PERFORMANCE MONITORING REPORT

IN SITU CHEMICAL OXIDATION

6 –MONTHS POST-TREATMENT

ESSEX/HOPE JAMESTOWN SITE

129 HOPKINS AVENUE

JAMESTOWN, NY

NYDEC Site ID No. 9-07-015

Prepared for:

ESSEX SPECIALTY PRODUCTS INC.

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1.0 BACKGROUND

This Performance Monitoring Report present the results and evaluation of the groundwater and soil sampling conducted to assess the performance of the insitu chemical oxidation (ISCO) project implemented in November, 2011 at the Essex Hope Site located in Jamestown, New York. The focus of the treatment was the UST Area. The acetone hotspot area near recovery well RW-6D was also treated.

The Essex Hope Site is a NYDEC Superfund Site that has been undergoing remedial actions since 1997. Essex Specialty Products was a former subsidiary company of The Dow Chemical Company (Dow). The property is currently owned and operated by Custom Production Manufacturing (CPM) as a metals fabrication business. Some of the site property is currently leased to Master Machine.

The original remedial investigation (RI) of the site occurred in 1988-1989. The UST Area is on the southern end of the site area behind CPM Building No.5. Five (5) underground storage tanks in the UST Area had been reported to be backfilled with concrete and closed by previous site owners around 1980. The USTs were not investigated during the site RI. Soil and groundwater sampling in the RI was limited to the area adjoining the tanks. Based on these investigations, a SVE/sparging system was installed in 1997 for extraction of VOCs. Ongoing monitoring of this system indicated that VOC removal was not effective and another contributing source of contamination was suspected. Supplemental site investigations indicated that the tanks contained paint by-products and solvents and they were not properly closed. Subsequently the five (5) tanks and approximately 1200 tons of contaminated soil were removed in December, 2003. Further investigations conducted from 2003 through 2009 indicated a more extensive VOC presence in soil and shallow groundwater across most of the UST Area, up to 200 feet from the original tank locations.

A Remedial Action Work Plan (RAWP) for ISCO treatment of the UST Area was prepared by URS in 2011 and approved by NYDEC. Treatment of the acetone hotspot was added after approval of the RAWP based on the recent appearance of elevated acetone in RW-6D.

Injection of activated sodium persulfate (ASP) oxidant was conducted from November 8 through November 18, 2011. Oxidants were injected where VOCs cumene, toluene, ethylbenzene and xylenes were present in shallow soils and groundwater, generally from 4 to 12 feet below ground surface (BGS). An acetone hot spot in the deep groundwater zone around recovery well RW-6D was also treated by injection of ASP. Injections in this area were in the 16-40 feet BGS interval.

This report contains performance monitoring data from samples collected pre-injection (baseline) and through 6-months post-injection. Sampling was conducted as follows:

- Baseline groundwater samples- November 3, 2011
- Post-injection groundwater samples- December 2, 2011, March 13, 2012, June 13, 2012 (3 rounds)
- Post-injection soil samples (UST Area only)- August 15, 2012

Other soil sampling has been performed in the UST Area prior to 2011 and provides a historic reference. These data are also presented in the report for comparative purposes.

1.1 Remedial Action Objectives

The primary objectives of the ISCO remedial actions are to:

- Reduce or eliminate volatile organic compounds (VOCs) present in soil and groundwater above the site remedial action objectives (RAOs) described in the Consent Order.
- Minimize Dow's long-term liabilities, O&M costs/efforts and constraints on potential future site use or reuse due to VOC-contaminated soils and groundwater on site.

The ROD Remedial Action Objectives (RAOs) for site cleanup as outlined in the NYDEC Consent Order are as follows:

Soil RAOs:

Total VOCs = 10 ppm

Individual VOCs = 1 ppm

Total Semi-VOCs = 500 ppm

Individual Semi-VOCs = 50 ppm

PCBs = 10 ppm

Groundwater RAOs:

Trans-1, 2- Dichloroethylene = 5 ppb

Trichloroethene = 5 ppb

Vinyl Chloride = 5 ppb

Ethylbenzene = 5 ppb

Toluene = 5 ppb

Xylene = 5 ppb

PCBs = 0.1 ppb

For other compounds not listed groundwater RAOs default to compliance with NYDEC Ambient Groundwater Quality Standards. For Site VOCs these would be at 5 ppb.

1.2 Chemical Oxidation Operations

From November 8 through 18, 2011, insitu chemical oxidation was implemented in the UST Area and acetone hot spots by Innovative Environmental Technologies Inc., (IET) as subcontractor to URS. The oxidant solution was injected by direct-push drilling equipment (Geoprobe) and consisted of:

- Sodium persulfate (Klozur ^{R}) - 66,575 pounds mixed with 15,815 gallons of water
- Zero-valent iron (ZVI), micron scale mixed with 8015 gallons of water
- Hydrogen peroxide solution (50%) diluted to 2.5-5% solution with water.

The oxidation approach employed the integration of Fenton's chemistry and persulfate oxidation, using zero-valent iron (ZVI)/hydrogen peroxide as catalysts for both reactions. Catalyzed persulfate (S_2O_8) results in the formation of short-lived free sulfate radicals that are available to oxidize VOCs and other naturally oxidizable matter (NOM). Reaction endpoints include organic (VOC) transformation to carbon dioxide, dissolved and mineralized sulfate ($CaSO_4$), and mineralized iron (various species, including pyrite Fe_2S). Inorganic species formation depends on the subsurface geochemical conditions, including acidity/alkalinity and pH. Sodium persulfate oxidation also has a tendency to reduce pH depending on the buffering capacity of the subsurface.

The hydrogen peroxide will also generate hydroxyl radicals that directly oxidize VOCs and other NOM.

After reaction of the oxidants and depletion of dissolved oxygen, the sulfate and ferric iron act as electron acceptors for facultative bacteria that may further degrade VOCs under reducing conditions. In this process, sulfide and ferrous iron are indicators of anaerobic activity, in addition to negative ORP (reducing).

A total of 123 injection points were used to deliver the oxidant to the groundwater and vadose soil zones. Injection spacing's were generally on 10 foot centers. The shallow zone injections were over the interval 6-16 feet BGS, which included 2-4 foot of vadose zone. The upper 4 foot of the site was not treated. The vadose zone injections were only in part of the UST Area, West 1 and 2 and East 1, where the elevated VOCs were present. The deep zone (acetone area) injections were over the interval 16-40 feet BGS. The general site map of the UST Area and acetone hot spot injection areas and sampling points is shown on Drawing C-1.

The IET Field Reports are included as Appendices A and B.

1.3 <u>Performance Monitoring Plan</u>

Monitoring wells and soil sampling were used to evaluate the effects of the oxidant injections. Samples were collected prior to injections (baseline) and at quarterly (3-month) intervals following the oxidant injections. All of the water samples underwent the same analytical suite, including field parameters for general water quality assessment. The monitoring parameters included:

- Field analyses by flow-through cell (Horiba) - pH, conductivity, oxidation/reduction potential (ORP), dissolved oxygen (DO).

- VOCs- EPA Method 8260

- Sulfate/sulfide- ASTM Method D516-90.02/SM-4500.S- Indicator of oxidant (sodium persulfate) presence and reductive state

- Ferrous/Ferric Iron- EPA Method 6010B-ICP (Total Fe) with SM 3500- Indicator of iron catalyst reductive state. Groundwater samples were not filtered in the lab (< 0.45 um) prior to analyses.

- Alkalinity- SM 2320B
- Total Petroleum Hydrocarbons (TPH)- EPA Method 1664A

Soil analyses was for VOCs and TPH.

The performance monitoring sampling plan is summarized on Table 1-1.

2.0 HYDROGEOLOGIC CONDTIONS

In the UST Area the subsurface zone of interest is from 4 foot BGS to the top of a clayey- silt semi-confining layer which comprises the lower limit of the shallow groundwater zone. The upper 5 feet consists of fine-grained, silty clay soils, with silty fill and concrete/fill present in the upper 2 ft. in some borings. Below the upper 5 feet is dominantly a sand and gravel, with clayey-silt lenses. The shallow water table is approximately 8-10 feet below ground surface (BGS).

The clayey-silt semi-confining layer is approximately 9-21 ft. below the ground surface (BGS). Its depth varies with surface elevation and the sloped surface of the layer. The layer was present throughout the UST Area, and generally exhibited an eroded surface feature that sloped to the east. The semi-confining layer was encountered at all boring locations across the site and ranged in thickness from 3 to 5 feet. This layer is thickest beneath Plant #5 and the UST Area and thins towards the north, east and south of this area. A map of the elevation of top of the upper semi-confining clay in the UST Area is contained on Figure 2-1.

In the acetone hotspot area near RW-6D, the subsurface zone of interest is below the shallow semi-confining layer where the lower (deep) water-bearing zone is present. This zone has been found across the site and is composed of fine sandy silt to silty fine sand with occasional silty clay laminations. This zone has historically been referred to as the lower water-bearing zone, or “deep zone”, The thickness of this unit ranged between approximately 17 feet in the UST Area (MW-23D) to 14.5-21.5 ft. the area northeast of CPM Plant #5 Building near RW-6D. A thick clayey confining layer occurs at the base of the lower water-bearing zone. Drilling for the deep zone monitoring wells stopped at the top of the lower confining layer so additional data on this layer’s thickness has not been obtained during previous investigations.

Existing site remedial actions include groundwater recovery in the deep groundwater zone, primarily to the north and northeast of the UST Area. These wells have been in operation since 1997. No recovery wells are present in the shallow groundwater zone. Groundwater contours representing normal recovery well pumping conditions are contained in the Annual Reports and have been depicted in other site investigation reports. The most recent (September, 2012) groundwater potentiometric surface maps for the shallow and deep groundwater zones are shown on Figures 2-2 and 2-3. These plots represent deep zone groundwater extraction with RW-6D in operation. From August, 2011 through June, 2012, the recovery well was shut down because of issues with elevated acetone. This shutdown temporarily affected the deep groundwater potentiometric surface during this period by reducing drawdown and the overall well field capture area in the northeast part of the site. Monitoring data during and after RW-6D shutdown indicates that the deep groundwater VOC plume has not migrated significantly beyond the overall deep zone capture area as demonstrated by MWs-22D and -25D.

3.0 PRE-TREATMENT CONTAMINANT CONDITIONS

Pre-treatment conditions have been established by historic site investigations and year 2011 pre-injection (baseline) monitoring. In the UST Area, the historic investigations occurred from 2003 through 2006, after removal of the five (5) underground tanks. The focus of these investigations was to determine the extent of residual VOCs in soils and groundwater. Direct-push soil and groundwater samples were collected and monitoring wells (MW-23S and -24S) were installed. Composite soil sampling was performed in November, 2009 to characterize the soil contaminants for the chemical oxidation treatability study. In November, 2011 four (4) additional monitoring wells were installed (MWs-26S through -29S) and baseline groundwater sampling was conducted, approximately 1-week prior to oxidant injection.

The historic soils data (2003-2006) was considered reasonably representative of pre-treatment baseline conditions since the main UST Area is paved with concrete and the vadose zone soils (4-8 foot BGS) are not subject to migration/degradation processes that would significantly reduce the contaminant characteristics. The 2009 composite soil sampling provided data that confirmed the historic soil contaminant conditions.

Historic (2003-2006) soil and groundwater data are summarized on Tables 3-1 and 3-2. Soils data are presented on isoconcentration plots in Figures 3-1 through 3-4. Groundwater data isoconcentration plots are shown on Figures 3-5 through 3-7.

Pre-treatment baseline sampling (November, 2011) was conducted for groundwater only. Baseline data are summarized on Tables 3-3 through 3-16. Figures 3-8 through 3-15 contain the isoconcentration plots for VOCs and oxidation indicator parameters sulfate/sulfide, ferrous (+2)/ferric (+3) iron and ORP. Sampling locations are shown on Drawing C-1.

The acetone hot spot in the deep groundwater zone was a relatively recent phenomenon (2008-2009) that was discovered as part of the routine annual groundwater monitoring conducted at the site since startup of the groundwater recovery system in 1997. Acetone detections in these wells are presented on Figure 3-16.

Note: Isocontour plots were prepared using Golden Surfer V.10 software. The contours are based on linear interpolation using the existing database. In areas where no data has been obtained, or *monitoring points are not present, the contouring program estimates a value based on the closest surrounding data values. In the case where the areal boundary of the data values has not been determined, i.e. where the boundary values are greater than zero, the contouring program will project a data value beyond the limits of the investigation data.*

3.1 Historic Soil Analytical Results Years 2003-2006- UST Area

From the period 2003-2006 a total of 43 test borings (TBUSTs) were drilled in the UST Area using direct-push drilling techniques. Samples were collected over a depth interval of 0-15 feet BGS. It is noted that some of the soil samples were from the interval at or near the saturated zone (8-10 feet BGS) and are suspected to include groundwater contaminants from the capillary/smear zone. These samples were not included in the historical soil data graphical presentations. The distribution of total CTEX and individual VOCs toluene, ethylbenzene and xylenes in shallow soils are depicted on Figures 3-1 through 3-4.

The data indicates that VOC‘s cumene, toluene, ethylbenzene and xylenes (CTEX) were most frequently detected in the soils and in total comprised 99-100% of the VOCs detected. Xylenes and ethylbenzene were the predominant compounds. Chlorinated VOCs were not found. In the western end of the UST Area the CTEX compounds were generally at levels 2 to 3 orders of magnitude above the Remedial Action Objectives (RAOs) of 1/10 mg/kg (individual/total). VOCs toluene, ethylbenzene and xylenes were found at concentrations up to 660 mg/kg, 250 mg/kg and 1520 mg/kg respectively. Cumene was generally found at lower concentrations, the maximum being at 5.9 mg/kg. The east UST Area had CTEX levels typically less than 10 mg/kg with the exception of TBUST 16 which had a level of 29.2 mg/kg (xylenes at 25 mg/kg). The elevated CTEX soil areas generally correlate with the elevated CTEX in shallow groundwater. See Section 3.2.

