property to characterize bedrock groundwater flow and contaminant transport. **No wells have been installed on the former Livingston Manor property to date.**
August 2009	A RIR and a RIW was submitted. **The former Livingston Manor Wells MW-1 through MW-5 (LMW-1 through LMW-5) were relabeled as PLAZA-1 to PLAZA-5 by the Site consultant and PLAZA-4 and PLAZA-5 (LMW-4 and LMW-5) were miss-located approximately 200 feet to the west on the consultant's figures.**
September 2009	A letter dated September 15, 2009 which approved the June 25, 2009 VIIW was received from the NJDEP on September 25, 2009 (Kleinfelder, 2010A; SITE213-008974).
October 2009	Indoor air and ambient air samples were collected from the properties located at 20 – 24 East Mount Pleasant Avenue on October 19, 2009. The collection of sub-slab vapor samples was initiated on October 20, 2009, but was cancelled due to painting occurring in one of the units. The results of the vapor intrusion investigation activities were submitted to the NJDEP on November 16, 2009 via electronic mail (Kleinfelder, 2010A; SITE213-008974 to 008975).

Date/Period	Activity
November 2009	A maximum detection of 28.7 µg/L MTBE was detected in groundwater sampled from Livingston PSW #11. *"A request for an extension of the deadline to submit a revised RAW from December 31, 2009 to June 30, 2010 was submitted to the NJDEP on November 16, 2009."* (Kleinfelder, 2010A; SITE213-008975). *"Kleinfelder met the NJDEP Case Manager on Site on November 17, 2009 to conduct a walkthrough of the commercial properties located at 20 - 24 East Mount Pleasant Avenue, and discuss the sampling locations. Kleinfelder re-mobilized to the properties located at 20 - 24 East Mount Pleasant Avenue to conduct a second round of indoor air and ambient air sampling, in conjunction with sub-slab vapor sampling during the period of November 19 - 21, 2009. The results of the vapor intrusion investigation activities were submitted to the NJDEP on December 8, 2009 via electronic mail."* (Kleinfelder, 2010A; SITE213-008975).
December 2009	Kleinfelder contacted the NJDEP regarding the status of the November 16, 2009 extension request for the revised RAW submittal on December 29, 2009. The NJDEP case manager stated that due to the Site Remediation Reform Act (SRRA) regulation changes, extension requests for report deadlines were being automatically approved, unless the NJDEP specifically issued a letter denying the extension request. The NJDEP case manager stated that a denial of the extension request for the revised RAW was not being prepared (Kleinfelder, 2010A; SITE213-008975).
January 2010	A NOD dated January 11, 2010 was issued by the NJDEP. The NOD stated that further evaluation of the vapor intrusion pathway to determine the source of trichloroethene (TCE) detected in indoor air and sub-slab vapor samples was necessary. The NOD required a RIW to evaluate potential sources of the elevated TCE concentrations detected in indoor air and sub-slab vapor samples collected from the properties located at 20 - 24 East Mount Pleasant Avenue within 30 days of receipt of the letter. The NOD also required a site investigation to determine the source of PCE and TCE detected in groundwater at the Site within 270 days of the date of the letter (Kleinfelder, 2010A; SITE213-008975).
February 2010	A Vapor Migration RIW/NOD Response report was submitted to the NJDEP on February 12, 2010 in response to the January 11, 2010 NOD.

Date/Period	Activity
	"Six soil borings were advanced at the Site, and a total of eight soil samples were collected as part of Phase II divestment activities during the period of February 12, 2010 through February 16, 2010. Analytical results of the soil samples indicated that benzene, ethyl benzene, total xylenes and TICs were detected at concentrations exceeding the NJDEP and/or NJDEP RDCSCC in soil samples SB-1 (16.5-17) and SB-2 (17.5-18). The targeted analytes were not detected at concentrations exceeding the applicable NJDEP Soil Cleanup Criteria in the remaining six soil samples." (Kleinfelder, 2010A; SITE213-008975). **Both SB-1 (2010) and SB-2 (2010) are in the vicinity of the current USTs.**
March 2010	Groundwater samples were collected from existing Site monitoring wells as part of the Phase II divestment activities on March 30, 2010. Analytical results of the soil samples indicated that benzene, toluene, ethyl benzene, total xylenes (BTEX) and/or MTBE were detected in samples collected from monitoring wells MW-1 through MW-4, MW-7, and MW-8 at concentrations exceeding the NJDEP GWQS. Additionally, lead was detected in the sample collected from MW-4 at a concentration of 14.9 ug/L, exceeding the NJDEP GWQS of 5 ug/L (Kleinfelder, 2010A; SITE213-008975).
April 2010	A meeting between the NJDEP, ExxonMobil and Kleinfelder was held at Kleinfelder's office on April 29, 2010. The SCM and proposed monitoring well locations on the Livingston Town Center property were discussed. It was Kleinfelder's and ExxonMobil's understanding that the NJDEP would rank the list of well locations discussed during the meeting based on their preference of location(s) (Kleinfelder, 2010A; SITE213-008975).
May 2010	The May 21, 2009 RIR/ RASR/ RIW was approved in a letter from the NJDEP dated May 6, 2010 (Kleinfelder, 2010A; SITE213-008975). The February 12, 2010, Vapor Migration RIW/NOD Response report was approved in a letter from the NJDEP dated May 6, 2010 (Kleinfelder, 2010A; SITE213-008975). A Remediation Timeframe Extension Request Form was submitted to the NJDEP on May 27, 2010. This form requested an extension of the submittal date for the RAW from June 30, 2010 to December 31, 2010 (Kleinfelder, 2010A; SITE213-008976).

Date/Period	Activity
June 2010	A meeting between Kleinfelder and EcolSciences (consultant for the Livingston Town Center) was held at Kleinfelder's office on June 2, 2010. The SCM and proposed monitoring well locations on the Livingston Town Center property were discussed (Kleinfelder, 2010A; SITE213-008976). *"Kleinfelder met with the owners of the properties located at 20 - 24 East Mount Pleasant Avenue on June 14, 2010 to discuss the scopes of work proposed in the May 21, 2009 RIR/ RASR/ RIW and the February 12,2010 Vapor Migration RIW/NOD Response, which were approved by the NJDEP in letters dated May 6, 2010. During this meeting, the property owners requested that the vapor migration investigation work be postponed until the findings of the* (Preliminary Assessment/Site Investigation) *PA/SI were available, and that the system upgrade activities proposed to be conducted on their property be delayed until approximately October 2010. The NJDEP was informed of the property owners' requests on June 15, 2010"* (Kleinfelder, 2010A; SITE213-008976).
July 2010	An email correspondence was received from the NJDEP on July 22, 2010 regarding the vapor migration investigation and system upgrade work proposed to be conducted on the property located at 20 - 24 East Mount Pleasant Avenue. The email indicated that the NJDEP had facilitated access to this property. The NJDEP required an updated schedule of activities associated with the vapor migration investigation within seven days. Requests for access were sent to the owners of the property located at 20-24 East Mount Pleasant Avenue on July 26, 2010 for the purpose of conducting the vapor migration investigation activities proposed in the February 12, 2010 Vapor Migration RIW/ NOD Response report. Signed access agreements were received from the property owners on August 6, 2010 and August 12, 2010 (Kleinfelder, 2010A; SITE213-008976). An updated schedule of activities for the vapor migration investigation and system upgrade was submitted to the NJDEP via email on July 29, 2010 (Kleinfelder, 2010A; SITE213-008976).
August 2010	The owner of the property located at 20 East Mount Pleasant Avenue contacted Kleinfelder on August 17, 2010 and indicated that he was entering the busiest time of year with back to school sales, and could not afford the loss of parking spots or disruption to the business for at least the next three weeks. The property owner indicated that the utility mark out could proceed, but that drilling would not be permitted at that time, and