3.1.1 Historical CTEX Mass-Vadose Zone Soils

The soil contaminant mass for four (4) VOC compounds (CTEX) in the UST Area was estimated as follows:

Vadose Zone Soils- CTEX Mass Estimate

CTEX, mg/kg	Contour Area, sf	CTEX Mass, kg

0	24436	
5	21555	1.80
10	20593	1.80
50	17622	22.28
100	15299	43.56
500	4235	829.80
1000	919	621.75
1500	296	194.69
2000	51	107.19
2300	0.12	27.35
	TOTAL Mass, kg	**1850.22**

Notes:
1. Mass estimate based on 5 foot thick vadose zone interval, average 4-9 feet BGS. Reference Figure 3-1.

Mass = avg. conc (mg/kg) x 110 lbs/cf soil x soil vol (cf) x kg/2.2 lbs

3.2 Historic Groundwater Analytical Results Years 2003-2006- UST Area

Shallow zone groundwater samples have been taken from existing monitoring wells and direct-push dual-screen sampling in the UST Area. Samples were collected from a short screened interval (~ 4 ft. or less) either near the top of the semi-confining layer (average 16 ft. BGS) or the top of the saturated zone (approximately 8-12 ft. BGS). Existing monitoring wells were also sampled. Only one monitoring well (MW-20) in the UST Area has been routinely sampled in as part of the annual performance monitoring plan for the site which commenced in 1997. The newer monitoring wells (MWs 23-S through -29S) were constructed from 2006- 2011 to provide better delineation of shallow groundwater contamination. The historic groundwater analyses for the UST Area are summarized on Table 3-2.

Consistent with the UST soils analyses, groundwater analyses indicates that the CTEX volatile organics (cumene, toluene, ethylbenzene and xylenes) were the predominant compounds detected in the UST Area. Chlorinated VOCs were found at relatively low levels.

The CTEX groundwater plume (1 ppm isocontour) extended from across the entire UST Area to the former tank farm to the east, north to MW-20 (beneath Plant #5), and to the southwest at and likely beneath the Master Machine building. The extent of the plume to the eastern areas has been determined to be offsite onto adjoining properties. The mean CTEX concentrations in the western portion of the UST Area are 1 to 2 orders of magnitude greater than the mean CTEX concentrations in the eastern part of the UST Area. See Figures 3-5 through 3-7.

3.3 Historic Groundwater Analytical Results - Acetone Hot Spot

Deep zone groundwater data has been obtained from routine groundwater monitoring performed since 1998 and supplemental site investigations.

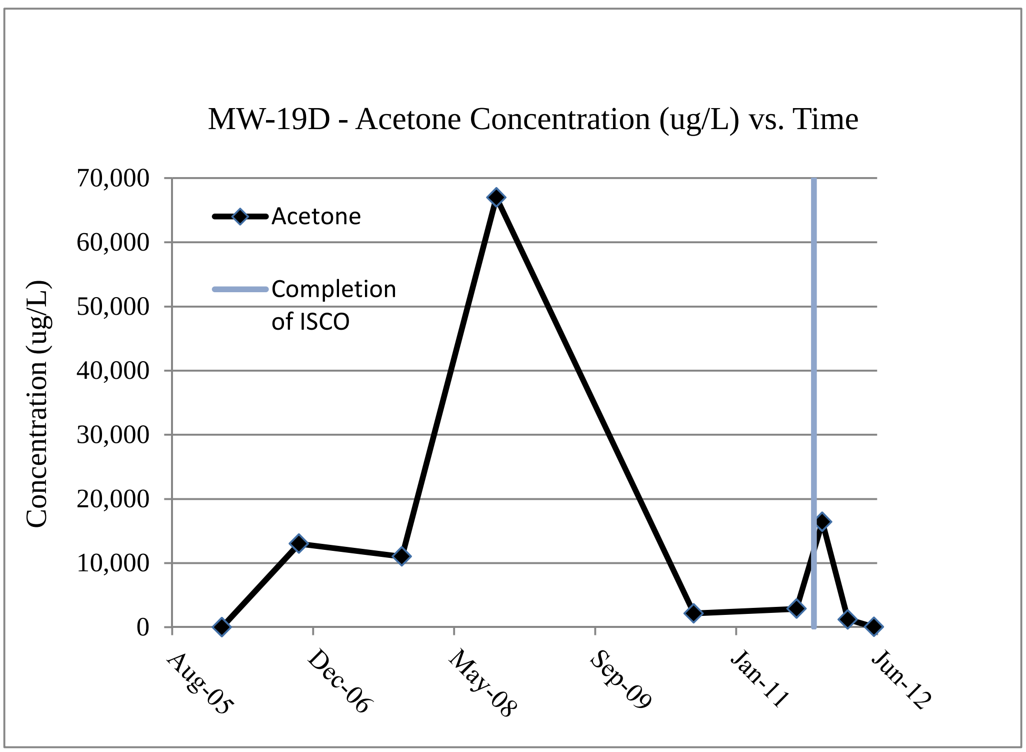
In 2001, acetone was found to be present in deep groundwater zone samples at PZ-5D and PZ-6D in the area southeast of Plant #5 (northeast of the UST Area). Concentrations ranged from 1,600 ug/l at PZ-6D to 14,000 μg/l at PZ-5D. PZ-9D in the UST Area had an acetone level of 240 μg/l. The acetone source appeared to originate in the deep zone at the northeast end of UST Area near PZ-9D, since acetone was not present in the shallow zone in the UST Area. Acetone in deep groundwater was limited to the area southeast of Plant #5 as evidenced by the non-detect levels in MW-19D and VP-6D. Additionally, the acetone was apparently concentrated in the upper interval of the deep water-bearing zone, which is the screened interval in PZ-5D and PZ-6D. The adjacent monitoring well MW-19D, directly north of PZ-6D, and screened in the lower interval of the deep water-bearing zone, historically has not had detectable levels of acetone.

In 2006, acetone was found in existing deep zone monitoring points PZ-5D and PZ-6D at concentrations of 960 mg/l and 190 mg/l, respectively. These points are located directly east of CPM Plant #5 and represented the highest acetone concentrations found onsite to that time. In addition, these levels represented increases of more than one order of magnitude compared to levels found in the same monitoring points from previous (2001) investigations.

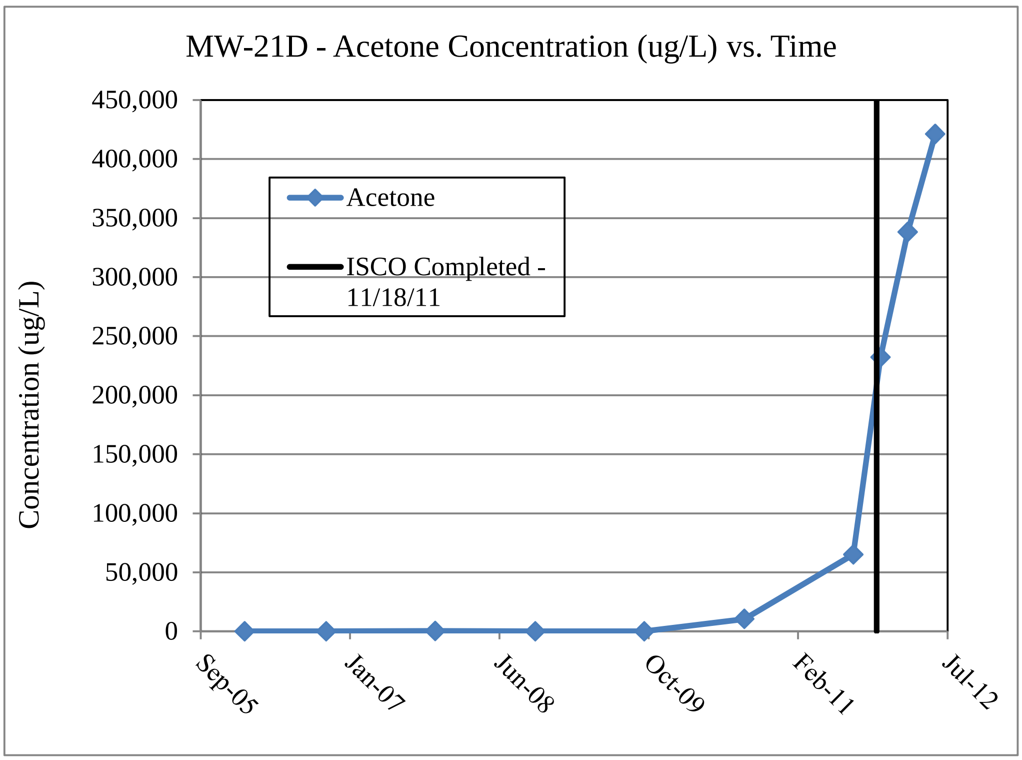
The 2006 groundwater samples confirmed the historic acetone detections in deep groundwater. The only performance monitoring well that had historic acetone detections was MW-19D, located directly east of CPM Building No. 5, and north of the UST Area. Acetone was first detected in MW-19D in 2006 with a level of approximately 12 mg/l. No other routinely monitored wells or recovery wells had detectable levels of acetone up to that date.

The acetone presence in the upper interval of the deep groundwater zone suggested either a historic upgradient source, or a historic onsite release that has migrated to the deep zone, and was not present in its original shallow source area (UST Area). No sources of acetone were reported in the original RFI or other previous site investigations. The migration of acetone was expected to be limited to the area east of CPM Building No. 5 by both the ongoing deep zone recovery well pumping and the natural attenuation of acetone in groundwater.

MW-19D is directly downgradient of the UST Area in both the shallow and deep groundwater zones, including under the condition of RW-6D pumping. RW-6D started operations in Q1 2008. Acetone levels continued to be detected in MW-19D and were found to fluctuate greatly since 2006, in some instances greater than 2 orders of magnitude. See the acetone versus time plot below. The source of the acetone and the reasons for these fluctuations have not yet been determined.



Recovery well RW-6D, approximately 40 foot north of MW-19D has indicated a continuous increase in acetone levels since 2008. This increasing trend is similar to the MW-19D increases but with an approximate 2-year lag time. This suggests a slug-type plume that has migrated from the MW-19D area, and possibly from beneath CPM Building No. 5 to the RW-6D area. The only other monitoring well near RW-6D with detectable levels of acetone was MW-21D, which is 50 feet due west. Acetone was initially detected in this well in 2010. See the acetone versus time plot below. Monitoring wells 19-D and 21-D are currently within the capture zone of recovery well RW-6D and the acetone plume is being contained and removed by pumping withdrawal.



3.4 <u>Treatability Study Soil Sampling Results- November, 2009</u>

Chemical oxidation treatability study soil samples were collected from the west UST Area in 2009 by composite sampling of six (6) test borings: TBOX-1 through TBOX-7. TBOX-2 was not sampled because of limited recovery. See Drawing C-1. Two (2) 5-gallon bulk composites were prepared by collecting all of the recovered sample from each test boring over the interval of approximately 4-8 feet BGS.

The samples were primarily sand and gravel with clayey silts from interspersed lenses. Field sample logs are contained in Appendix C. The clayey silt fraction was manually separated from the samples for characterization to prepare a fine-grained composite sample for chemical analyses. Coarse-grained samples were also collected from each composite container for analyses. A summary of the chemical analyses data is as follows:

Treatability Study- Soil Sample Characterization

Analyses	S1- Sand/Gravel	S2- Sand/Gravel	S3- Clayey Silt
VOCs, ug/kg			
Ethylbenzene	1,100	7,900	12,000
Benzene	2,700	BDL	6,200
Methylene chloride	BDL	BDL	17,000
n-Butylbenzene	180	480	1,000
n-Propylbenzene	110	410	870
Cumene	500	610	3,800
tert-butylbenzene	BDL	BDL	10,000
Toluene	940	980	7,800
Xylenes	19,500	28,000	263,000
Total VOCs, mg/kg	28.64	41.96	328.67
Total TPH, mg/kg	149	310	3,030

The clayey-silt composite had total VOCs of approximately 329 mg/kg, with xylenes the primary constituent. The VOC levels found in the coarse-grained samples were about 1 order of magnitude lower concentration than the fine-grained sample. The VOC levels and detected compounds were in general agreement with the vadose zone soil results obtained in the 2003-2006 investigations as reported on Table 3-1.

3.5 Baseline Groundwater Sampling Results- November, 2011

Groundwater samples were collected on November 3, 2011 approximately 1 week prior to the start of the oxidant injections. Existing shallow monitoring wells in the UST area were used. Deep zone monitoring wells and piezometers in the RW-6D area provided suitable points for baseline groundwater sampling for the acetone hotspot. All monitoring point locations are shown on Drawing C-1.

Samples were analyzed for VOCs and water quality parameters indicative of chemical oxidant presence and behavior: ORP, sulfate/sulfide, and ferrous (+2)/ferric iron(+3).

Baseline groundwater data is presented on Tables 3-3 through 3-16 and Figures 3-11 through 3-19. Monitoring well construction logs are contained in Appendix D. Laboratory analyses reports are contained in Appendix E (CD).

3.5.1 UST Area –Shallow Groundwater

3.5.1.1 VOCs

VOCs ethylbenzene and xylenes were the predominant compounds detected in the baseline groundwater sampling. Cumene was found at lower concentrations and toluene was not detected in any of the samples. In all of the baseline samples the total CTEX concentration comprised 100% of the detected VOCs with the exception of MW-20 and MW-29S. Other VOCs were found at lower concentrations and are considered not related to the UST Area.

Cumene

Baseline cumene levels ranged from non-detect (ND) to 325 ug/l (MW-29S in the west UST Area). Cumene was generally evenly distributed within one (1) order of magnitude across the entire UST Area. See Figure 3-11.

The baseline levels matched the historic cumene distribution across the site with the exception of the MW-20 area beneath CPM building #5. Historically cumene was elevated in this area (350 ug/l) whereas it has reduced approximately 70% by 2011.

Ethylbenzene

Baseline ethylbenzene levels ranged from non-detect (ND) to 8700 ug/l (MW-29S in the west UST Area). Ethylbenzene was generally one (1) order of magnitude higher in the western side. See Figure 3-12.