Date/Period	Activity
	that he would contact the NJDEP case manager directly to discuss the issue. The NJDEP was notified of this on August 18, 2010 (Kleinfelder, 2010A; SITE213-008976).
	Kleinfelder met with the owners of the property located at 20 - 24 East Mount Pleasant Avenue on August 26, 2010. A date of October 11, 2010 was agreed upon as the date when subsurface work for the vapor migration investigation and remediation system upgrade would commence on that property. The NJDEP was notified on September 1, 2010 (Kleinfelder, 2010A; SITE213-008976).
	A soil investigation was conducted as part of the SI in response to the January 11, 2010 NOD during the period of August 31 to September 2, 2010. Seven borings were advanced to investigate potential impact from historical automotive repair operations at the Site, the reported former waste oil UST, associated oil-water separator, and sewer line. Two surficial soil samples were collected - one from beneath each of two hydraulic lift vents - along the southern side of the station building (Kleinfelder, 2010A; SITE213-008976).
September 2010	A RIR/ RAW Addendum was submitted to the NJDEP on September 29, 2010 with a proposal to install an extraction well in the southeast corner of the property located at 20 - 24 East Mount Pleasant Avenue, and to connect off Site monitoring wells MW-10D, MW-10R, MW-11D, MW-11R and a newly installed extraction well to the existing GWP&T system. (Kleinfelder, 2010A; SITE213-008996). *"… dissolved phase hydrocarbon recovery trend graphs prepared for the GWP&T… indicate that hydrocarbon mass recovery has not reached asymptotic conditions…"* (Kleinfelder, 2010A; SITE213-008986).
	The former Livingston Manor Wells LMW-1 through LMW-5 continued to be miss-located approximately 200 feet to the west on the consultant's figures.
January 2011	A Site Status Update was submitted by ExxonMobil indicating that a new recovery well, and the MW-10 and MW-11 cluster wells, would be added to the remediation system. The new recovery well named RW-18 was installed to 78 feet bgs; however, "*initial review of the completed well indicates that RW-18 may not be viable, as on November 18, 2010 the well was gauged to a terminal depth of 62.5 feet bgs on mud. This suggests that either the open-hole interval collapsed or it has become impacted with sediment from*

Date/Period	Activity
	the formation during the stabilization period" (ExxonMobil, 2011; SITE213-008523).
February 2011	An Initial Receptor Survey Evaluation Form was submitted. Eight residences were located within 200 feet of the Site. Additionally, the supporting documents indicated that four vapor probes (VP-4 to VP-7) had been installed on the property to the west of the Site at 20-24 Mount Pleasant in October of 2010. After installation, they were not deemed as appropriate vapor points by ExxonMobil as they were observed to be under vacuum by the remediation system (Kleinfelder, 2011; SITE213-008448).

5.0 HYDROGEOLOGIC SETTING

5.1 Site Geology and Hydrogeology

The geology beneath the Site consists of unconsolidated silt and fine sand grading to coarse sand up to an approximate depth of 30 feet bgs and then coarse sands and gravels to bedrock at approximately 45 feet bgs. Underlying these unconsolidated sediments are the interbedded gray and red to reddish-brown siltstones of the Towaco Formation. The siltstones are generally located with upward fining sequences one to three meters thick and are commonly planar- or cross- laminated. *"Bedrock topography in the vicinity of the Site is irregular with the top-of-bedrock elevation ranging from around 300 to 250 feet AMSL"* (Kleinfelder, 2010A). Siltstones commonly have vertical fractures and horizontal partings along bedding planes (Drake et aI., 1996). The United States Geological Survey (USGS) Bedrock geology map for Essex and Morris Counties by R. A. Volkert shows the nearest measured attitude of the Towaco Formation being a ¼ mile to the west with a strike of N14E and dip of 7° to the northwest with the mean strike of the sedimentary bedding in these counties reported as N19E (Volkert, 2006) with a dip between 7 and 12°(Drake et aI., 1996). Regional geology is presented on Figure 4 and a regional cross section is illustrated on Figure 5.

The nature of groundwater occurrence and flow characteristics have not been adequately assessed beneath the Site; however, publications describe the Brunswick Aquifer as primarily having secondary porosity with the majority of the fractures and joints providing the principal passages for groundwater flow and occurrence (Sloto et. aI., 1995). Two pumping tests have been performed at the Site. The first evaluated the hydrologic properties of the unconsolidated sediments while the second focused on bedrock. Neither test provided information on the hydraulic communication between the shallow groundwater located in the unconsolidated sediments and the saturated bedrock. Site boring logs indicate an absence of an aquiclude between the unconsolidated sediments and the bedrock allowing for the vertical migration of contaminants in groundwater from the unconsolidated sediments into lower bedrock units. Cross Section A-A' on Figure 6a, shows the dipping siltstone units in relation to the unconsolidated sediments. Cross Section B-B' on Figure 6b is constructed along the strike of the bedrock. Cross-Sections from the May 2009 RIR/ RASR/ RIW are included in Appendix G which depict the vertical and horizontal fractures concluded from the October 2004 bedrock study.

For the purposes of this report, the wells associated with this Site have been grouped based on specific characteristics. Unconfined groundwater is present in the unconsolidated sediments and wells screened within these sediments are designated as "Unconsolidated Wells". Wells screened within the siltstone bedrock are designated “Bedrock Wells”. The Bedrock Wells are then divided into groups that intersect the same general bedding planes stratigraphically. This division of wells is based on the premise that the Brunswick Aquifer primarily has secondary porosity with the majority of the fractures and joints providing the principal passages for groundwater flow and occurrence (Sloto et. al., 1995), that fractures and partings occur along bedding planes (Drake et al., 1996), and “*Ground water occurs along bedding surfaces, joints…*” (NJDEP, 1990).

Aquilogic assigned the groundwater zones beneath the Site the arbitrary names: Zone A, Zone B, Zone C, and Zone D. To the northwest of the Site, a Zone Z exists above Zone A. Note: Some wells within the same zone have differing screen intervals because the bedrock is dipping. Those wells that extend through the boundaries of two zones and extend greater than 5 feet into both zones have been designated as dual-zoned (e.g. Zone B/C) accordingly. These wells have not been used for examining groundwater gradients. Examples of the naming convention are shown below, pictorially on cross section A-A’ and B-B’ (Figures 6a and 6b), and the zone designations for each well are on Table 1.

- MW-10R – Zone A
- MW-5D – Zone B
- MW-5D2R – Zone C
- MW-5D3 – Zone D
- MW-12D – Zone B
- MW-16D – Zone B/C

Groundwater monitoring and flow information for each bedrock zone is in Section 5.3. The anomalously high groundwater elevations from the June 8, 2010 groundwater monitoring event were not used for analyzing average groundwater gradients. The most recent groundwater elevation data is on Figures 7bi and 7bii.

5.2 Unconsolidated Wells

5.2.1 Depth/Elevation

The depth to water in the Unconsolidated Wells has ranged from a minimum of ~ 27 to a maximum of ~42 feet bgs corresponding to an elevation of 286 to 300 feet AMSL (Table 2). All of the on-site unconsolidated wells are currently being used for remedial extraction. This wide elevation range between wells in close proximity is likely due to a combination of seasonal recharge variations, remediation activities, and off-site groundwater pumping.

5.2.2 Flow Direction and Gradient

"Groundwater flow direction in the overburden aquifer was determined to be towards the west or northwest during the four most recent sampling events, which is consistent with historical data." (Kleinfelder, 2010A; SITE213-008983) However, based on data prior to the initiation of the groundwater extraction system in December 2004 and the use of the on-site unconsolidated wells as extraction wells, the groundwater in the unconsolidated sediments generally flows to the southwest as depicted on the rose diagram, Figure 7ai. Hydraulic gradients are generally steep between 0.067 feet/foot and 0.125 feet/foot with an average gradient of 0.092 feet/foot.

5.2.3 Hydraulic Properties

As part of a "GWP&T and SVE feasibility tests" conducted from May to June 2003, *"Rising head slug testing was conducted using MW-1, MW-3, and MW-6 as the test wells. The average hydraulic conductivity for the overburdened aquifer was calculated to be 3.805 feet per day"* (Kleinfelder, 2010B; SITE213-009217). The average depth to water in the unconsolidated zone is 34 feet bgs (290.87 feet AMSL).

5.2.4 Velocity

Using 0.33 as a representative effective porosity (n_e) for fine sand (McWorter and Sunada, 1977), the above average hydraulic gradient (i) (0.092 feet/ foott), and the calculated hydraulic conductivity (K) (3.805 feet/day), the average linear velocity in the unconsolidated sediments is 1.06 feet/day (387 feet/year) per the equation:

$$V = K*i/n_e$$

5.3 Bedrock Wells

5.3.1 Zone A Wells

5.3.1.1 Zone A Depth/Elevation

There are no on-site Zone A monitoring wells. Two off-site wells MW-10R and MW-11R are screened within this zone. Depth to water in MW-10R has ranged from 41.39 to 43.56 feet bgs with a corresponding elevation of 278.40 to 280.57 feet AMSL. Depth to water in MW-11R ranged from 46.80 to 48.15 feet bgs with a corresponding elevation of 273.50 to 274.85 feet AMSL.