The baseline levels matched the historic ethylbenzene distribution across the site with the exception of the west UST Area where ethylbenzene levels are about one (1) order of magnitude lower than maximum historic levels of 21,000 ug/l (TBUST-22).

Xylenes (Total)

Baseline total xylene levels ranged from non-detect (ND) to 52,900 ug/l (MW-29S in the west). Xylenes were generally one (1) order of magnitude higher in the western side. See Figure 3-13.

The baseline levels matched the historic xylene distribution across the site with the exception of the west UST Area where xylene levels are generally about one (1) order of magnitude lower than historic levels which had a maximum xylene concentration of 134,000 ug/l (TBUST-22).

Other VOCs

TCE and by-product cis-1,2- DCE were detected at 79 and 403 ug/l respectively in MW-20. These chlorinated VOCs are expected to be related to the historic TCE plume that originated in the northwest area of the Essex/Hope Site known as the NPL Area. This plume is being remediated by ongoing pumping of extraction wells in that area.

MIBK (4-methyl-2-pentanone), acetone and benzene were detected at 45.2, 26.5 and 135 ug/l, respectively in MW-29S, in the west UST Area. These VOCs were only detected in this monitoring well and are considered isolated contaminants local to this well area.

3.5.1.2 CTEX Mass in Shallow Groundwater

The shallow groundwater pre-treatment contaminant mass for four (4) VOC compounds (CTEX) was estimated as follows:

Shallow Groundwater Mass CTEX Estimate- Baseline Data

CTEX, ug/l	Contour Area, sf	CTEX Mass, kg

0	29116	
100	28063	0.003
500	24271	0.058
1000	20164	0.157
2500	12386	0.693
5000	6849	1.058
10000	3068	1.445
20000	1924	0.874
30000	1229	0.885
40000	684	0.972
50000	213	1.080
	TOTAL Mass, kg	**7.22**

Notes:
1. Mass estimate based on average 6 foot thick saturated zone interval, average 8-14 feet BGS. Assumed uniform vertical distribution of CTEX.
Mass = avg. conc (ug/l) x 28.3 l/cf x aquifer vol (cf) x porosity (0.3)
2. Ref Figure 3-11

3.5.1.3 Water Quality Parameters- Shallow Groundwater

Baseline data is summarized on Tables 3-3 through 3-12 by individual wells. Isoconcentration plots of sulfate, ferric/ferrous iron and ORP are shown on Figures 3-12 through 3-15.

Baseline sulfate levels ranged from 10-60 mg/l across the UST Area with the maximum level at MW-13 near Blackstone Avenue. It is noted that a city sewer is present on Blackstone Avenue and sewage exfiltration may be influencing the local shallow groundwater near MW-13. Sulfide, indicative of reducing groundwater conditions, was detected in only two (2) monitoring wells, MWs-24S and -26S, at 1.0 mg/l. See Figures 3-14 and 3-15.

Baseline total iron levels ranged from 8-33 mg/l. Naturally-occurring iron in shallow groundwater is expected to occur predominantly in the oxidized ferric (+3) form. This was the case for all monitoring wells except PZ-5S to the north of the UST Area. See Figure 3-16.

Baseline ORP was predominately negative across the site (-10 to -100mV) indicative of mildly reducing conditions. An exception was the south-central area mainly east of the metal hut which had mildly oxidizing conditions. The furthest east area at MW-27S had the lowest ORP at -163.5 mV. See Figure 3-17.

3.5.1.4 Total Petroleum Hydrocarbons (TPH)

TPH was non-detect in all baseline monitoring well samples.

3.5.2 Acetone Hot Spot- Deep Groundwater

Acetone was detected in deep groundwater baseline samples at levels up to 65 mg/l in monitoring well MW-21D, located on Hopkins Avenue directly north of CPM Plant Building #5. The acetone hotspot appeared to be centered at the northeast corner of the building around MW-21D and RW-6D. See Figure 3-16.

3.5.2.1 Acetone Mass in Deep Groundwater Hot Spot

The acetone mass in the deep groundwater hot spot was estimated as follows:

Deep Groundwater Mass Acetone Estimate- Baseline Data,
November 2, 2011

Acetone, ug/l	Contour Area, sf	Acetone Mass, kg
0	34670	
1000	28317	0.485
5000	19513	4.036
10000	14800	5.402
20000	9562	12.007
30000	5674	14.854
40000	2644	16.207
50000	848	12.351
60000	68	6.556
	TOTAL Mass, kg	**71.90**

Notes:

1. Mass estimate based on average 18 foot thick saturated zone interval, average 20-38 feet BGS.

Mass = avg. conc (ug/l) x 28.3 l/cf x aquifer vol (cf) x porosity (0.3)

2. Ref Figure 3-16

3.5.2.2 Water Quality Parameters- Deep Groundwater

Baseline data is summarized on Tables 3-13 through 3-17 by individual wells.

Baseline sulfate levels were non-detect with the exception of MW-22D which had a concentration of 24.1 mg/l. Sulfide, indicative of reducing groundwater conditions, was not detected in any of the deep zone monitoring wells.

Baseline total iron levels ranged from 5.1-594 mg/l. The highest iron concentration was found in PZ-6D, directly east of CPM Building #5. All iron was predominantly in the oxidized ferric (+3) form.

Baseline ORP was predominately negative across the site (-33 to -87mV) indicative of moderately reducing conditions. An exception was at MW-22D furthest downgradient to the north which had mildly oxidizing conditions.

4.0 POST-TREATMENT CONTAMINANT CONDITIONS

Post-treatment conditions and percentage changes in VOCs focus on the 180-day results (Round 3, June 13, 2012) as compared to the baseline and historic contaminant conditions. The interim monitoring results are presented on the data tables. The treatment performance is presented for three (3) areas:

- UST Area East (low VOCs in shallow soils/groundwater)
- UST Area West (high VOCs in shallow soils/groundwater),
- Acetone Hot Spot near RW-6D (elevated acetone in deep groundwater)

Post-treatment sampling was conducted over three (3) quarterly rounds primarily for groundwater. Soils sampling was conducted in August, 2012 in the UST Area. Contaminant data summaries for the designated ISCO monitoring wells are summarized on Tables 3-3 through 3-16. Post-treatment soil analytical results are summarized on Table 4-1. Sampling locations are shown on Drawing C-1.

4.1 UST Area East

4.1.1 Groundwater

Five (5) monitoring wells have been sampled in the UST Area East. Graphical presentations of VOC and indicator parameter distribution in groundwater for Round 3 sampling are presented on Figures 3-17 through 3-24. Tabular and graphical summaries of the VOC data are presented below.

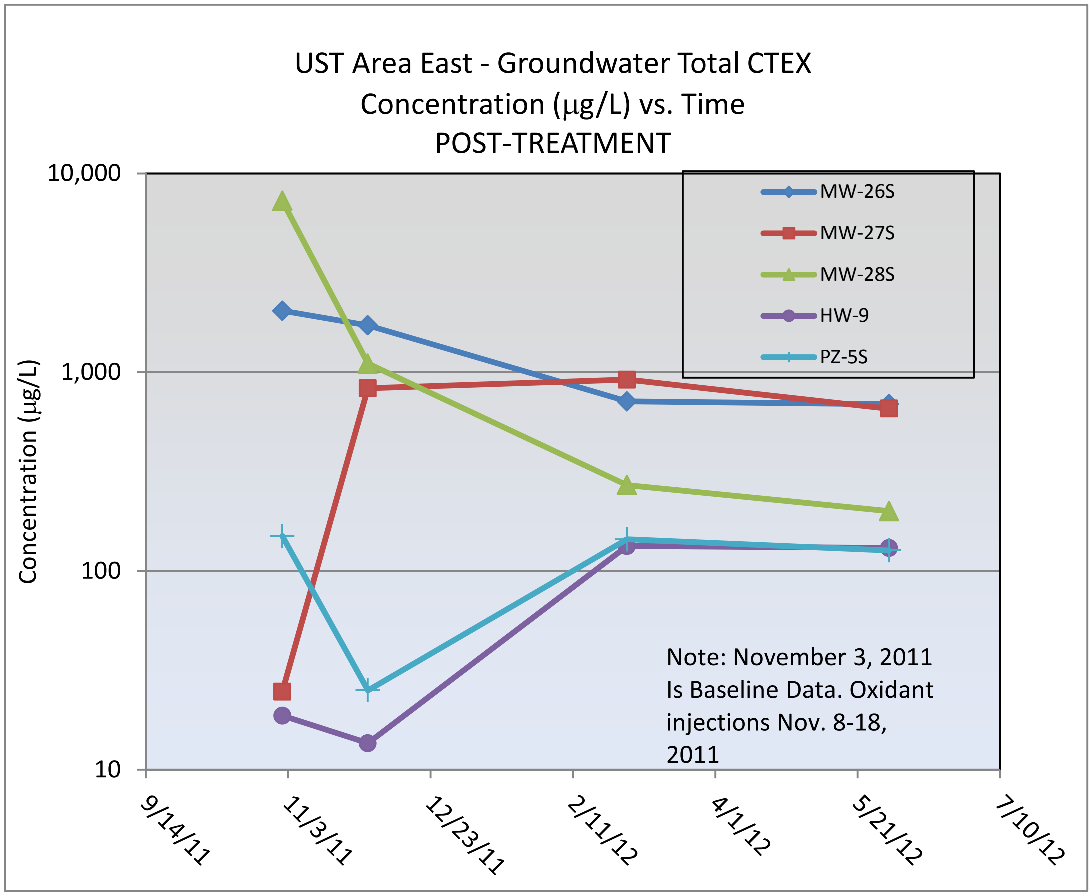
The monitoring data indicates that ISCO has significantly reduced and simultaneously redistributed VOCs in groundwater in the East UST Area. Individual VOCs are at 400 ug/l or less as compared to individual baseline VOCs over 5000 ug/l. CTEX percent reductions vary by monitoring point and range from 15.3 to 97.3 percent. CTEX increases are evident mainly at MW-27S and to a lesser degree at HW-9 and PZ-5S. The increases are expected to be a result of both vadose zone soil VOC desorption/flushing and groundwater zone fluid displacement by injection of oxidant solutions.

UST Area East- Groundwater Monitoring Summary- VOCs, ug/l

Monitoring Point	Parameter	Baseline- 11/3/11	Round 3- 6/13/12	% Change
MW-26S	**CTEX**	**2033**	**691**	-66.0
	Cumene	225	1	-99.6
	Toluene	1	1	0.0
	Ethylbenzene	398	290	-27.1
	Xylenes	1410	401	-71.6
MW-27S	**CTEX**	**25**	**655**	Increase
	Cumene	24.7	106	Increase
	Toluene	1	1	ND
	Ethylbenzene	1	313	Increase
	Xylenes	1	236	Increase
MW-28S	**CTEX**	**7286**	**200**	-97.3
	Cumene	316	69.9	-77.9
	Toluene	1	1	0.0
	Ethylbenzene	1490	96.5	-93.5
	Xylenes	5480	33.5	-99.4
HW-9	**CTEX**	**19**	**131**	Increase
	Cumene	18.7	40	Increase
	Toluene	1	1	ND
	Ethylbenzene	1	84.1	Increase
	Xylenes	1	6.4	Increase
PZ-5S	**CTEX**	**150**	**127**	-15.3
	Cumene	4.4	27.4	Increase
	Toluene	1	1	ND
	Ethylbenzene	20.4	45.5	Increase
	Xylenes	125	53.9	-56.9

Note: Non-detect (ND) entered as 1.0 ug/l

Other VOCs of interest detected included acetone, which was found up to 441 ug/l (MW-26S), only in the Round 1 samples (12/5/11). All acetone results were non-detect in Round 3. Acetone is suspected to be an intermediate by-product of cumene oxidation.



Round 3 sulfate levels ranged from 311-1130 mg/l across the UST Area East which represented a significant increase above baseline levels of non-detect. Sulfate is the primary indicator of persulfate oxidant presence from the ASP injections. It is noted that the UST Area east had lower oxidant doses, on average 25% solutions, by weight compared to the east UST Area. Sulfide was not detected. See Figures 3-21 and 3-22.

Round 3 total iron levels ranged from 47.7- 153 mg/l. Total iron increased above baseline levels as a result of the ZVI catalyst injected with the oxidant. Baseline iron occurred predominantly in the oxidized ferric (+3) form. All Round 3 monitoring wells exhibited predominantly ferrous (+2) iron indicative of reducing conditions and/or facultative bacteria utilization of ferric iron as an electron acceptor. See Figure 3-23.

Round 3 ORP was predominately negative across the east side of the site (0.6 to -53 mV) indicative of slightly reducing conditions. Baseline conditions were moderately reducing. See Figure 3-24.

Post-treatment monitoring data at 6 months indicates that the east UST Area has transitioned from persulfate-based oxidation to the facultative biological stage. The oxidation phase occurred primarily within the first month after injection as indicated by maximum sulfate and ferric iron levels and increased ORPs. See Round 1 monitoring well data in Tables 3-7 through 3-9.

Rounds 2 and 3 monitoring indicated a decline in sulfate, and increase in ferrous iron (reduced) and decreased ORPs. Sulfide, as an indicator of anaerobic biodegradation was not yet detected in groundwater.

4.2 UST Area West

4.2.1 Groundwater

Five (5) monitoring wells have been sampled in the UST Area West. Graphical presentations of VOC and indicator parameter distribution in groundwater for Round 3 sampling are presented on Figures 3-20 through 3-27. Tabular and graphical summaries of the VOC data are presented below.

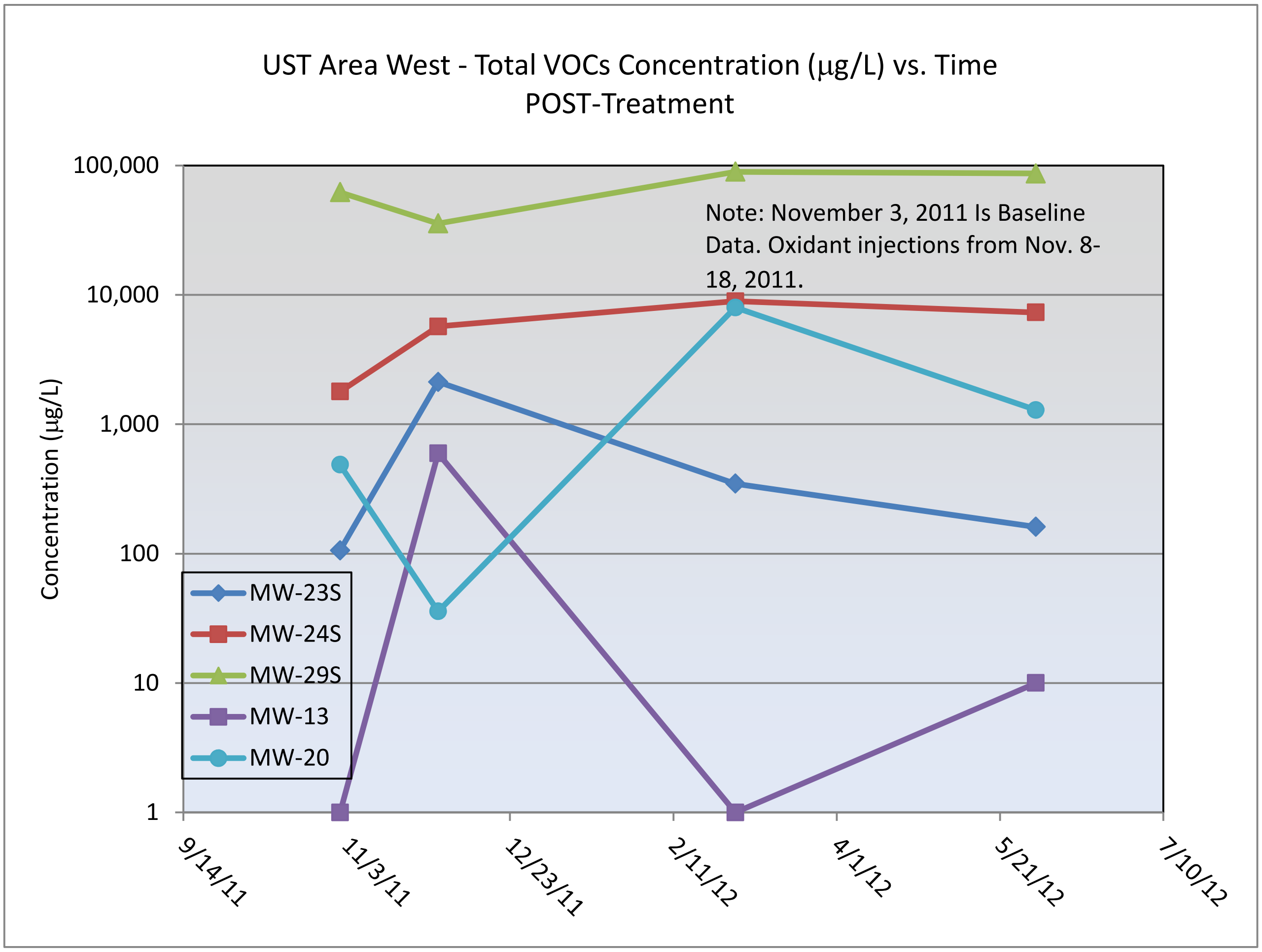
The monitoring data indicates that ISCO has significantly redistributed VOCs in the West UST Area with minimal reductions in groundwater VOC levels. This area underlies the vadose zone area with the highest VOCs found in the UST Area, and it is suspected that oxidant injections in this zone has caused VOC desorption/flushing into the shallow groundwater simultaneously with VOC oxidation. Individual VOCs have increased above baseline levels in three (3) of the wells and have decreased in MW-23S. CTEX percent reduction was 17.7 percent. CTEX increases are evident throughout most of the west area, primarily in the area of the elevated soil VOCs. Xylenes continued to be the predominant VOC and are concentrated in the southwest area of the UST Area, near the Master Machine building (MW-29S).

UST Area West- Groundwater Monitoring Summary- VOCs, ug/l

Monitoring Point	Parameter	Baseline- 11/3/11	Round 3- 6/13/12	% Change
MW-13	**CTEX**	1	1	0.0
	Cumene	1	1	0.0
	Toluene	1	1	0.0
	Ethylbenzene	1	1	0.0
	Xylenes	1	1	0.0
MW-20	**CTEX**	0	1288	Increase
	Cumene	1	71	Increase
	Toluene	1	1	ND
	Ethylbenzene	1	482	Increase

	Xylenes	1	735	Increase
MW-23S	**CTEX**	106	87.2	-17.7
	Cumene	57.5	8.2	-85.7
	Toluene	1	1	ND
	Ethylbenzene	15.9	33.5	Increase
	Xylenes	32.7	45.5	Increase
MW-24S	**CTEX**	1789	7286	Increase
	Cumene	229	201	-12.2
	Toluene	1	8.7	Increase
	Ethylbenzene	94.1	1900	Increase
	Xylenes	1465	5176	Increase
MW-29S	**CTEX**	61925	85555	Increase
	Cumene	325	275	-15.4
	Toluene	1	3480	Increase
	Ethylbenzene	8700	11900	Increase
	Xylenes	52900	69900	Increase

Other VOCs of interest included TCE and by-products cis-1,2 dichloroethylene and vinyl chloride in MW-20 which were detected in the baseline samples. The post-treatment samples were all non-detect for these constituents. Acetone was elevated in post-treatment samples in MW-23, MW-24 and MW-29. Baseline acetone levels ranged from non-detect to 26.5 ug/l in these wells, significantly lower (1-2 orders of magnitude) than the concentrations found in post-treatment monitoring. In all cases the acetone was highest in the round 1 samples (12/1/11) and declined over time. Round 3 acetone levels ranged from 24.7 to 531 ug/l. The highest level was found in MW-29S which also had the highest VOC levels in groundwater. This acetone behavior is consistent with its generation as an intermediate by-product of cumene oxidation.



Round 3 sulfate levels ranged from 232-6400 mg/l across the UST Area West which represented a significant increase above baseline levels of non-detect. Sulfate is the primary indicator of persulfate oxidant presence from the ASP injections. It is noted that the UST Area west had the highest oxidant doses, on average 60% solutions, by weight. Sulfide was detected only in MW-29-S (3.2 mg/l). This well had a sulfate level of 6400 mg/l which indicates limited reduction of sulfate. See Figures 3-21 and 3-22.

Round 3 total iron levels ranged from 22.1- 372 mg/l. Total iron increased above baseline levels as a result of the ZVI catalyst injected with the oxidant. Baseline iron occurred predominantly in the oxidized ferric (+3) form. All Round 3 monitoring wells except MW-29S exhibited predominantly ferrous (+2) iron indicative of reducing conditions and/or facultative bacteria utilization of ferric iron as an electron acceptor. MW-29S was over 99% ferric iron indicating ongoing oxidizing conditions. See Figure 3-23.

Round 3 ORP was predominately positive across the west side of the site (4.9 to 175.8 mV) indicative of slight to strong oxidizing conditions. The highest ORP was at MW-29S, in the area of the highest VOCs. The exceptions were at MW-13 and MW-20 which had mildly reducing conditions. Baseline conditions were more reducing. See Figure 3-24.

Post-treatment monitoring data at 6 months indicates that the west UST Area has partially transitioned from persulfate-based oxidation to the facultative biological stage. MW-29S in the area of the highest CTEX levels, appears to be undergoing continued oxidation. In all west areas the oxidation phase occurred primarily within the first month after injection as indicated by maximum sulfate and ferric iron levels and increased ORPs. See Round 1 monitoring well data in Tables 3-3 through 3-12.

Rounds 2 and 3 monitoring indicated a decline in sulfate, and increase in ferrous (+2) iron (reduced) and decreased ORPs. Sulfide, as an indicator of anaerobic biodegradation was not yet detected in groundwater. MW-29S has continued to indicate strongly oxidizing conditions (ORP at 175.8 mV), predominantly ferric iron, and elevated sulfate (6400 mg/l). Sulfide was also detected in MW-29S, although the oxidizing conditions likely preclude anaerobic bioactivity.

The estimated groundwater CTEX mass in the UST Area after oxidant treatment based on 180-days is as follows:

Shallow Groundwater Mass CTEX Estimate- Post Treatment Data, June 13, 2012

CTEX, ug/l	Contour Area, sf	CTEX Mass, kg
0	22908	
100	21185	0.004
500	11392	0.150
1000	9552	0.070
2500	7695	0.166
5000	5368	0.445
10000	3835	0.586
20000	2566	0.970
30000	1846	0.917
40000	1327	0.925
50000	903	0.972
60000	506	1.112
70000	196	1.026

TOTAL Mass, kg	7.34

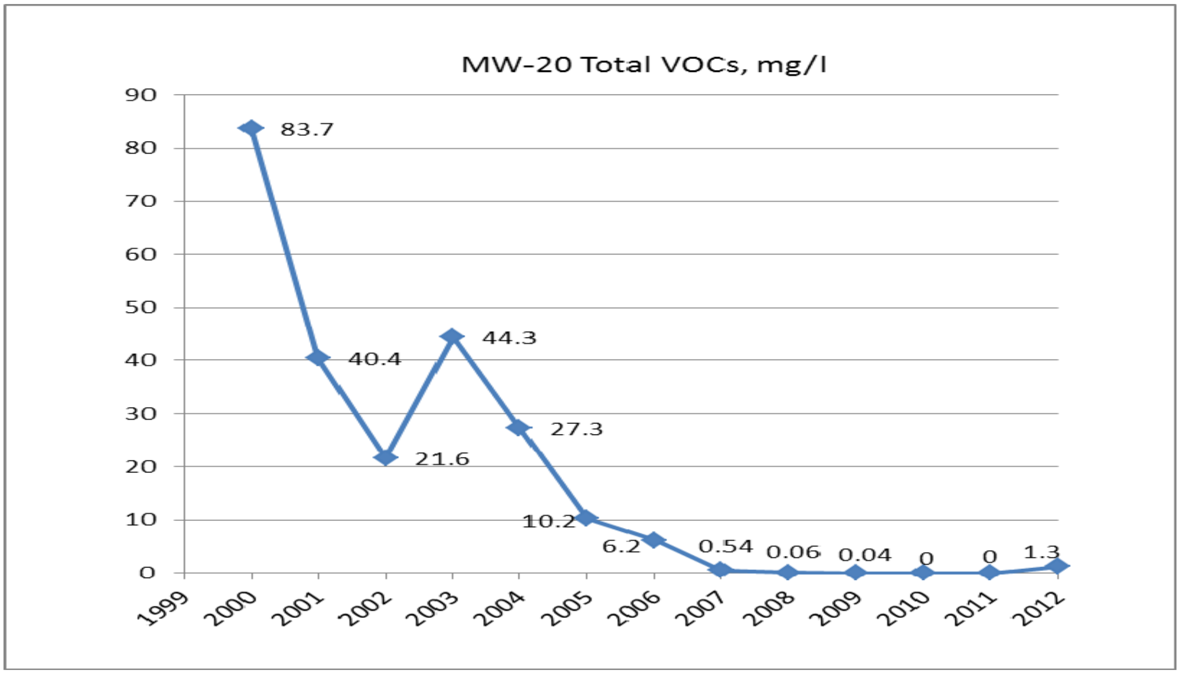
Notes:
1. Mass estimate based on average 6 foot thick saturated zone interval, average 8-14 feet BGS.

Mass = avg. conc (ug/l) x 28.3 l/cf x aquifer vol (cf) x porosity (0.3)
2. Ref Figure 3-20

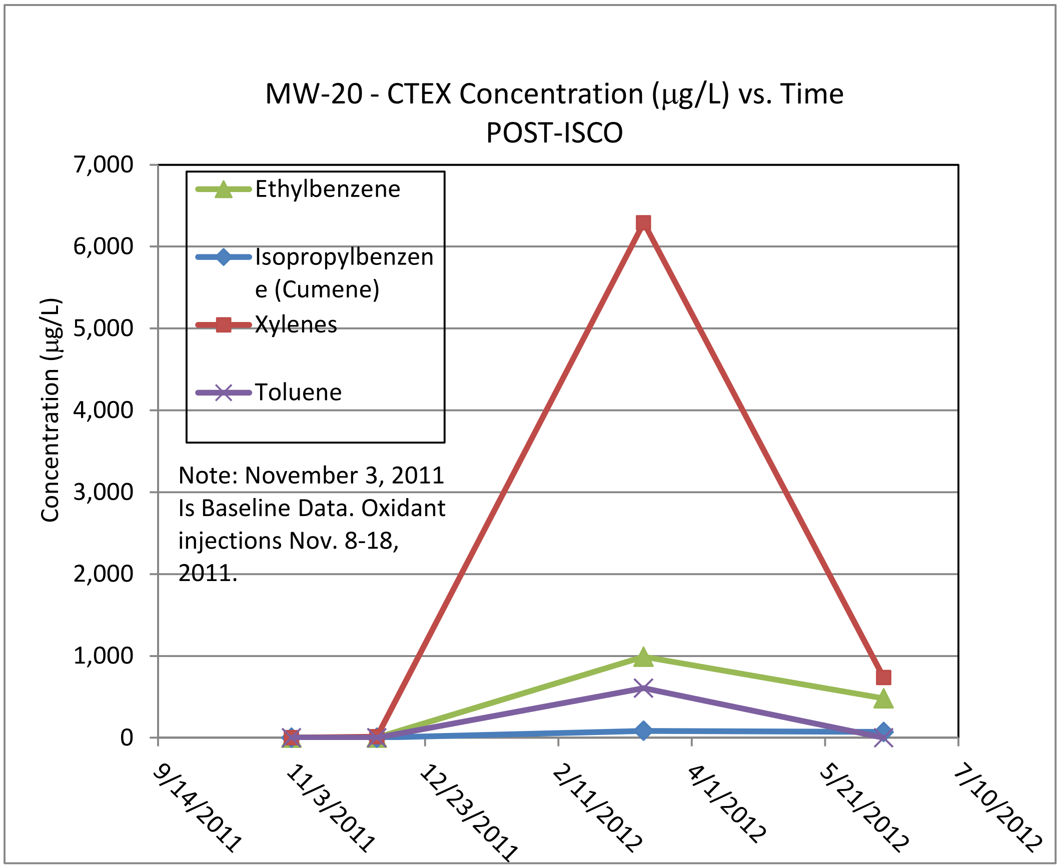
The 180-day post-treatment CTEX groundwater mass of 7.34 kg represents a 1.6 percent increase in CTEX mass compared to baseline conditions of 7.22 kg.