5.3.1.2 A Zone Flow Direction and Gradient

Groundwater flow and gradient cannot be determined using the data reviewed.

5.3.2 Zone B Wells

5.3.2.1 Zone B Depth/Elevation

On-site extraction well MW-5D and off-site monitoring wells MW-10D, MW-11D, and MW-12D are screened within this zone. MW-5D is an extraction well and has not been used in this analysis as the field procedures used to determine the depth to groundwater in remediation wells is unknown.

The following is the most recent data in which all three wells were measured on the same day:

	MW-10D	MW-11D	MW-12D
Date	(Feet AMSL)	(Feet AMSL)	(Feet AMSL)
12/2/2009	282.32	265.94	263.53
9/29/2009	283.12	263.05	265.64
6/11/2009	282.47	270.29	264.70
3/10/2009	281.17	268.95	258.16

5.3.2.2 Zone B Flow Direction and Gradient

Based on these groundwater monitoring events, the groundwater flow direction in the Zone B is predominately toward the southwest from the Site, which is along the general strike of the bedrock. Based on the above data, the average hydraulic gradient is steep and estimated at 0.118 feet/foot.

5.3.3 Zone C Wells

5.3.3.1 Zone C Depth/Elevation

On-site monitoring well MW-5D2 was replaced by well MW-5D2R in October 2006 (Kleinfelder, 2010A; SITE213-008972). On-site well MW-5D2R and off-site wells MW-9D and MW-17D are screened within Zone C.

The following is the most recent data in which all three wells were measured on the same day:

	MW-5D2R	MW-9D	MW-17D
Date	(Feet AMSL)	(Feet AMSL)	(Feet AMSL)
12/14/2010	260.35	275.82	262.43
9/15/2010	260.60	274.37	264.81
12/9/2009	264.10	274.74	267.40
9/29/2009	265.50	273.13	271.37

5.3.3.2 Zone C Flow Direction and Gradient

Based on these groundwater monitoring events, the groundwater flow direction in Zone C is to the northwest from the Site, which corresponds with the general dip of the bedrock. Based on the above data, the average hydraulic gradient is steep and estimated at 0.080 feet/foot.

5.3.4 Zone D Wells

5.3.4.1 Zone D Depth/Elevation

On-site groundwater monitoring well MW-5D3 and off-site well MW-17D2 are the only Zone D groundwater monitoring wells at the Site. Depth to water in MW-5D3 has ranged from 90.79 to 119.84 feet bgs with a corresponding elevation of 205.17 to 234.22 feet AMSL. Depth to water in MW-17D2 ranged from 81.72 to 92.80 feet bgs with a corresponding elevation of 217.70 to 228.78 feet AMSL. The large fluctuation in groundwater elevations likely reflect pumping activity in nearby WSWs.

5.3.4.2 Zone D Flow Direction and Gradient

Groundwater flow and gradient cannot be determined with the available data.

5.3.5 Bedrock Hydraulic Properties

The SCM prepared by Kleinfelder in 2009 states that the *"current conceptual model for groundwater beneath the Site is predominately along strike from Exxon Site #31310 to the southwest of the site towards the Bottle King property, with a lesser flow component down dip."* Anisotropic flow within the bedrock units is expected within this formation. Within wells associated with this Site, average depth to groundwater increases from 54 (271 feet AMSL) to 104 feet bgs (221 Feet AMSL) between Zone B and Zone D, respectively.

In January 2007, step-drawdown and constant-rate pumping tests were conducted using Zone B well MW-5D as the extraction well and Zone B monitoring wells MW-10D and MW-11D and Zone C well MW-9D as monitoring wells. *"Results of the pumping tests indicate the maximum sustainable pumping rate for MW-5D was 2.5 gallons per minute and that the water-bearing fractures in monitoring wells MW-5D, MW-9D and MW-11D exhibited connectivity. Hydraulic conductivity and specific storage for the <u>bedrock aquifer fractures</u> were estimated to be 0.9378 foot per day and 6.88E-12 per foot, respectively."* (Kleinfelder, 2008; SITE213-006564 and -006565). *"… constant-rate pumping test was conducted utilizing MW-5D as the extraction well… Based on the results of the aquifer testing, hydraulic conductivity and specific storage for the <u>bedrock aquifer matrix</u> were estimated to be 9.678E-6 foot per day and 2.837E-8 per foot, respectively. Drawdown was detected in observation wells MW-9D and MW-11D, which* *indicates that the fractures in MW-5D, MW-9D and MW-11D exhibited connectivity."* (Kleinfelder, 2007; SITE213-001984 and -001985). Based on the connectivity of MW-5D and MW-11D, as determined during the January 2007 aquifer testing, groundwater flow in the Zone B bedrock aquifer is predominately along strike to the southwest. Based on the observed water levels during the test at MW-5D and MW-9D it was concluded that hydraulic connection exists between Bedrock Zone B and C.

5.3.6 Velocity

The wells used for the calculation of the hydraulic conductivity of the bedrock are screened in the Zone B and Zone C aquifer units. These units have different groundwater elevations, gradients, and flow directions. Therefore, the estimated hydraulic conductivity is probably not representative of a single hydrogeologic zone. Given that, and the anisotropic nature of fracture dominated flow, velocity cannot be estimated based on existing information. However, it is likely higher than that estimated for the overlying unconsolidated sediments; that is, greater than 1 foot/day.

6.0 CONTAMINANT CONDITIONS

6.1 Chemicals of Concern

The principle chemicals of concern (COCs) are MTBE, TBA, and benzene. It should be noted that elevated concentrations of lead have also been detected in groundwater beneath the Site. Groundwater analytical results are summarized in Appendix A (by well) and Appendix B (by date). A summary of key groundwater data is illustrated on Table 5.

6.2 Soil and Soil Vapor Contamination

6.2.1 Nature

Soil sampling was limited to exploratory borings using direct push methods. All of the wells were drilled with air-rotary drill rigs and consequently no soil samples were collected. Soil samples were collected during piping and tank upgrades and as part of Phase 2 divestment activities. Soil data tables do not report fuel oxygenate results for those soil samples collected. Soil boring locations are located on Figure 2 and Figure 2a and soil analytical data is in Appendix D.

6.2.2 Magnitude

The data does not indicate that soil samples at the Site were analyzed for MTBE and TBA. Soil samples were analyzed for aromatic hydrocarbons (BTEX) and a few soil samples were analyzed for total petroleum hydrocarbons as gasoline (TPHg). The following are the maximum concentrations of benzene and TPHg in soil samples collected as part of investigations at the Site:

- Benzene: 49.0 milligrams per kilogram (mg/kg) in a sample collected from SB-9 at 15 to 15.5 feet bgs on December 14, 2001 (Kleinfelder, 2010A; SITE213-009083).
- TPHg: 3,540 micrograms per kilogram (mg/kg) in a sample collected from SB-2 (2010) at 17.5 to 18.0 feet bgs (Kleinfelder, 2010A; SITE213-009083).

Several episodes of indoor air monitoring were conducted at the private residence directly to the south of the Site at 16 Sherbrooke Parkway. Indoor air monitoring was also conducted to the west of the Site at the commercial building at 20 to 24 East Mount Pleasant Avenue. Copies of soil vapor tables are in Appendix E.

Vapor samples collected on August 5, 2004 from the private property at 16 Sherbrooke Parkway located directly south of the Site had MTBE detections above the NJDEP Indoor Air Screening Levels (IASLs). Again on October 14, 2004, air samples were collected from this private residence and MTBE was detected above the IASL in the basement, basement crawl space, the first floor and the outside of the house. A third vapor sampling event was conducted on April 21, 2005. Benzene was detected above the IASL in the basement and MTBE was detected above the IASL in the bathroom. In a document prepared by Kleinfelder on February 23, 2011, it states "*Exceedances of the NJDEP Soil Gas Screening Levels (SGSL) were not detected in the sub-slab soil gas samples collected during the vapor intrusion investigation activities described above. Because the house has an attached garage where automobiles, gasoline cans and other potential sources of the gasoline-related compounds detected in indoor air samples could be present; and because exceedances of the NJDEP SGSL were not detected* (in the sub-slab samples)*, ExxonMobil has not proposed further vapor intrusion investigation activities at 16 Sherbrooke Parkway"* (Kleinfelder, 2011; SITE213-008399). Results of the indoor air sampling at 16 Sherbrooke Parkway are provided in Appendix E. No additional vapor sampling has been conducted at 16 Sherbrooke Parkway since April 2005.

Indoor Air sampling was conducted at 20 to 24 East Mount Pleasant Avenue in the commercial buildings on October 19, 2009 and on November 19 through 21, 2009. Benzene was detected at levels exceeding the IASL. TCE and PCE were also detected, and these chlorinated solvents are not typically associated with gasoline contamination. The NJDEP required ExxonMobil to conduct an investigation in the vicinity of the auto repair shop to determine if a source for the TCE and PCE was at the Site. No source at the Site was located (Kleinfelder, 2011; SITE213-008401). No additional vapor sampling has been conducted at 20 to 24 East Mount Pleasant Avenue.

In April 2006, the NJDEP Bureau of Emergency Response responded to a request for assistance when 50% LEL readings were detected in Bell fiber optic cable boxes approximately 40 feet to the northwest of MW-4 (NJDEP Bureau of Emergency Response Region I, 2011; SITE213-008383 to -008388).

6.2.3 Extent

The magnitude and extent of MTBE and TBA within the vadose zone beneath the Site appears to not have been investigated. No analytical data for these constituents has been included in any soil data tables associated with site reports; therefore, the extent of contamination cannot be determined.

- Benzene: In January 2003, benzene was detected in a saturated soil sample collected from 34.0 to 34.5 feet bgs (SB-20) at a concentration of 2.01 mg/kg. This is the deepest soil sample collected at the Site and indicated that benzene contamination in soil extended to groundwater in 2003. The maximum concentration of benzene detected at the Site (49.0 mg/kg) was from SB-9 at a depth of 15 to 15.5 feet bgs. A more recent boring SB-2 (2010) was drilled in February of 2010 and was located 15 feet south of SB-9. SB-2 (2010) had the second highest concentration of benzene ever detected at the Site with a concentration of 45.5 mg/kg at a depth of 17.5 to 18. From this data, benzene contamination is currently present to the east of the current Site USTs to at least 18 feet bgs. Another boring SB-1 (2010) which was also drilled recently, but to the west of the current USTs, had a benzene concentration of 11.8 mg/kg (16.5 to 17 feet bgs). This data indicates that benzene is also present to at least 17 feet to the west of the current USTs. Currently, benzene is not delineated laterally in soil and likely still extends to groundwater at the Site.

- TPHg: Only samples collected from piping and dispenser island upgrades, and the most recent borings SB-1 (2010) through SB-6 (2010), were tested for TPHg. TPHg was detected in SB-1 (2010), SB-2 (2010), and SB-3 (2010) from 17 to 20 feet bgs. From this data, it appears that TPHg contamination currently exists in the vicinity of former and current USTs to at least 20 feet bgs, and extends to groundwater. Currently, TPHg is not delineated vertically and laterally at the Site.

6.3 LNAPL

6.3.1 Nature

LNAPL was measured in unconsolidated sediment groundwater monitoring wells immediately after installation in January 2002 and persisted until September 2007.

6.3.2 Magnitude

A maximum LNAPL thickness of 1.18 feet was observed at on-site monitoring well MW-4 on April 4, 2003 (Geologic Services Corporation, 2004A; SITE213-001131).

6.3.3 Extent

LNAPL was measured in MW-1, MW-2, MW-4, and MW-7 and once in MW-6. The majority of the LNAPL plume has been in the eastern half of the Site in the vicinity of at least three generations of USTs. There have been no dedicated unconsolidated sediment groundwater monitoring wells at the Site since July 2004 (all wells are connected to the on-site remediation system) and no unconsolidated sediment wells installed off-site down-gradient of the Site.

"(Liquid phase hydrocarbon) *LPH bailing events were conducted from May 6, 2003 through February 2004 and approximately 354 gallons of groundwater and LPH were recovered."* (Kleinfelder, 2008; SITE213-006565). A total of 198.5 gallons of LNAPL were removed from well MW-4 alone which is located in the northeastern area of the Site. All wells that contained LNAPL are now connected to the remediation system. LNAPL has not been detected in any bedrock wells; however, no bedrock wells have been installed on the eastern half of the site near the USTs.

6.4 Groundwater Contamination

6.4.1 Nature

Petroleum hydrocarbon impacts to groundwater were detected with the installations of the first wells in January of 2002. Contaminant concentrations at on-site wells have diminished over time as a result of on-site remediation and off-site contaminant migration. MTBE analytical results are shown on Figures 8a, 8b, and 8d and TBA analytical results are on Figures 9a, 9b, and 9d. Time-Series Hydrographs for each well are provided in Appendix C.

6.4.2 Magnitude

6.4.2.1 Unconsolidated Sediment Wells

Benzene

- Initial: Benzene was first detected at a concentration of 39,400 µg/L in a sample collected from MW-1 on January 29, 2002. MW-1 is located to the northeast of the USTs.
- Maximum: The maximum historic detection of benzene in unconsolidated groundwater was 46,400 µg/L in a sample collected from MW-1 on September 3, 2003.
- Current: Remediation wells MW-2 through MW-4 were not sampled during the most recent sampling event for which we have data (December 2010). However, using the sampling data from September 2010 and December 2010, the maximum detection of benzene in unconsolidated groundwater was 510 µg/L in a sample collected from MW-3. MW-3 is located to the west of the dispenser island near the northern property line.

MTBE

- Initial: MTBE was first detected at a concentration of 187,000 µg/L in a sample collected from MW-2 on January 29, 2002. MW-2 is located south of the current operating USTs near the southern property line.

- Maximum: The maximum historic detection of MTBE in unconsolidated groundwater was 234,000 µg/L in a sample collected from MW-1 on July 1, 2003. MW-1 is located to the northeast of the current operating tanks.
- Current: The maximum detection of MTBE in unconsolidated groundwater during the most recent sampling event for which we have data (December 2010) was 98.4 µg/L in a sample collected from MW-1. MW-1 is located to the northeast of the current operating tanks.

<u>TBA</u>

- Initial: TBA was first detected at a concentration of 80,100 µg/L in a sample collected from MW-2 on January 29, 2002. MW-2 is located south of the current operating USTs near the southern property line.
- Maximum: TBA was detected at a maximum concentration of 118,000 µg/L in a sample collected from unconsolidated sediment monitoring well MW-2 on July 11, 2002. MW-2 is located south of the current operating USTs near the southern property line.
- Current: The maximum detection of TBA in unconsolidated groundwater during the most recent sampling event for which we have data (December 2010) was 2,990 µg/L in a sample collected from MW-1. MW-1 is located to the northeast of the current operating tanks.

6.4.2.2 Bedrock Wells

<u>Benzene</u>

- Initial: MTBE was first detected in bedrock groundwater at a concentration of 3,370 µg/L in a sample collected from on-site well MW-5D on July 1, 2003. Well MW-5 is located near the western property line.
- Maximum: The maximum historic detection of benzene in bedrock groundwater was 5,970 µg/L in a sample collected from MW-5D on June 9, 2004.
- Current: The maximum detection of benzene in bedrock groundwater during the most recent sampling event for which we have data (December 2010) was 308 µg/L in a sample collected from MW-5D.

<u>MTBE</u>

- Initial: MTBE was first detected in bedrock groundwater at a concentration of 21,000 µg/L in a sample collected from MW-5D on July 1, 2003.
- Maximum: The maximum historic detection of MTBE in bedrock groundwater was 33,700 µg/L in a sample collected from MW-5D on June 9, 2004.
- Current: The maximum detection of MTBE in bedrock groundwater during the most recent sampling event for which we have data (December 2010) was 195 µg/L in a sample collected from MW-16D**.** Well MW-16D is located 250 feet southwest of the property line.

TBA

- Initial: TBA was first detected in bedrock groundwater at a concentration of 10,700 µg/L in a sample collected from MW-5D on July 1, 2003.
- Maximum: The maximum historic detection of TBA in bedrock groundwater was also 24,200 µg/L in a sample collected from MW-5D on July 14, 2003.
- Current: The maximum detection of TBA in bedrock groundwater during the most recent sampling events for which we have data (December 2010) was 5,350 µg/L in a sample collected from MW-5D.

6.4.3 Extent

6.4.3.1 Unconsolidated Sediments

Unconsolidated sediment groundwater monitoring well MW-10 only contained enough water to sample on three occasions and MW-11 was dry for all sampling events. These wells were re-drilled entirely into shallow bedrock as MW-10R and MW-11R and are now considered Zone A bedrock monitoring wells based on the lithology recorded on the boring logs.