4.2.2 Monitoring Well MW-20

The only monitoring well in or near the UST Area that has been routinely sampled since the start of the site remedial action in 1997 is MW-20, beneath CPM Building No. 5. This well is in the shallow groundwater zone and is hydraulically downgradient of the UST Area. The year 2010 data shows that CTEX levels decreased to below detection limits (BDL). The total VOC levels in MW-20 have been decreasing continuously since a maximum recorded value of 83.7 ppm in 2000. The reason for the significant decline in CTEX up to 2010 has not been determined. The recent increase of VOCs is attributed to CTEX displacement by oxidant injections in November, 2011. This effect is illustrated by the MW-20 CTEX concentrations over three (3) rounds of ISCO monitoring. MW-20 VOC data from years 2000 to 2012 is as follows:



Post-treatment ISCO monitoring data for MW-20 is as follows:



4.2.3 Soils

Post treatment soil samples in the UST Area were taken in August, 2012 by direct-push test borings on approximately 20 foot grid spacing's. The test borings (TBUST-100 through -113) were advanced in the UST Area West in the area of the historically highest soil VOC concentrations. Borings were located equidistant of oxidant injection points. Samples were collected by compositing the 4-8 foot BGS interval. Test borings were not drilled in the east area because of drill rig inaccessibility. The east area vadose soils had CTEX levels 1 to 2 orders of magnitude lower than the west area and post-treatment CTEX levels are expected to be at or below the performance of the west area. Future sampling will be required to confirm the east area vadose soil CTEX. Soils VOC distributions are presented on Figures 3-25 through 3-27. Soil analyses is summarized on Table 4-1. Test boring locations are shown on Drawing C-1.

VOC levels were significantly reduced in vadose zone soils in the west UST Area. All samples had VOC concentrations below the RAOs of 1/10 mg/kg (individual/total). The maximum VOC detected was xylenes (total) at 0.97 mg/kg in TBUST-112. The 180-day post-treatment CTEX soil mass in the west UST Area was estimated at 0.13 kg. See calculation below. This mass represents a 99.9 percent decrease in CTEX compared to baseline (historic) conditions of 1850 kg (Section 3.1.1).

Vadose Zone Soils West UST Area- Mass CTEX Estimate
Post-Treatment Data, August, 2012

CTEX, ug/kg	Contour Area, sf	CTEX Mass, kg
0	3584	
50	2160	0.009
100	1515	0.012
200	917	0.022
300	444	0.030
400	273	0.015
500	179	0.011
800	27	0.025
1000	0.6	0.006
	TOTAL Mass, kg	**0.13**

Notes:
1. Mass estimate based on 5 foot thick vadose zone interval, average 4-9 feet BGS.
Mass = avg. conc (ug/kg) x 110 lbs./cf soil x soil vol (cf) x kg/2.2 lbs.

2. Ref Figure 3-25

This significant reduction in vadose soil VOCs is expected to be caused by a combination of desorption/flushing and chemical oxidation caused by the oxidant injections. Field examination of the soil sample cores indicated no visual contamination or odors from 0-8 foot BGS. Samples were not collected from below this interval to avoid the capillary/smear zone.

Residual TPH was present in the west area vadose zone and ranged from 127 to 2790 mg/kg. Average TPH from 14 samples was 542 mg/kg .

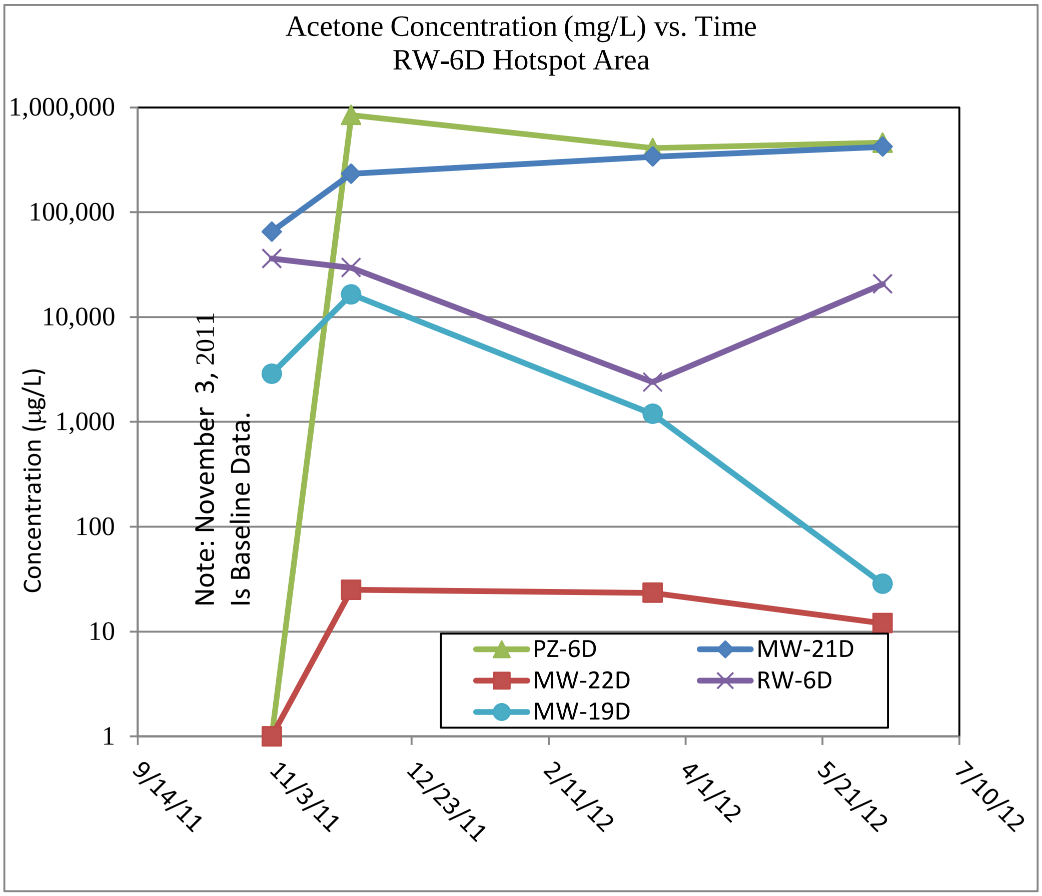
4.3 Acetone Hot Spot near RW-6D

Five (5) groundwater monitoring points have been sampled from the deep groundwater zone in the acetone hot spot area near RW-6D. These include monitoring wells (2-in diameter) MW-19D, MW-21D and MW-22D , piezometer PZ-6D (1-in diameter) and recovery well RW-6D (6-in diameter). The monitoring wells and piezometer have a 10-foot long screen across the lower interval of the deep groundwater zone, generally 32-42 feet BGS. The recovery well has a 20 foot screen set across most of the deep water-bearing zone. A graphical presentation of acetone for Round 3 sampling is presented on Figure 3-28. Tabular and graphical summaries of the acetone levels over time are presented below.

The monitoring data indicates that ISCO has significantly redistributed acetone in the RW-6D area with minimal reductions in overall groundwater concentrations. Acetone has decreased 99% in MW-19D and increased above baseline levels in MW-21D and PZ-6D. Baseline PZ-6D levels were non-detect. MW-21D and PZ-6D are on the opposite ends of the oxidant injection area and the acetone levels are expected to be elevated because of displacement of the plume by injection solution.

Acetone-Groundwater Analytical Results - (ug/L)

Monitoring Location	Baseline- 11/2/2011	Round 1- 12/1/2011	Round 2- 3/20/2012	Round 3- 6/12/2012	% Change- Round 3 vs. Baseline
RW-6D	36,000	29,500	2,390	20,600	-42.78
MW-19D	2,870	16,400	1,190	28.5	-99.01
PZ-6D	ND	843,000	407,000	460,000	Increase
MW-21D	65,100	232,000	338,000	421,000	Increase
MW-22D	ND	25.0	23.4	12.0	Increase



The acetone mass in the deep groundwater hot spot was estimated at 648.61 kg. See calculation below. The baseline acetone mass was estimated at 71.9 kg (See Section 3.5.2.1). This represents an 800% increase in acetone mass post-treatment. This significant increase in acetone mass is expected to be accounted for by redistribution of the acetone plume by injection. It is also expected that the baseline acetone data and mass estimate was not representative of the acetone hot spot distribution. All of the groundwater monitoring points are located outside of CPM Building No. 5. The area upgradient of RW-6D is primarily the CPM Building No. 5 where there are limited groundwater monitoring points. The entire northeast corner of the building, up to 100 feet from RW-6D, does not have any groundwater monitoring locations. The acetone plume in this area was estimated by linear interpolation using isocontour plotting software (Surfer 10).

Deep Groundwater Acetone Mass Estimate- Post Treatment
June 13, 2012

Acetone, ug/l	Contour Area, sf	Acetone Mass, kg
0	38717	
1000	37717	0.076
5000	34714	1.377
10000	32094	3.003
50000	22685	43.137
100000	16543	70.397
200000	8016	195.464
300000	2413	214.063
400000	149	121.095
	TOTAL Mass, kg	**648.61**

Notes:
1. Mass estimate based on average 18 foot thick saturated zone interval, average 20-38 feet BGS.
Mass = avg. conc (ug/l) x 28.3 l/cf x aquifer vol (cf) x porosity (0.3)
2. Ref Figure 3-28

Chlorinated VOCs are present in the acetone hot spot area and have been the focus of pump and treat operations since startup of the remedial actions in 1997. The area of the highest TCE/cis-1,2-DCE in this area has been at MW-21D. TCE and cis-1,2- DCE Round 3 levels were 95% and 38% lower, respectively compared to baseline. These VOCs both had declining concentration trends over time which suggests that ongoing reductions have occurred by recovery well pumping and likely chemical oxidation over the ISCO monitoring period. Vinyl chloride, a by-product of TCE degradation, increased slightly over this period. In MW-22D, TCE and cis-1,2- DCE levels were reduced 59% and 68% respectively. This well is north of RW-6D. Vinyl chloride was also reduced 86% in MW-19D. TCE and DCE were not detected in this well. Recovery well RW-6D TCE and vinyl chloride levels increased slightly (~ 10%), however cis-1,2-DCE decreased 30%.

These results indicate that the ISCO had a positive reduction in chlorinated VOCs in the RW-6D area, and this decline is expected to continue over time.

The oxidant indicator data appears to be inconsistent and possibly in error. The primary markers of oxidant presence, sulfate and iron, were not increased above baseline levels for all three (3) rounds of post-injection sampling in the three (3) primary monitoring points within or adjoining the injection areas:

MW-19D, MW-21D and RW-6D. Sulfate was detected in MW-22D and PZ-6D, further from the injection area, however the data is inconsistent and does not correlate with expected increases in iron levels. Additional monitoring is required to confirm the indicator parameter values and data quality in the acetone hot spot area.

5.0 CONCLUSIONS AT 180-DAYS POST-TREATMENT

Summary

In the UST Area shallow groundwater, CTEX has not yet been reduced to RAO levels, and it has been redistributed in the groundwater zones by ISCO injections. ISCO has been more effective in the east UST Area than in the west where historic CTEX levels are higher. The groundwater CTEX mass post-treatment has not changed significantly in the west UST Area and is expected to be a result of CTEX desorption/flushing from the vadose zone soils into the shallow groundwater. Groundwater post-treatment CTEX levels are highest at MW-29S (86 mg/l) in the west UST Area.

The UST Area soil CTEX levels have been reduced to below RAO levels in the west area, and likely in the east area. The west area soil CTEX mass has been reduced over 99%.

In the deep groundwater hotspot area acetone has been redistributed , and levels have increased in some wells and have decreased in others. Post-treatment acetone mass is estimated to have increased, however the baseline acetone data and acetone mass estimate are not expected to be representative of the acetone distribution, mainly because data is unavailable from beneath the CPM Building No. 5 area. Chlorinated VOCs have declined in the acetone hot spot area around RW-6D.

Historic and Baseline Contaminant Conditions

VOCs ethylbenzene and xylenes were the predominant compounds detected in historic and baseline groundwater and soil sampling in the UST Area. CTEX concentration comprised 100% of the detected VOCs with the exception of MW-20 and MW-29S. Baseline groundwater ethylbenzene levels across the UST Area ranged from non-detect (ND) to 8700 ug/l in MW-29S in the west UST Area. Ethylbenzene was generally one (1) order of magnitude higher in the western side. Baseline total xylene levels ranged from non-detect (ND) to 52,900 ug/l in MW-29S in the west. Xylenes were generally one (1) order of magnitude higher in the western side.

Historic soil CTEX levels in the western end of the UST Area had VOCs toluene, ethylbenzene and xylenes at concentrations up to 660 mg/kg, 250 mg/kg and 1520 mg/kg respectively. Cumene was generally found at lower concentrations, the maximum being at 5.9 mg/kg. The eastern UST Area had soil CTEX levels typically less than 10 mg/kg with the exception of TBUST 16 which had a level of 29.2 mg/kg (xylenes at 25 mg/kg). The elevated CTEX soil areas generally correlate with the elevated CTEX in shallow groundwater.

Acetone was detected in deep groundwater baseline samples at levels up to 65 mg/l in monitoring well MW-21D, located on Hopkins Avenue directly north of CPM Plant Building #5. The acetone hotspot appeared to be centered at the northeast corner of the building around MW-21D and RW-6D. No data was available from the area inside of the building.

UST East Area ISCO Treatment

CTEX levels in soils and groundwater have been reduced and redistributed by oxidant treatment. Individual VOCs are at 0.4 mg/l or less as compared to individual baseline VOCs over 5.0 mg/l. CTEX percent reductions vary by monitoring point and range from 15.3 to 97.3 percent. CTEX increases are evident mainly at MW-27S and to a lesser degree at HW-9 and PZ-5S. The extent of CTEX east of the area (offsite at Rollform) has not been confirmed.

Post-treatment soil sampling was not performed in the east area because of site access limitations for the direct-push drill rig.

UST West Area ISCO Treatment

VOCs have been significantly redistributed with minimal net reductions in groundwater levels. This area underlies the vadose zone area with the highest VOCs found in the UST Area, and it is suspected that oxidant injections have caused VOC desorption/flushing into the shallow groundwater simultaneously with VOC oxidation. Individual VOCs have increased above baseline levels in most of the wells. The highest CTEX levels post-treatment are 85.6 mg/l and 7.3 mg/l at monitoring wells MW-29S and MW-24S, respectively, on the far west side of the UST Area adjoining the Master Machine building.

The extent of the VOCs in the shallow groundwater have not been fully defined. In the area west of the UST Area beneath Master Machine no monitoring wells are available and no groundwater samples have been taken within the building area.

Oxidation reactions are ongoing in the UST west area groundwater around the highest VOC zone near MW-29D. Other UST area groundwater has transitioned to more biological (facultative/anaerobic) reducing conditions.

Vadose zone soils VOC levels were significantly reduced in the west area. All samples had VOC concentrations below the RAOs of 1/10 mg/kg (individual/total). The maximum VOC detected was xylenes (total) at 0.97 mg/kg in TBUST-112. The 180-day post-treatment CTEX soil mass in the west area was estimated at 0.13 kg. This mass represents a 99.9 percent decrease in CTEX compared to baseline (historic) conditions of 1850 kg.

This significant reduction in vadose soil VOCs is expected to be caused by a combination of desorption/flushing and chemical oxidation caused by the oxidant injections.

Residual TPH was present in the west area vadose zone and ranged from 127 to 2790 mg/kg after ISCO treatment. Average TPH from 14 samples was 542 mg/kg. These samples were field composites of the 4-8 foot BGS interval. Pre-treatment soil samples used for the treatability study were analyzed for TPH. The coarse fraction (sand and gravel) samples had TPH from 149-310 mg/kg. The silty clay fraction had a TPH of 3030 mg/kg. Baseline soil samples were not collected. From this limited historic data, the ISCO had minimal effect on the soil TPH levels.

ISCO Treatment of Acetone Hotspot at RW-6D

The acetone hot spot has been significantly redistributed with minimal reductions in groundwater acetone levels. Acetone has decreased 99% in MW-19D and increased above baseline levels in MW-21D, Acetone hotspot mass was estimated to increase approximately 700% post-treatment. This increase is expected to be accounted for by redistribution of the acetone plume by injection. It is also expected that the baseline and post-treatment acetone data used to estimate mass quantities was not representative of the acetone hot spot distribution. The deep groundwater zone in this area is continuing to exist under reducing conditions and oxidant injections have not had a significant effect on groundwater chemistry.

Chlorinated VOCs TCE and cis-1,2-DCE in the acetone plume area have been reduced by ISCO. TCE and cis-1,2- DCE Round 3 levels were 95% and 38% lower, respectively compared to baseline. These VOCs both had declining concentration trends over time which suggests that further reductions are likely. In MW-22D, TCE and cis-1,2- DCE levels were reduced 59% and 68% respectively. This well is north of RW-6D. Vinyl chloride was also reduced 86% in MW-19D. TCE and DCE were not detected in this well. Recovery well RW-6D TCE and vinyl chloride levels increased slightly (~ 10%), however cis-1,2-DCE decreased 30%.

The extent of the VOCs in the acetone plume deep groundwater zone have not been fully defined. In the area upgradient of the RW-6D deep groundwater zone beneath CPM building No. 5 no monitoring wells are available and no groundwater samples have been taken within the building area.

TABLES

Table 1-1
Essex Jamestown Site
UST Area ISCO
ISCO Performance Monitoring Summary

ISCO Performance Monitoring Summary

Work Phase	Objective	Monitoring Locations	Parameters	Frequency
seline (Pre-Operatior	Measure Groundwater Levels and Water Quality Indicators and VOCs to establish baseline conditions.	**Wells-** HW-9, MWs- 20, 23S, 24S, 26S, 27S and 28S, and PZ-5S	VOCs (EPA 8260), pH, cond, ORP, DO, sulfate, alkalinity, iron, and water levels	Within 2 weeks prior to the start of site oxidant applications
Post-Operations	**Groundwater-** Measure Well Water Levels, Water Quality Indicators and VOCs to evaluate ISCO performance. **Soils-** Measure soil organic constituents to evaluate ISCO performance.	**Wells-** HW-9, MWs- 20, 23S, 24S, 26S, 27S and 28S, and PZ-5S. **Soils-** Continuous samples, 4 ft to water table. Select sample based on VOC headspace (HS) result. Sample vadose soils in west treatment area on 20 ft center grid and in east treatment area at centerline (E-W) on 10 ft centers.	**Groundwater-** VOCs (EPA 8260), pH, cond, ORP, DO, sulfate, alkalinity, iron and water levels. **Soils-** Field HS, VOCs and TPH.	**Wells-** Quarterly for 1-year after the end of site operations monitoring. **Soils-** 180 days after treatment

Table 3-1
Soil Analytical Results- UST Area
Volatile Organics
UST Area and Vinyl Chloride Groundwater Investigations
Samples taken December 16-22, 2003

Table 3-1

SAMPLE ID:	TBUST 1	TBUST 1	TBUST 2	TBUST 4	TBUST 5	TBUST 6	TBUST 6 (4)	TBUST 7 (4)	TBUST 7 (4)	TBUST 8	TBUST 9 (4)	TBUST 9 (4)	TBUST 10	TBUST 11 (4)	TBUST 12 (4)
Depth Interval, ft BGS	4-5 ft	6.5-8 ft	4-4.5 ft	4-5 ft	4-6.2 ft	5.4-7.3 ft	8-10.1 ft	8-8.9 ft	8.9-10.5 ft	6-6.5 ft	6.7-8.9 ft	14-15 ft	5.3-7 ft	9.2-11.4 ft	8-10 ft
DATE SAMPLED:	03-Nov-03	03-Nov-03	03-Nov-03	03-Nov-03	03-Nov-03	03-Nov-03	04-Nov-03	11-Nov-03	11-Nov-03	05-Nov-03	05-Nov-03	05-Nov-03	05-Nov-03	11-Nov-03	11-Nov-03
COMPOUND															
Acetone	89		26	37	38	57				28		1300			
Benzene			7.9												
Bromodichloromethane															
Bromoform															
Bromomethane															
2-Butanone	11														
Carbon Disulfide			8.8		9.7	18									
Carbon Tetrachloride															
Chlorobenzene															
Chloroethane															
Chloroform															
Chloromethane															
Cumene		1900					6100		380	2100	3700	6100		1200	
Dibromochloromethane															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
1,1-Dichloroethane															
1,2-Dichloroethane															
1,1-Dichloroethene															
cis-1,2-Dichloroethene															
trans-1,2-Dichloroethene															
1,2-Dichloropropane															
cis-1,3-Dichloropropene															
trans-1,3-Dichloropropene															
Ethylbenzene	25	14000	28		63	6.6	15000		980	18000	40000	160000	1100	8000	
2-Hexanone															
4-Methyl-2-pentanone															
Methylene chloride															
Styrene															
1,1,2,2-Tetrachloroethane															
Tetrachloroethene															
Toluene	6.6	800	22	6.3	13					190	3300	26000			
1,1,1-Trichloroethane															
1,1,2-Trichloroethane															
Trichloroethene															
Trichlorofluoromethane															
Vinyl chloride															
m,p-Xylene	130	330000	95	9.3	260	26	70000	940	2900	160000	350000	620000	6900	35000	530
o-Xylene	33	140000	35		24		2700			46000	150000	190000	1700		
Total CTEX, mg/kg (note 3)	0.19	486.70	0.18	0.02	0.36	0.03	93.80	0.94	4.26	226.29	547.00	1002.10	9.70	44.20	0.53
Total VOCs, mg/kg	0.29	486.70	0.22	0.05	0.41	0.11	93.80	0.94	4.26	226.32	547.00	1003.40	9.70	44.20	0.53
CTEX/Total VOCs, %	66.1	100.0	80.8	29.7	88.3	30.3	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0

Note:
1. All units are ug/kg, unless noted otherwise
2. Blank entry indicates below analytical detection limits
3. C= cumene, T= toluene, E= ethylbenzene, X= total xylenes
4. Soil sample taken in shallow water-bearing zone capillary fringe or saturated zone
5. Shaded value indicates exceedance of NYDEC RAOs for VOCs- 10/1 ppm for total/each VOC.

Table 3-1
UST Area Shallow Soils (see Note 1)
VOCs Analytical Results (ug/kg)
2005-2006

	UST Area East (tank pad area)									UST Area West (former UST area)					
Sample ID	**TBUST-13 (4.3-6.4)**	**TBUST-14 (5-7.2)**	**TBUST-15 (6.4-7.6)**	**TBUST-16 (6.2-7.7)**	**TBUST-17 (4-6.7)**	**TBUST-18 (4-8)**	**TBUST-19 (4-6)**	**TBUST-20 (4-7)**	**TBUST-34 (4-6.8)**	**TBUST-21 (6-6.6)**	**TBUST-22 (4.8.-5.4)**	**TBUST-23 (8-8.7)**	**TBUST-29 (5.4-6.7)**	**TBUST-30 (4.9-6.6)**	**TBUST-31 (4.8-6.4)**
Date Sampled	4/14/05	4/14/05	4/27/05	4/27/05	4/14/05	4/27/05	4/14/05	4/14/05	5/9/05	5/3/05	5/3/05	4/28/05	5/5/05	5/5/05	5/4/05
VOC compound:															
Acetone	<10	<11	<520	<530	<12	**39.0**	<10	<11	<10	<490	<430	<510	<490	<540	<460
Benzene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	**6,300.0**	<240	<270	<230
Bromodichloromethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Bromoform	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Bromomethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
2-Butanone	<10	<11	<520	<530	<12	<11	<10	<11	<10	<490	<430	<510	<490	<540	<460
Carbon Disulfide	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Carbon Tetrachloride	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Chlorobenzene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Chloroethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Chloroform	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Chloromethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Isopropylbenzene (Cumene)	<5.1	<5.6	**1,000.0**	**1,200.0**	<6.0	**200.0**	<5.0	<5.3	<5.0	**3,400.0**	4,500.0	**5,100.0**	**3,800.0**	**4,400.0**	**5,900.0**
Dibromochloromethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,2-Dichlorobenzene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,3-Dichlorobenzene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,4-Dichlorobenzene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,1-Dichloroethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,2-Dichloroethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,1-Dichloroethene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
cis-1,2-Dichloroethene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
trans-1,2-Dichloroethene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,2-Dichloropropane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
cis-1,3-Dichoropropene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
trans-1,3-Dichloropropene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Ethylbenzene	<5.1	<5.6	**670.0**	**3,000.0**	<6.0	**430.0**	<5.0	<5.3	<5.0	**10,000.0**	120,000.0	**14,000.0**	**110,000.0**	**65,000.0**	**250,000.0**
2-Hexanone	<10	<11	<520	<530	<12	<11	<10	<11	<10	<490	<430	<510	<490	<540	<460
4-methyl-2-pentanone	<10	<11	<520	<530	<12	<11	<10	<11	<10	<490	<430	<510	<490	<540	<460
Methylene Chloride	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Styrene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,1,2,2-Tetrachloroethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Tetrachloroethene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Toluene	<5.1	<5.6	260.0	270.0	<6.0	5.4	<5.0	<5.3	<5.0	**2,300.0**	**15,000.0**	4,300.0	**12,000.0**	**2,500.0**	**660,000.0**
1,1,1-Trichloroethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
1,1,2-Trichloroethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Trichloroethene	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Trichlorofluoromethane	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Vinyl Chloride	<5.1	<5.6	<260	<270	<6.0	<5.4	<5.0	<5.3	<5.0	<240	<210	<250	<240	<270	<230
Xylenes (total)	<5.1	<5.6	**8,200.0**	**25,000.0**	<6.0	**1,827.0**	<5.0	<5.3	<5.0	**580,000.0**	**780,000.0**	**373,000.0**	**980,000.0**	**470,000.0**	**1,520,000.0**
Total VOCs	***ND***	***ND***	***10,130.0***	***29,470.0***	***ND***	***2,501.4***	***ND***	***ND***	***ND***	***595,700***	***919,500***	***402,700***	***1,105,800***	***541,900***	***2,435,900***
% CTEX			*100.0%*	*100.0%*		*98.4%*				*100.0%*	*100.0%*	*98.4%*	*100.0%*	*100.0%*	*100.0%*

Notes:
1. Soil samples not taken at UST Area test borings TBUST24 through -28, TBUST32 and -33, and TBUST35 and -43.
< = Below minimum laboratory reporting limit
ND = Non-Detect

PLANT NO. 5 EAST AREA INVESTIGATION
SOIL ANALYTICAL RESULTS - SHALLOW ZONE[(1)]

Essex/Hope SMAART Investigation
Jamestown, New York
Project No. 804041.21

SAMPLE ID	PZ-10D	PZ-11D	
DEPTH INTERVAL	11-12 ft	10.5-11.5 ft	11.5-12 ft
DATE / COMPOUND	02-Aug-00	02-Aug-00	02-Aug-00
Chloromethane	<6	<6	<6
Vinyl Chloride	<6	<6	<6
Bromomethane	<6	<6	<6
Chloroethane	<6	<6	<6
Trichlorofluoromethane	<6	<6	<6
Acetone	**19**	**43**	**7 J**
1,1-Dichloroethene	<6	<6	<6
Methylene Chloride	**8**	**11**	**10**
trans-1,2-Dichloroethene	<6	<6	<6
1,1-Dichloroethane	<6	<6	<6
2-Butanone	<11	<12	<11
Chloroform	<6	<6	<6
1,1,1-Trichloroethane	<6	<6	<6
Carbon Tetrachloride	<6	<6	<6
1,2-Dichloroethane	<6	<6	<6
Benzene	<6	<6	<6
Trichloroethene	<6	<6	<6
1,2-Dichloropropane	<6	<6	<6
Bromodichloromethane	<6	<6	<6
cis-1,3-Dichloropropene	<6	<6	<6
Toluene	<6	<6	<6
trans-1,3-Dichloropropene	<6	<6	<6
1,1,2-Trichloroethane	<6	<6	<6
Tetrachloroethene	<6	<6	<6
Dibromochloromethane	<6	<6	<6
Chlorobenzene	<6	<6	<6
Ethylbenzene	**120**	<6	<6
Xylenes (total)	**500 DJB**	**50 B**	**3 JB**
m,p-Xylenes	**350 DJB**	**48 B**	**3 JB**
o-Xylene	**190**	2 J	<6
Bromoform	<6	<6	<6
Isopropylbenzene	**43**	<6	<6
1,1,2,2-Tetrachloroethane	<6	<6	<6
1,3-Dichlorobenzene	<6	<6	<6
1,4-Dichlorobenzene	<6	<6	<6
1,2-Dichlorobenzene	<6	<6	<6

Notes:
1. Samples from PZ-11D are considered shallow zone based on elevation; no confining clay was encountered at this location.
2. Units are ug/kg.
3. [B] indicates constituent was detected in the associated method/trip blank
4. [J] indicates constituent was detected but below laboratory quantitation limits.
5. [D] indicates dilute analysis, see laboratory reports for dilution factors.