Benzene

Benzene has been detected in groundwater samples collected from unconsolidated monitoring wells MW-1 through MW-9. There are no off-site, down-gradient unconsolidated sediment monitoring wells. Wells MW-1 through MW-8 were converted to remediation extraction wells. In the unconsolidated sediments, the groundwater flow is to the southwest. Therefore, benzene is delineated up-gradient by unconsolidated groundwater monitoring wells MW-14S and MW-9 and delineated cross-gradient (to the south) by MW-13 and cross-gradient to the west by MW-15. No off-site groundwater monitoring wells screened within the unconsolidated sediments have been installed to the southwest of MW-7 and MW-8; therefore, the lateral extent of benzene contamination is not delineated down-gradient of the Site.

MTBE

MTBE has been detected in unconsolidated sediment groundwater samples collected from wells MW-1 through MW-8 and MW-13. Wells MW-1 through MW-8 are located on-site and MW-13 cross-gradient to the south of the Site. Wells MW-1 through MW-8 were converted to remediation extraction wells. MTBE was not detected in MW-9 above the estimated value of 0.42 µg/L and was not detected in MW-14S and MW-15S. Groundwater flows to the southwest in the unconsolidated sediments and MTBE was delineated in the unconsolidated groundwater up-gradient (to the north) by MW-14S and cross-gradient (to the west) by MW-15S. The maximum MTBE detected in MW-13 has been 4.1 µg/L (3/21/2006), reasonably delineating

MTBE contamination cross-gradient (to the south). No groundwater monitoring wells screened within the unconsolidated sediments have been installed to the southwest of MW-7 and MW-8; therefore, the lateral extent of MTBE contamination is not delineated down-gradient of the Site.

TBA

TBA has been detected in unconsolidated sediment groundwater samples collected from wells MW-1 through MW-8. Wells MW-1 through MW-8 are located on the Site; however, these wells were converted to remediation extraction wells. TBA was not detected in MW-9, MW-13, MW-14S, and MW-15S. Groundwater flows to the southwest in the unconsolidated sediments and TBA was delineated in the unconsolidated groundwater up-gradient (to the north) by MW-14S, and cross-gradient (to the west) by MW-15S. The maximum TBA detected in MW-13 has been 4.1 µg/L (3/21/2006), reasonably delineating TBA contamination cross-gradient (to the south). No groundwater monitoring wells screened within the unconsolidated sediments have been installed to the southwest of MW-7 and MW-8; therefore, the lateral extent of TBA contamination is not delineated down-gradient of the Site.

6.4.3.2 Bedrock

Bedrock Zone A

Two wells have been installed into the uppermost Bedrock Zone A, off-site wells MW-10R and MW-11R. Groundwater flow in this zone cannot be estimated; however, it is likely to the southwest. Benzene, MTBE, and TBA have been detected in both wells. Current benzene concentrations are 268 µg/L in MW-10R and 138 µg/L in MW-11R. MTBE is currently not detected in MW-10R and is 26.7 µg/L in MW-11R. Current TBA concentrations are 168 µg/L in MW-10R and 462 µg/L in MW-11R. In Zone A, benzene, MTBE, and TBA contamination is currently at least 170 feet off-site to the southwest and is not delineated in this direction.

Bedrock Zone B

Four wells have been installed into Bedrock Zone B, on-site well MW-5D and off-site wells MW-10D, MW-11D, and MW-12D. Benzene has been detected in all wells except MW-12D. The maximum current detection in this zone is 180 feet to the southwest of the Site. Groundwater in Zone B flows predominately to the southwest and appears to be delineated cross-gradient to the northwest by MW-12D; however, the benzene contamination is not delineated up-gradient to the northeast, cross-gradient to the southeast, or down-gradient to the southwest. In Zone B, benzene is currently at least 170 feet off-site to the southwest (MW-11D).

MTBE has been detected in all wells and is not delineated in any direction. In Zone B, MTBE contamination is currently at least 270 feet off-site to the northwest (MW-12D) and 170 feet off-site to the southwest (MW-11D).

TBA has been detected in all wells; however, during the last sampling of MW-10D in September of 2010, TBA was not detected. During the June 2010 sampling event, TBA was detected at 538 µg/L at MW-10D. TBA contamination is not delineated in any direction in Bedrock Zone B. In Zone B, TBA is currently at least 270 feet off-site to the northwest (MW-12D) and 170 feet off-site to the southwest (MW-11D).

Bedrock Zone B/C

Two off-site wells have been installed with screens that extend into both Zones B and C. MW-14D is located 320 feet up-gradient to the northeast, and benzene, MTBE, or TBA have not been detected at this well. MW-16D is located 250 feet southwest of the Site, and benzene, MTBE, and TBA concentrations of 26.5, 195, 726 µg/L , respectively, have been detected at this well. In Bedrock Zone B/C, benzene, MTBE, and TBA contamination extends at least 250 feet southwest of the Site. Former Livingston Manor well LMW-2 was screened within the Zone B and C and benzene, MTBE, and TBA concentrations were detected at this well. If this data is taken into consideration, it can be inferred that these COCs also extend at least 400 feet to the northwest of the Site.

Bedrock Zone C

Four wells have been installed into Bedrock Zone C, on-site former well MW-5D2 and replacement well MW-5D2R, and off-site wells MW-9D and MW-17D. Benzene, MTBE, and TBA have been detected at both MW-5D2 and MW-5D2R. Benzene and TBA, and only low concentrations of MTBE have been detected at MW-9D. Historically, benzene has not been detected at MW-17D, but MTBE and TBA have been detected up to 124 µg/L and 47 µg/L, respectively. TBA was not detected and MTBE concentrations were low at MW-17D during the most recent groundwater sampling event in December of 2010. Groundwater in Zone C flows predominately to the northwest and appears to be delineated up-gradient to the east by MW-9D and cross-gradient to the southwest by MW-17D. No wells screened within Zone C have been installed off-site to the northwest down-gradient of MW-5D2R; therefore, the lateral extent of contamination to the northwest is not delineated. However, Livingston Manor well LMW-3 which was screened into Zone C, can be used to infer that benzene, MTBE, and TBA extended at least 300 feet to the northwest of the Site in 2004.

Bedrock Zone D

Two wells have been installed into Bedrock Zone D, on-site well MW-5D3 and off-site wells MW-17D2. Low MTBE concentrations and no TBA has been detected at MW-5D3. However, this well had maximum detections of 512 µg/L MTBE and 411 µg/L TBA in October of 2005. Benzene, MTBE, and TBA have been not been detected in MW-17D2. Groundwater flow direction in this zone cannot be determined, and the extent of contamination is unknown.

6.4.3.3 Summary of Plume Dimensions

Benzene

The data suggests that the benzene plume is limited to the Unconsolidated Zone groundwater and bedrock groundwater in Zone A and B, with the exception being Zone B/C at Well MW-16D. This plume measures at least 250 feet long to the southwest (MW-16D) by 120 feet wide, with a depth of approximately 70 feet bgs at MW-16D (the bottom of the MW-16D well screen).

MTBE

The data indicates that the MTBE plume extends from the on-site Unconsolidated Zone to the southwest, and to the southwest and northwest along strike and dip of the various bedrock units. MTBE has been detected in the deepest on-site well installed to date (MW-5D3) and has been detected down strike in a southwesterly direction in Zone A, B, B/C, and C wells to the most distant well installed from the Site (MW-17D). MTBE contamination does not appear to extend along strike to the depth of the Zone D groundwater at MW-17D2. Based on this data the plume extends at least 460 feet down strike (southwest) to a depth of at least 70 feet bgs.

The predominant groundwater flow direction is down dip to the northwest of the Site in Zone C. MTBE is not delineated down-gradient of Zone C well MW-5D2R. However, Zone B well MW-12D has MTBE contamination. Based on this data, the plume extends at least 270 feet to the northwest to a depth of at least 101 feet bgs (the bottom of the screen interval for MW-12D). If the data collected from Former Livingston Manor wells are taken into consideration, the MTBE plume in 2004 extended at least 400 feet to the northwest of the Site to a depth of 141 feet bgs (bottom of screened interval for LMW-3).

TBA

Historically, the TBA plume has similar dimensions to the MTBE plume extending to at least 460 feet down strike to the southwest and to a depth of 70 feet bgs. Currently, TBA contamination extends at least 250 feet down strike (southwest) to the most distal well MW-16D (726 µg/L).

The predominant groundwater flow direction is down dip to the northwest of the Site in Zone C, and TBA is not delineated down-gradient of Zone C well MW-5D2R. However, Zone B well MW-12D has TBA contamination. Based on this data, the plume extends at least 270 feet to the northwest to a depth of at least 101 feet bgs (the bottom of the screen interval for MW-12D). If the data collected from Former Livingston Manor wells are taken into consideration, the TBA plume in 2004 extended at least 400 feet to the northwest of the Site to a depth of 141 feet bgs (bottom of screened interval for LMW-3).