Table 3-2
Groundwater Analytical Results- Shallow Zone
Volatile Organics
UST Area and Vinyl Chloride Groundwater Investigations
Samples taken December 16-22, 2003

SAMPLE ID:	GP-2S	GP-3S	HW-6	HW-9	MW-13	MW-20	MW-23S	MW-24S	PZ-5S	RW-5S
DATE SAMPLED:	18-Dec-03	18-Dec-03	18-Dec-03	18-Dec-03	18-Dec-03	18-Dec-03	17-Dec-03	17-Dec-03	22-Dec-03	18-Dec-03
COMPOUND										
Acetone					12	31				
Benzene										
Bromodichloromethane										
Bromoform										
Bromomethane										
2-Butanone										
Carbon Disulfide										
Carbon Tetrachloride										
Chlorobenzene										
Chloroethane										
Chloroform										
Chloromethane										
Cumene			43			340	57	97		
Dibromochloromethane										
1,2-Dichlorobenzene										
1,3-Dichlorobenzene										
1,4-Dichlorobenzene										
1,1-Dichloroethane										
1,2-Dichloroethane										
1,1-Dichloroethene			9.6							
cis-1,2-Dichloroethene			2900		5	5		5		
trans-1,2-Dichloroethene			24							
1,2-Dichloropropane										
cis-1,3-Dichloropropene										
trans-1,3-Dichloropropene										
Ethylbenzene			12			2600	400	1000		
2-Hexanone										
4-Methyl-2-pentanone						14				
Methylene chloride										
Styrene										
1,1,2,2-Tetrachloroethane										
Tetrachloroethene										
Toluene						1700				
1,1,1-Trichloroethane										
1,1,2-Trichloroethane										
Trichloroethene			110		22	7.5		29		
Trichlorofluoromethane										
Vinyl chloride			1400			170				
m,p-Xylene			87	8.1	7.3	20000	1700	6500	8.3	
o-Xylene			13			50	350	77		
Total VOCs	*0*	*0*	*4599*	*8.1*	*46.3*	*24918*	*2507*	*7708*	*8.3*	*0.0*
Total CTEX (note 3)	*0*	*0*	*155*	*8.1*	*7.3*	*24690*	*2507*	*7674*	*8.3*	*0.0*
CTEX/Total VOCs, %	*#DIV/0!*	*#DIV/0!*	*3*	*100*	*16*	*99.1*	*100.00*	*99.6*	*100*	*#DIV/0!*

Note:
1. All units are ug/L
2. Blank entry indicates below analytical detection limits
3. C= cumene, T= toluene, E= ethylbenzene, X= total xylenes

Table 3-2
UST Area Shallow Groundwater
VOCs Analytical Results (ug/l)
2005-2006

Sample ID	TBUST-1 (4-5)	TBUST-1 (6.5-8)	TBUST-2 (4-4.5)	TBUST-4 (4-5)	TBUST-5 (4-6.2)	TBUST-6 (5.4-7.3)	TBUST-6 (8-10.1)	TBUST-7 (8-8.9)	TBUST-7 (8.9-10.5)	TBUST-8 (6-6.5)	TBUST-9 (6.7-8.9)	TBUST-9 (14-15)	TBUST-10 (5.3-7)	TBUST-11 (9.2-11.4)	TBUST-12 (8-10)	TBUST-13 (14-16)	TBUST-14 (15-17)
Date Sampled	**11/3/03**	**11/3/03**	**11/3/03**	**11/3/03**	**11/3/03**	**11/3/03**	**11/4/03**	**11/3/03**	**11/3/03**	**11/5/03**	**11/5/03**	**11/5/03**	**11/5/03**	**11/3/03**	**11/3/03**	**4/22/05**	**4/22/05**
VOC compound:																	
Acetone	**89.0**	<10	**26.0**	**37.0**	**38.0**	**57.0**	<10	<10	<10	**28.0**	<10	**1,300.0**	<10	<10	<10	<10	**11.0**
Benzene	<1.0	<1.0	**7.9**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone	**11.0**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**11.0**	<10	<10	<10	<10	<10
Carbon Disulfide	<5.0	<5.0	**8.8**	<5.0	**9.7**	**18.0**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon Tetrachloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Isopropylbenzene (Cumene)	5.0	**1,900.0**	5.0	5.0	5.0	5.0	**6,100.0**	5.0	**380.0**	**2,100.0**	**3,700.0**	**6,100.0**	5.0	**1,200.0**	5.0	**6.3**	5.0
Dibromochloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichoropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	**25.0**	**14,000.0**	**28.0**	5.0	**63.0**	**6.6**	**15,000.0**	5.0	**980.0**	**18,000.0**	**40,000.0**	**160,000.0**	**1,100.0**	**8,000.0**	5.0	5.0	5.0
2-Hexanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrachloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene	**6.6**	**800.0**	**22.0**	**6.3**	**13.0**	5.0	5.0	5.0	5.0	**190.0**	**3,300.0**	**26,000.0**	5.0	5.0	5.0	5.0	5.0
1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Xylenes (total)	163.0	**470,000.0**	**130.0**	**9.3**	**284.0**	**26.0**	72,700.0	<5.0	**2,900**	**206,000**	**500,000**	**810,000**	**8,600**	35,000	**530.0**	5.0	5.0
Total VOCs	***299.6***	***486,700.0***	***227.7***	***62.6***	***412.7***	***117.6***	***93,805.0***	***ND***	***4,265***	***226,318***	***547,000***	***1,003,411***	***9,710***	***44,205***	***545.0***	***21.3***	***31.0***
% CTEX	*66.6%*	*100.0%*	*81.2%*	*40.9%*	*88.4%*	*36.2%*	*100.0%*		*100.0%*	*100.0%*	*100.0%*	*99.9%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*64.5%*

Table 3-2
UST Area Shallow Groundwater
VOCs Analytical Results (ug/l)
2005-2006

Sample ID	TBUST-15 (13-15)	TBUST-16 (12-14)	TBUST-17 (16-18)	TBUST-18 (16-18)	TBUST-19 (19-21)	TBUST-20 (16-18)	TBUST-21 (9-11)	TBUST-22 (9-11)	TBUST-23 (7-9)	TBUST-24 (8-12)	TBUST-25 (10-12)	TBUST-26 (9-11)	TBUST-27 (8-10)	TBUST-28 (7-9)	TBUST-29 (9-11)	TBUST-30 (8-9)	TBUST-31 (8-10)
Date Sampled	4/27/05	4/27/05	4/15/05	4/27/05	4/15/05	4/18/05	5/3/05	5/3/05	4/28/05	5/3/05	5/2/05	5/2/05	5/2/05	5/3/05	5/5/05	5/5/05	5/4/05
VOC compound:																	
Acetone	<10	<10	<10	<10	<10	<10	<10	<10	180.0	<10	<10	<10	<10	<10	<10	23.0	<10
Benzene	1.1	1.0	<1.0	<1.0	<1.0	<1.0	55.0	120.0	21,000.0	<1.0	2.4	<1.0	1.2	1.2	27.0	10.0	9.4
Bromodichloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon Tetrachloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	18.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Isopropylbenzene (Cumene)	210.0	140.0	250.0	120.0	180.0	190.0	320.0	320.0	310.0	5.0	59.0	5.0	5.0	130.0	180.0	320.0	220.0
Dibromochloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichoropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	54.0	<5.0
trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	880.0	550.0	1,700.0	550.0	190.0	1,600.0	17,000.0	21,000.0	2,100.0	31.0	890.0	5.0	5.0	5,900.0	11,000.0	16,000.0	9,800.0
2-Hexanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone	<10	<10	<10	<10	<10	<10	31.0	18.0	100.0	<10	<10	<10	<10	<10	29.0	25.0	<10
Methylene Chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrachloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene	5.0	5.0	16.0	5.0	5.0	5.0	6,500.0	12,000.0	2,800.0	6.2	21.0	<5.0	5.0	1,300.0	6,700.0	3,000.0	34,000.0
1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Xylenes (total)	1,848	2,100	6,190	2,406	2,400	9,727	107,000	134,000	34,000	289.0	3,790.0	<5.0	5.0	39,200	95,000	96,000	66,000
Total VOCs	*2,944*	*2,796*	*8,156*	*3,081*	*2,775*	*11,522*	*130,906*	*167,458*	*60,508*	*331.2*	*4,762.4*	*ND*	*21.2*	*46,531*	*112,936*	*115,432*	*110,029*
% CTEX	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*99.9%*	*99.9%*	*64.8%*	*100.0%*	*99.9%*		*94.3%*	*100.0%*	*100.0%*	*99.9%*	*100.0%*

Table 3-2
UST Area Shallow Groundwater
VOCs Analytical Results (ug/l)
2005-2006

Sample ID	TBUST-32 (9-10)	TBUST-33 (9-11)	TBUST-34 (10-12)	TBUST-35 (11-13)	TBUST-36 (14-16)	TBUST-37	TBUST-38	TBUST-39	TBUST-40	TBUST-41	TBUST-42	TBUST-43
Date Sampled	5/10/05	5/9/05	5/9/05	5/9/05	5/13/05	12/9/05	12/9/05	12/13/05	12/21/05	1/17/06	1/17/06	1/18/06
VOC compound:												
Acetone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**12.0**
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon Disulfide	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon Tetrachloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Isopropylbenzene (Cumene)	5.0	**370.0**	5.0	5.0	**6.5**	5.0	**76.0**	**6.4**	5.0	5.0	5.0	5.0
Dibromochloromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichoropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	5.0	**8,200.0**	5.0	5.0	**69.0**	5.0	**7.0**	5.0	5.0	5.0	5.0	5.0
2-Hexanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Tetrachloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Toluene	<5.0	5.0	<5.0	<5.0	5.0	<5.0	5.0	5.0	<5.0	<5.0	<5.0	5.0
1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Xylenes (total)	<5.0	**31,000**	<5.0	<5.0	**680.0**	<5.0	**19.0**	5.0	<5.0	<5.0	<5.0	5.0
Total VOCs	***ND***	***39,575***	***ND***	***ND***	***760.5***	***ND***	***108.1***	***21.4***	***ND***	***ND***	***ND***	***32.0***
% CTEX		*100.0%*			*100.0%*		*99.0%*	*100.0%*				*62.5%*

PLANT NO. 5 EAST AREA INVESTIGATION
GROUNDWATER ANALYTICAL RESULTS-SHALLOW ZONE

Essex/Hope SMAART Investigation
Jamestown, New York
Project No. 804041.21

SAMPLE ID	PZ-5S	PZ-6S	TRIP BLANK
DATE	8/17/00	8/17/00	8/17/00
COMPOUND			
Chloromethane	<1	<1	<1
Vinyl Chloride	<1	<1	<1
Bromomethane	<1	<1	<1
Chloroethane	<1	<1	<1
Trichlorofluoromethane	<1	<1	<1
Acetone	<5	<5	<5
1,1-Dichloroethene	<1	<1	<1
Methylene Chloride	15 B	15 B	13 B
trans-1,2-Dichloroethene	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1
2-Butanone	<5	<5	<5
Chloroform	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1
Carbon Tetrachloride	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1
Benzene	<1	<1	<1
Trichloroethene	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1
Bromodichloromethane	<1	<1	<1
cis-1,3-Dichloropropene	<1	<1	<1
Toluene	**7**	<1	<1
trans-1,3-Dichloropropene	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1
Tetrachloroethene	<1	<1	<1
Dibromochloromethane	<1	<1	<1
Chlorobenzene	<1	<1	<1
Ethylbenzene	**33**	**3**	<1
Xylenes (total)	**69**	**7**	<3
m,p-Xylenes	**68**	**7**	<2
o-Xylene	<1	<1	<1
Bromoform	<1	<1	<1
Isopropylbenzene	**7**	**10**	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1
1,3-Dichlorobenzene	<1	<1	<1
1,4-Dichlorobenzene	<1	<1	<1
1,2-Dichlorobenzene	<1	<1	<1

Note:
1. All units are ug/L
2. B indicates constituent was detected in the associated method/trip blank

Table 3-3
MW-26S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011	12/5/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	441	10.8	ND
Bromomethane	ND	11.4	ND	ND
2-Butanone (MEK)	ND	55.2	ND	ND
Chloromethane	ND	27.7	ND	ND
Ethylbenzene	398	340	221	290
Isopropylbenzene (Cumene)	225	129	107	ND
4-Methyl-2-Pentanone (MIBK)	ND	ND	ND	18.8
Xylenes	1,410	1,250	385	401
Inorganics				
Iron, Total	18,200	282,000	133,000	103,000
Iron, Ferric	9,200	280,000	47,100	39,000
Iron, Ferrous	9,000	2,100	86,300	64,300
TPH	ND	ND	ND	ND
Alkalinity	208,000	26,000	88,000	109,000
Sulfide	1,000	ND	ND	ND
Sulfate	ND	4,140,000	1,090,000	1,130,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.41	5.27	6.23	6.30
Temperature (°C)	14.31	13.35	7.84	11.01
Conductivity (mS/cm)	0.340	5.314	1.322	1.500
Dissolved Oxygen (mg/L)	0.24	0.33	0.87	0.70
ORP (mV)	-59.0	74.1	-100.1	-53.4

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

Injection activities were conducted between November 8 and 18, 2011.