7.0 REMEDIATION

Remediation at the Site has consisted of soil excavation, bailing events to remove LNAPL, SVE, and GWP&T, as discussed below. According to available reports, all remediation activities had only occurred on-site as of December 2010.

- In October 1986, *"Approximately five tons of soil and 765 gallons of liquid were disposed of during the UST removal activities."* (Kleinfelder, 2010B; SITE213-009217).
- In May 2001, a drive-off at a dispenser discharged less than a gallon of gasoline to the pavement and to the pea gravel beneath the dispenser island. In November of the same year, approximately one ton of pea gravel was removed from around a gasoline flex line and hauled off-site for disposal (Kleinfelder, 2010B; SITE213-009217).
- *"LPH bailing events were conducted from May 6, 2003 through February 2004 and approximately 354 gallons of groundwater and LPH were recovered."* (Kleinfelder, 2008; SITE213-006565).
- In March 2004, five previously abandoned-in-place USTs and the associated product piping were removed (Geologic Services Corporation, 2004B; SITE213-000403 and -000404). *"135 tons of soil were removed from the site."* (Kleinfelder, 2008; SITE213-006565).
- In May and June 2003, GWP&T and SVE feasibility tests were conducted to evaluate the effectiveness of GWP&T and SVE as remedial technologies for the Site (Kleinfelder, 2010A; SITE213-008970). *"These results indicate that a GWPT/SVE system would be effective at remediating and inhibiting the migration of dissolved phase hydrocarbon downgradient of the dispenser island and UST area. Based on test data, an effective radius of influence (ROI) for SVE system is estimated at 45 feet at an applied vacuum of 55 inches of water. In addition, groundwater recovery and observed drawdown data indicates a groundwater capture ROI of approximately 51 feet which is anticipated to be sufficient to inhibit off site migration."* Based on this data, an extraction well network was constructed using the existing groundwater monitoring wells MW-1 through MW-8. Monitoring wells MW-5D and MW-5D2 were added to the remedial system piping layout due to *"recent groundwater concentrations, and initially will not be hooked up to the GWPT/SVE system, but are added for potential future use."* (Geologic Services Corporation, 2004A; SITE213-001102).
- The SVE system was installed and started in July 2004 extracting from on-site unconsolidated groundwater monitoring wells MW-1 through MW-8. The SVE system was shut down in November with the failure of the catalytic-oxidation unit. These wells were screened from an average of 22 to 42 feet bgs with the average depth to water at approximately 33 feet bgs. The SVE system has operated through at least December 2010

according to the last available information, and a total of 12,475 pounds of hydrocarbons had been removed as of September 2010. No additional vapor extraction wells were installed at the Site.

- In December 2004, The GWP&T system was activated utilizing eight groundwater monitoring wells, MW-1 through MW-8, as extraction wells at a maximum pumping rate of two gallons per minute (Kleinfelder, 2010A; SITE213-008971). Groundwater is recovered from MW-1 through MW-8 utilizing submersible pumps**.** The catalytic-oxidation unit was replaced in January 2005 and the system restarted (Kleinfelder, 2008; SITE213-006563). "*Active remediation of the bedrock aquifer did not begin until May 2007, when monitoring well MW-5D was connected to the GWP&T system as an extraction well for the shallow bedrock aquifer.*"(Kleinfelder, 2010A; SITE213-008992). However, an e-mail dated November 28, 2007 from Gary A. Slater (NJDEP) asked William E. Gottobrio (Kleinfelder) if they had begun "*pumping from 5D yet*?" Gottobrio responded that they had *"been pumping from MW-5D since November 8, 2007"* (Gottobrio, 2007; SITE213-008558). As of September 2010, the GWP&T system has removed 191 pounds of dissolved phase hydrocarbon and 1,311,183 gallons of groundwater. *"The dissolved phase hydrocarbon recovery trend for the GWP&T system indicates that hydrocarbon mass recovery has not reached asymptotic conditions".* (Kleinfelder, 2010A; SITE213-008985 to -008987).
- *"During UST system upgrade activities conducted in April 2006, 122.33 tons of soils were removed from the site."* (Kleinfelder, 2008; SITE213-006565)
- A Site Status Update was prepared by ExxonMobil in January of 2011, *"Assuming approval of the September 2010 Remedial Action Workplan Addendum (RAWA) by the New Jersey Department of Environmental Protection (NJDEP), the MW-10 and MW-11 cluster wells are expected to be brought on-line with the existing onsite remedial system in the first quarter of 2011"* (ExxonMobil, 2011; SITE213-008524). No additional information was obtained.

As of December 2010, on-site SVE and on-site GWP&T had been operating at the Site for approximately six years, and had not reached asymptotic levels. The on-site remedial activities were not designed to address the complete lateral and vertical extent of the hydrocarbon and fuel oxygenate detections in soil and groundwater. As of December of 2010, no off-site remediation had been conducted to contain and mitigate contaminant migration off-site and at depth.

8.0 FATE AND TRANSPORT

8.1 Physical and Chemical Properties of COCs

The environmental fate and transport of benzene, MTBE and TBA in groundwater at the Site can be estimated from the release histories at the source site(s), the hydrogeology and groundwater flow conditions beneath the source site(s), and the chemical properties of these constituents (Table 4).

The aqueous solubility of the constituents at their respective volume in gasoline will determine their partitioning into groundwater after a release; that is, the rate at which dissolution will occur and the resulting magnitude of the contaminant concentration in groundwater. MTBE and TBA are considerably more soluble than benzene. Benzene is the least soluble constituent. In addition, unleaded gasoline generally contains between 0.12% and 3.5% benzene and 11% and 15% MTBE (for oxygenated gasoline) (State of California, 1988; Chevron, 1993). Therefore, the mole fraction solubility for MTBE versus benzene will be even higher than the aqueous solubility. Given this, one would expect MTBE to dissolve in groundwater much faster than the other constituents and be present at much higher dissolved concentrations, followed by TBA.

Dispersion will tend to spread the contaminants within the aquifers in the transverse, longitudinal, and vertical directions. This results in dilution of the contamination, but longitudinal dispersion also allows some contaminant to migrate faster than the average velocity. However, various physical and chemical processes can act to slow the movement and reduce the concentration of these constituents in groundwater. The combination of all of these processes is commonly referred to as chemical attenuation. Attenuation of benzene, TBA, and MTBE in groundwater is controlled primarily by three processes: adsorption, volatilization, and biological degradation.

Among the COCs, benzene is expected to be attenuated more strongly by adsorption relative to MTBE and TBA. MTBE and TBA are commonly considered to be unaffected by adsorption, possessing a partitioning coefficient that is three to six times lower than benzene. Thus, MTBE and TBA migration normally occurs at approximately the same speed as groundwater.

All of the contaminants are susceptible to attenuation by volatilization from the water table (controlled by the Henry's constant). However, this volatilization will not have a significant effect on contaminant migration in groundwater. Benzene is the most susceptible to volatilization.

All of the contaminants are known to undergo biological degradation under certain conditions. Benzene is known to undergo biological degradation in groundwater under aerobic (oxygen-rich) and anaerobic (oxygen-poor) conditions. TBA and MTBE are primarily susceptible to biological decay under aerobic conditions. However, they degrade at rates three to five times slower than benzene (Howard, 1991).

Based on the aforementioned summary of fate and transport properties, it is expected that MTBE and TBA should move without significant attenuation within the groundwater. MTBE would also be present at relatively high concentrations and persist longer. Benzene is the most attenuated of these constituents and therefore, would migrate slower than MTBE in groundwater. This observation appears to be supported by the occurrence and distribution of COCs in groundwater beneath the Site.

8.2 Sources

The following sources of petroleum hydrocarbon contamination, including MTBE and TBA, were identified from the data reviewed. Based on the timing of these referenced releases, they are likely to have contained MTBE. No off-site sources of petroleum hydrocarbon contamination have been identified.

- In May 2001, a drive-off at the regular dispenser occurred at the Site. *"Less than one gallon of gasoline was discharged to the pavement and to the pea gravel beneath the dispenser island. The NJDEP was notified and case # 01-05-04-1325-59 was assigned to the Site"* (Kleinfelder, 2010A; SITE213-008969). The NJDEP Communication Center Notification Report noted a customer drive-off and a resulting spill of an unknown quantity and the presence of soil contamination.
- In November 2001, a release of unknown quantity was reported when the 8,000-gallon gasoline UST was found to be leaking. Case # 01-11-13-0846-55 (McCusker et al., 2005; SITE213-008513) was assigned. Repairs were conducted on the flex line for the 10,000-gallon UST. Approximately one ton of pea gravel was removed from around the flex line and hauled off-site for disposal (Kleinfelder, 2010A; SITE213-008969).
- In May 2004, a field violation was issued noting: "*inaccurate registration"*, *"liquid/free product in spill bucket"*, and *"Other: Delivery Ban. Do not fill tanks…Contaminated soil found… run enhanced tracer test for UST system."* (McCusker et al., 2005; SITE213-008522)
- In December 2004, a drive-off at a dispenser and a 5-gallon release occurred at the Site. The NJDEP was notified and case # 04- 12-15-1558-52 was assigned (Kleinfelder, 2010A; SITE213-008971).

- In April 2006, UST system upgrade activities were conducted, including replacement of the dispensers and product piping to the top of the USTs. A total of 122.33 tons of soil were removed from the Site.

Concentrations of MTBE detected in wells (and LNAPL volumes) during the initial sampling of MW-1 through MW-3 sampling on January 29, 2002 were inconsistent with the initial reported release of 1-gallon of gasoline. Therefore, it is likely that at least one undocumented release of RFG had occurred at the Site prior to the sampling on January 29, 2002. In addition, there is evidence of a much older release of leaded gasoline, as a groundwater sample from MW-4 in March of 2010 contained 14.9 µg/L of lead.

8.3 Pathways

Petroleum hydrocarbons, including MTBE and TBA, were released at the Site and impacted the vadose zone in the vicinity of the current and former USTs. Given the depth to groundwater and permeable unconsolidated sediments beneath the Site, releases rapidly entered the unconsolidated groundwater zone. This contaminated groundwater migrated down-gradient to the southwest in the unconsolidated sediments towards the commercial well located at 19 South Livingston Avenue.

Contamination from the vadose zone and the unconsolidated groundwater has resulted in detections of COCs in soil vapor. Soil vapor contamination has migrated to nearby utility man holes/vaults and caused indoor vapor intrusion issues. Periodically, the subsurface utilities surrounding the Site have had detections of COCs. Indoor vapor intrusion and vapor migration studies have detected contaminants at the adjacent properties.

A downward vertical hydraulic gradient exists in the vicinity of the Site resulting from recharge and the regional pumping of bedrock aquifers. There is also no aquitard between the unconsolidated sediments and the bedrock beneath the site. Therefore, contaminated groundwater in unconsolidated sediments migrates into the bedrock aquifer and flows through fractures in the bedrock zones. Fractures within the bedrock include both sub-vertical high-angle fractures and low-angle fractures/ partings along bedding planes. In addition, former “leaking” well MW-5D2 could have provided a vertical pathway for contaminant migration into deeper aquifer zones. Pumping tests utilizing a Bedrock Zone B extraction well and Bedrock Zone B and Zone C monitoring wells established that the Bedrock Zones B and C exhibited hydraulic connectivity.

Groundwater flow within the vertical to orthogonal bedrock fractured zones appears to be predominately along -strike (southwest) in the siltstones in the upper bedrock units (Zones A and B) and down-dip (northwest) along the bedding plane fractures/partings in the lower bedrock units (Zones C and D). Therefore, the groundwater in the upper bedrock units flows along-strike (southwest) towards the commercial well at 19 South Livingston Avenue (Bottle King); whereas, the groundwater in the lower bedrock units flows down-dip (northwest) towards Livingston PSW #11.

8.4 Receptors

Releases at the Site have contaminated groundwater resources, which constitute a receptor. In addition, the following additional receptors are threatened or impacted:

- nearby residents, building occupants, and utility workers through vapor intrusion; and
- WSWs both domestic and public.

COCs have been detected at subsurface utilities and in indoor air samples at adjacent properties. The private residence at 16 Sherbrooke Parkway has not been monitored since April of 2005. There is no indication that additional private residences to the south have been monitored for vapor intrusion. Benzene has been detected in indoor air samples at commercial properties at 20 – 24 East Mount Pleasant Avenue located directly west of the Site. In April of 2006, 50% LEL readings were reported in Bell fiber optic cable boxes just north of the site.

The analysis of impacts to groundwater from MTBE released at the Site has been limited by the Court to a delineated area in order to efficiently present evidence. Contamination released at the Site will continue to migrate with groundwater and, without remediation, the contamination may migrate beyond the delineation boundaries.

There is a Livingston Township PSW and two commercial/domestic supply wells well near the Site (Figure 1). Of these WSWs, two are known to be contaminated with MTBE (Table 3). On October 28, 2004, a maximum MTBE concentration of 13.9 µg/L was detected at the nearby commercial supply well at 19 South Livingston Avenue. This commercial supply well is located approximately 700 feet southwest and down-gradient (i.e., Unconsolidated Zone and Bedrock Zone B) of the Site. On November 19, 2009, MTBE was detected at a maximum concentration of 28.7 µg/L in Livingston PSW #11. Livingston Township Well # 11 is located approximately 1,750 feet to the northwest and down-gradient (i.e., Bedrock Zone C and D) of the Site.

8.5 Site Conceptual Model

8.5.1 Hydrogeology

The Site is underlain by unconsolidated sediment to a depth up to 45 feet bgs. Groundwater in these sediments is present at an average elevation of 291 feet AMSL (approximately 36 feet bgs). Siltstone bedrock units underlie the unconsolidated sediments with a strike of northeast-southwest and dip to the northwest between 7 and 14°. The Siltstone bedrock contains both high-angled fractures and fractures along bedding planes. The average groundwater elevation decreases with increasing depth from an average of 271 (Zone B) to 221 (Zone D) feet AMSL. This indicates a high downward vertical gradient likely due to recharge and regional pumping. Groundwater flows to the southwest in the unconsolidated sediments and upper bedrock units, and to the northwest in the lower bedrock units. See Section 5.0.

8.5.2 Releases

The Site is reported to have operated as a gasoline service station since 1934. During the long history of Site operations, there were no reported releases of gasoline until May 2001 when 1-gallon of reformulated gasoline was reported to have been spilled. The magnitude and distribution of groundwater contamination in 2002 indicates that a larger release of gasoline containing MTBE occurred prior to 2002. See Section 8.2.

8.5.3 Investigation and Remediation

Since early 2002, a total of 14 unconsolidated sediment and 16 bedrock groundwater monitoring wells have been installed in association with this Site. All the unconsolidated sediment wells on-site have been converted to remediation wells and no down-gradient wells have been installed in unconsolidated sediments. Contaminated groundwater in the bedrock aquifer is not delineated to the southwest and northwest.

A SVE system began operation in July 2004 extracting from on-site unconsolidated monitoring wells MW-1 through MW-8. As of December 2010, a total of 12,475 pounds of hydrocarbons were removed using this system. A P& T system began operation in December 2004 using MW-1 through MW-8 and MW-5D. As of December 2010, approximately 191 pounds of dissolved phase hydrocarbons and 1,311,183 gallons of groundwater were removed. As of December 2010, asymtopic concentrations have not been achieved with the P&T system, and no off-site remediation has been conducted at the Site.

8.5.4 COC Magnitude and Extent

The lateral and vertical extent of COCs in vadose zone soil beneath the Site has not been fully investigated. There has been no analysis for MTBE or TBA in soil samples.

The maximum historic detection of MTBE in unconsolidated groundwater was 234,000 µg/L in a sample collected from MW-1 on July 1, 2003. The maximum historic detection of MTBE in bedrock groundwater was 33,700 µg/L in a sample collected from MW-5D on June 9, 2004. Given the historically high MTBE concentrations on-site (up to three orders of magnitude greater than current MTBE concentrations), the MTBE plume likely extends off-site and down-gradient (southwest) of the Site within the unconsolidated groundwater. No unconsolidated groundwater monitoring wells have been installed down-gradient of the Site; therefore, the extent of MTBE contaminated groundwater within the unconsolidated sediments is unknown.

MTBE has migrated vertically on-site in the groundwater to Bedrock Zones B, C, and D, and off-site to Bedrock Zones A, B, and C. MTBE has also migrated off-site to the southwest along-strike of the bedrock (Zone B) and down-dip to the northwest (Zone C). The MTBE plume is at least 600 feet long (southwest), 300 feet wide (northwest), and 121 feet deep. The majority of the MTBE mass, as determined by observed concentrations, is currently present down-gradient of the Site and vertically distributed in all of groundwater Bedrock Zones. The full vertical and horizontal extent of MTBE contamination in bedrock is unknown. See Section 6.0.

8.5.5 Pathways

COCs migrated from vadose zone soils rapidly into groundwater in the unconsolidated sediments. COCs then migrated off-site in the unconsolidated groundwater to the southwest. Under the downward vertical hydraulic gradient, groundwater contamination migrated vertically from unconsolidated sediments into the bedrock aquifer zones (A, B, C, and D). Contaminated groundwater flows within fractures to the southwest in bedrock Zones A and B and to the northwest in Zones C and D. See Section 8.3.

8.5.6 Receptors

COCs have been detected at subsurface utilities and in indoor air samples at adjacent properties. MTBE concentrations have been detected at the commercial supply well at 19 South Livingston Avenue (700 feet to the southwest) and Livingston Township PSW #11 (1,750 feet to the northwest). See Section 8.4.

8.5.7 Summary

COCs were released at the Site prior to 2002 and quickly migrated to groundwater in the unconsolidated sediments beneath the Site. Contamination migrated off-site down-gradient to the southwest in the groundwater in unconsolidated sediments, and within the fractured bedrock to the southwest and northwest. The extent of contamination in groundwater has not been delineated in the unconsolidated sediments nor in the bedrock. The neighboring properties to the south and west of the Site have had vapor intrusion of COCs above indoor-air screening levels. MTBE has been detected at the commercial supply well at 19 South Livingston Avenue and Livingston PSW #11. A SVE system and a groundwater P&T system have operated on the Site; however, asymptotic concentrations have not been reached. No off-site remediation activities have been conducted to mitigate off-site contamination.

9.0 DATA GAPS

The following section describes data gaps and recommendations for additional Site assessment and remediation, based on the information reviewed.

9.1 Hydrogeology

- A fracture lineament assessment is needed to identify zones of increased fracture density, and fracture orientation and depth. These features act as primary groundwater (and contaminant) transport pathways.
- Too few monitoring wells have been installed discretely in Bedrock Zones A through D to accurately evaluate the hydraulic conditions beneath the Site and off-site. Additional discretely screened bedrock wells need to be installed to characterize hydrogeologic conditions in the bedrock aquifer.
- No pumping tests were conducted to evaluate hydraulic properties in the various hydrogeologic units, and the hydraulic connectivity between specific bedrock zones and between the unconsolidated sediments and the bedrock. Aquifer testing must be conducted at the Site using wells that are discretely screened in specific hydrogeologic zones.

9.2 Contamination

9.2.1 Soil and Soil Vapor

- The lateral and vertical extent of petroleum hydrocarbons and fuel oxygenates in soil has not been fully investigated. No analysis of soil samples for MTBE and TBA was identified. Additional soil sampling should be conducted on-site to determine if residual contaminant mass remains in the vadose zone.
- The potential health risks to building occupants, residents, and utility workers posed by soil vapor intrusion into the service station building, the adjacent properties, and utility manholes have not been fully investigated. Additional vapor intrusion studies should be conducted at the neighboring properties.

9.2.2 Groundwater

- The magnitude and extent of COCs in groundwater in the unconsolidated sediments on-site and down-gradient of the Site is unknown. Additional off-site, down-gradient, groundwater monitoring wells should be installed, monitored, and sampled within the unconsolidated groundwater.

- The lateral and vertical extent of COCs in the bedrock aquifer is unknown, especially to the southwest of the Site along the strike of the siltstone bedrock and to the northwest along the dip of the siltstone bedrock. Additional discretely screened on- and off-site bedrock monitoring wells should be installed, monitored, and sampled.
- Given the currently observed magnitude and extent of off-site groundwater contamination, and the likely full extent once delineation is complete, off-site remediation is required to: 1) Limit impact to WSWs; 2) Limit risks from indoor vapor intrusion; and 3) Restore the groundwater resource to its pre-impacted condition.
- MTBE has been detected at concentrations as high as 28.7 μg/L at the Livingston Township PSW #11, located approximately 1,750 feet northwest of the Site. Given the detection of MTBE at this public well, a well-head treatment system should be designed and permitted. The system need not be installed at this time, but should be ready for immediate installation should MTBE and/or other COCs be consistently detected at PSW #11.

10.0 KEY OPINIONS

The following summarizes the key findings of the investigative and remedial activities conducted to date, and our opinions based on the data reviewed:

1. Releases of gasoline containing MTBE have occurred at the Site. Gasoline releases have been reported at the Site in May 2001, November 2001, May 2004, and April 2006. The magnitude and distribution of groundwater contamination in 2002 indicates that a larger release of gasoline containing MTBE occurred prior to 2002. See Section 8.2.
2. MTBE has impacted soil and groundwater beneath the Site. MTBE contamination was first detected in groundwater beneath the Site in January 2002. See Section 6.2.
3. TBA has impacted soil and groundwater beneath the Site. TBA contamination was first detected in groundwater beneath the Site in January 2002. See Section 6.2.
4. MTBE has migrated off-site beyond the Site boundaries. MTBE contamination in groundwater was first detected in October 2005 in off-site well MW-10D. See Section 6.4.
5. TBA has migrated off-site beyond the Site boundaries. TBA contamination in groundwater was first detected in October 2005 in off-site well MW-10D. See Section 6.4.
6. Groundwater contamination has not co-mingled with releases from nearby facilities. There is no indication that contamination from the Site has co-mingled with releases of gasoline at other facilities.
7. Investigations have failed to delineate the extent of MTBE contamination in groundwater laterally. MTBE contamination is not delineated in groundwater to the southwest of the Site in the unconsolidated sediments. MTBE contamination is not delineated in bedrock groundwater to the southwest and northwest of the Site. See Section 6.4.3.
8. Investigations have failed to delineate MTBE in groundwater vertically. MTBE contamination has been detected in Zone D bedrock groundwater monitoring wells. No deeper bedrock zones have been installed and sampled. See Section 6.4.3.
9. Investigations have failed to delineate the extent of TBA contamination in groundwater laterally. TBA contamination is not delineated in groundwater to the southwest of the Site in the unconsolidated sediments. TBA contamination is not delineated in bedrock groundwater to the southwest and northwest of the Site. See Section 6.4.3.
10. Investigations have failed to delineate TBA in groundwater vertically. TBA contamination has been detected in Zone D bedrock groundwater monitoring wells. No deeper bedrock zones have been installed and sampled. See Section 6.4.3.

11. MTBE contamination in groundwater exists beyond the current monitoring network. MTBE contamination has been detected in the most down-gradient groundwater monitoring wells. See Section 6.4.3.
12. TBA contamination in groundwater exists beyond the current monitoring network. TBA contamination has been detected in the most down-gradient groundwater monitoring wells. See Section 6.4.3.
13. Remediation performed to date has failed to fully address on-site groundwater contamination. Asymptotic concentrations have not been achieved by the on-site P&T system. Additional investigation is required to further evaluate the effectiveness of the on-site remediation system.
14. Remediation performed to date has failed to effectively control the off-site migration of groundwater contamination. Contamination has migrated off-site in unconsolidated sediments to the southeast and in bedrock to the southwest and northwest. See Section 6.4.3.
15. Remediation performed to date has failed to effectively remediate off-site groundwater contamination. To date, no off-site remedial actions have been implemented. See Section 6.4.3.
16. Additional off-site investigation is required. Groundwater contamination is not delineated to the southwest and northeast of the Site. See Section 6.4.3.
17. Investigation of deeper groundwater zones is required. Contamination has been detected in Zone D bedrock groundwater monitoring wells. No deeper bedrock zones have been installed and sampled. See Section 6.4.3.
18. Additional on-site remediation of groundwater is required. The on-site remediation systems have not reached asymptotic levels.
19. Additional off-site remediation of groundwater is required. To date, no off-site groundwater remediation has been conducted at the site. The magnitude and extent of contamination in groundwater warrants remediation. See Section 6.4.3.
20. Releases pose a threat to deeper aquifers. Contaminants have been detected to a depth of 121 feet bgs on-site within the deepest bedrock unit investigated. MTBE has been detected in a commercial supply well at 19 South Livingston Avenue (screened to a depth of 298 feet). MTBE has been detected at PSW #11 (screened from 54 to 423 feet bgs). See Section 6.4.3, 8.3, 8.4.
21. Releases pose a threat to, and have impacted, WSWs. MTBE contamination has been detected in a commercial supply well 700 feet to the southwest and a PSW located 1,750 feet to the northwest. Additional vapor intrusion studies are needed to evaluate the risks to nearby building occupants. See Section 8.5.

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