Table 3-4
MW-27S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (μg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011	12/5/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	392	ND	ND
2-Butanone (MEK)	ND	48.8	ND	ND
Ethylbenzene	ND	201	358	313
Isopropylbenzene (Cumene)	24.7	133	134	106
4-Methyl-2-Pentanone (MIBK)	ND	ND	ND	14.2
Xylenes	ND	496	425	236
Inorganics				
Iron, Total	20,300	404,000	116,000	47,700
Iron, Ferric	13,900	402,000	22,500	23,400
Iron, Ferrous	6,400	2,500	93,000	24,200
TPH	ND	ND	ND	ND
Alkalinity	122,000	38,000	110,000	113,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	2,800,000	1,060,000	489,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.22	5.51	6.10	5.99
Temperature (°C)	15.70	14.71	10.08	11.78
Conductivity (mS/cm)	0.235	3.815	1.342	0.843
Dissolved Oxygen (mg/L)	0.30	0.32	1.08	1.68
ORP (mV)	-163.5	-21.5	-106.9	-11.1

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

Injection activities were conducted between November 8 and 18, 2011.

Table 3-5
MW-28S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011	12/5/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	69.5	ND	ND
2-Butanone (MEK)	ND	12.3	ND	ND
Ethylbenzene	1,490	296	93.8	96.5
Isopropylbenzene (Cumene)	316	190	103	69.9
Toluene	ND	8.0	ND	ND
Xylenes	5,480	609	73.7	33.5
Inorganics				
Iron, Total	33,000	184,000	98,000	48,700
Iron, Ferric	21,000	181,000	34,800	23,200
Iron, Ferrous	11,900	2,900	63,200	25,500
TPH	ND	ND	ND	ND
Alkalinity	208,000	110,000	178,000	160,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	1,260,000	454,000	311,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.28	6.01	6.29	6.06
Temperature (°C)	15.38	14.09	10.14	11.40
Conductivity (mS/cm)	0.360	2.076	0.857	0.614
Dissolved Oxygen (mg/L)	0.19	0.46	2.70	0.70
ORP (mV)	-31.5	-9.6	-88.4	0.60

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

Injection activities were conducted between November 8 and 18, 2011.

Table 3-6
MW-13 - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline*	Round 1	Round 2	Round 3
	11/2/2011	12/1/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	381	ND	10.0
Benzene	ND	3.3	ND	ND
2-Butanone (MEK)	ND	30.0	ND	ND
Carbon Disulfide	ND	11.1	ND	ND
Chloromethane	ND	64.8	ND	ND
Ethylbenzene	ND	15.7	ND	ND
Xylenes	ND	88.9	ND	ND
Inorganics				
Iron, Total	9,930	2,890,000	105,000	28,500
Iron, Ferric	6,100	2,890,000	3,800	14,900
Iron, Ferrous	3,800	260	101,000	13,600
TPH	ND	ND	ND	ND
Alkalinity	110,000	200,000	178,000	90,600
Sulfide	ND	ND	ND	ND
Sulfate	65,500	6,450,000	1,100,000	317,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.14	5.58	5.73	5.96
Temperature (°C)	14.45	14.46	12.18	14.24
Conductivity (mS/cm)	0.717	9.448	1.445	0.455
Dissolved Oxygen (mg/L)	0.98	0.67	0.36	0.51
ORP (mV)	11.5	37.5	-49.6	-22.1

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 6/30/11.

Injection activities were conducted between November 8 and 18, 2011.

Table 3-7
MW-20 - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (μg/L)			
	Baseline*	Round 1	Round 2	Round 3
	11/3/2011	12/5/2011	3/14/2012	6/12/2012
VOCs				
cis-1,2-Dichloroethene	403	17.5	5.5	ND
Ethylbenzene	ND	ND	990	482
Isopropylbenzene (Cumene)	ND	ND	83.5	71.0
Toluene	ND	ND	607	ND
Trichloroethene	79.0	6.2	ND	ND
Vinyl Chloride	5.1	ND	ND	ND
Xylenes	ND	12.1	6,290	735
Inorganics				
Iron, Total	16,300	88,700	63,800	22,100
Iron, Ferric	10,000	25,800	16,900	8,200
Iron, Ferrous	6,300	63,000	46,900	13,900
TPH	ND	ND	ND	ND
Alkalinity	82,000	20,000	114,000	154,000
Sulfide	ND	ND	ND	ND
Sulfate	14,100	620,000	680,000	232,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.42	6.29	6.26	5.74
Temperature (°C)	15.19	14.38	12.20	13.73
Conductivity (mS/cm)	0.245	1.036	1.057	0.553
Dissolved Oxygen (mg/L)	0.58	0.51	1.27	1.38
ORP (mV)	-42.5	-40.4	-95.0	-24.8

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 9/21/11.

Injection activities were conducted between November 8 and 18, 2011.

Table 3-8
MW-23S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (μg/L)			
	Baseline*	Round 1	Round 2	Round 3
	11/2/2011	12/1/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	1,200	216	64.0
Benzene	ND	3.1	ND	ND
Bromomethane	ND	31.0	5.9	ND
2-Butanone (MEK)	ND	94.9	19.0	ND
Carbon Disulfide	ND	136	14.9	ND
Chloroethane	ND	12.6	ND	ND
Chloromethane	ND	394	82.3	9.7
Ethylbenzene	15.9	38.7	7.8	33.5
Isopropylbenzene (Cumene)	57.5	12.2	1.8	8.2
Xylenes	32.7	198.9	ND	45.5
Inorganics				
Iron, Total	15,800	1,360,000	67,700	100,000
Iron, Ferric	14,400	1,360,000	16,300	ND
Iron, Ferrous	1,500	2,000	51,400	108,000
TPH	ND	ND	ND	ND
Alkalinity	304,000	ND	ND	54,000
Sulfide	ND	ND	ND	ND
Sulfate	14,800	12,900,000	6,040,000	4,390,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.64	2.59	3.29	5.07
Temperature (°C)	12.94	16.71	8.98	13.62
Conductivity (mS/cm)	0.649	20.56	5.673	4.924
Dissolved Oxygen (mg/L)	0.56	1.62	1.11	0.25
ORP (mV)	-60.4	442.3	466.3	104.2

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 6/30/11.

Injection activities were conducted between November 8 and 18, 2011.

Table 3-9
MW-24S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter(1)	Groundwater Analytical Results(1) - (μg/L)			
	Baseline*	Round 1	Round 2	Round 3
	11/2/2011	12/1/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	1,300	116	24.7
Benzene	ND	3.9	1.1	ND
Bromomethane	ND	77.5	ND	ND
2-Butanone (MEK)	ND	115	ND	ND
Carbon Disulfide	ND	294	5.1	ND
Chloroethane	ND	6.9	ND	ND
Chloromethane	ND	377	ND	ND
Ethylbenzene	94.1	450	2,040	1,900
Isopropylbenzene (Cumene)	229	51.3	164	201
4-Methyl-2-Pentanone (MIBK)	ND	10.1	ND	ND
Toluene	ND	11.0	10.1	8.7
Xylenes	1,465	3,008	6,595	5,176
Inorganics				
Iron, Total	12,700	844,000	221,000	131,000
Iron, Ferric	7,700	842,000	218,000	ND
Iron, Ferrous	5,000	1,600	ND	144,000
TPH	ND	ND	ND	ND
Alkalinity	236,000	ND	632,000	126,000
Sulfide	1,000	ND	ND	ND
Sulfate	ND	13,300,000	3,390,000	1,760,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.58	2.72	5.24	5.56
Temperature (°C)	12.94	17.61	11.02	13.66
Conductivity (mS/cm)	0.414	18.51	3.301	2.404
Dissolved Oxygen (mg/L)	0.37	0.38	0.63	0.17
ORP (mV)	-51.5	412.7	-6.0	4.9

Notes:
1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.
NA = Not Analyzed
ND = Non Detect
*VOCs and Water Quality Data were collected on 6/30/11.

Injection activities were conducted between November 8 and 18, 2011.

Table 3-10
MW-29S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011	12/1/2011	3/13/2012	6/13/2012
VOCs				
Acetone	26.5	5,360	1,360	531
Benzene	135	7.5	85.5	24.1
Bromomethane	ND	334	16.5	ND
2-Butanone (MEK)	ND	191	109	50.2
Carbon Disulfide	ND	136	46.8	ND
Chloroethane	ND	45.5	16.8	ND
Chloromethane	ND	2,730	665	144
1,1-Dichloroethane	ND	6.0	ND	ND
Ethylbenzene	8,700	3,660	12,500	11,900
2-Hexanone	ND	10.5	21.3	ND
Isopropylbenzene (Cumene)	325	113	218	275
Methylene Chloride	ND	8.3	ND	ND
4-Methyl-2-Pentanone (MIBK)	45.2	ND	45.8	ND
Styrene	ND	101	ND	466
Toluene	ND	ND	3,350	3,480
Xylenes	52,900	22,950	71,000	69,900
Inorganics				
Iron, Total	8,260	643,000	710,000	372,000
Iron, Ferric	5,400	641,000	708,000	370,000
Iron, Ferrous	2,900	2,300	1,700	2,100
TPH	ND	ND	ND	ND
Alkalinity	358,000	ND	ND	37,000
Sulfide	ND	1,200	ND	3,200
Sulfate	ND	18,100,000	12,200,000	6,400,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.31	2.50	4.13	4.75
Temperature (°C)	15.53	18.62	11.36	13.74
Conductivity (mS/cm)	0.945	27.98	10.031	8.057
Dissolved Oxygen (mg/L)	0.24	0.24	0.71	0.24
ORP (mV)	-8.0	475.9	219.3	175.8

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

Injection activities were conducted between November 8 and 18, 2011.

Table 3-11
HW-9 - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (μg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011	12/5/2011	3/13/2012	6/13/2012
VOCs				
Acetone	ND	10.3	ND	ND
Ethylbenzene	ND	ND	48.9	84.1
Isopropylbenzene (Cumene)	18.7	13.6	26.5	40.0
Xylenes	ND	ND	58.1	6.4
Inorganics				
Iron, Total	11,300	29,600	177,000	153,000
Iron, Ferric	7,200	7,300	29,200	31,400
Iron, Ferrous	4,100	22,300	147,000	122,000
TPH	ND	ND	ND	ND
Alkalinity	166,000	110,000	138,000	135,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	298,000	2,190,000	2,140,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.21	6.06	5.98	6.04
Temperature (°C)	13.35	12.06	8.68	10.32
Conductivity (mS/cm)	0.277	0.678	2.385	2.243
Dissolved Oxygen (mg/L)	1.61	0.70	2.43	1.63
ORP (mV)	29.7	31.5	-62.9	-4.0

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

Injection activities were conducted between November 8 and 18, 2011.

Table 3-12
PZ-5S - UST Area ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline*	Round 1	Round 2	Round 3
	11/2/2011	12/5/2011	3/14/2012	6/12/2012
VOCs				
Acetone	ND	162	ND	ND
Carbon Disulfide	ND	8.8	ND	ND
Chloromethane	ND	13.0	ND	ND
Ethylbenzene	20.4	11.8	54.2	45.5
Isopropylbenzene (Cumene)	4.4	5.7	18.9	27.4
Xylenes	125	7.6	71.1	53.9
Inorganics				
Iron, Total	3,170	105,000	94,900	70,300
Iron, Ferric	800	54,100	ND	27,800
Iron, Ferrous	2,400	51,200	95,800	42,500
TPH	ND	ND	ND	ND
Alkalinity	68,000	ND	82,000	90,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	2,710,000	52,800	1,020,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.65	5.30	5.91	5.74
Temperature (°C)	12.65	12.56	9.62	12.95
Conductivity (mS/cm)	0.145	3.760	1.983	1.439
Dissolved Oxygen (mg/L)	0.96	0.21	1.46	1.33
ORP (mV)	-10.4	82.8	-79.9	-42.5

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 6/30/11.

Injection activities were conducted between November 8 and 18, 2011.

Table 3-13
MW-19D - Acetone Plume ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011*	12/1/2011	3/14/2012	6/12/2012
VOCs				
Acetone	2,870	16,400	1,190	28.5
Benzene	ND	2.9	ND	ND
2-Butanone (MEK)	17.5	64.4	ND	ND
Vinyl Chloride	130	48.3	19.6	18.3
Inorganics				
Iron, Total	455,000	417,000	1,030,000	203,000
Iron, Ferric	446,000	411,000	1,030,000	197,000
Iron, Ferrous	8,800	6,200	6,300	6,000
TPH	NA	NA	NA	NA
Alkalinity	630,000	620,000	586,000	595,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	ND	ND	ND
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.94	6.53	6.53	6.35
Temperature (°C)	12.15	12.75	12.71	12.67
Conductivity (mS/cm)	0.605	0.800	0.768	0.835
Dissolved Oxygen (mg/L)	0.96	0.22	0.72	2.76
ORP (mV)	-87.0	-53.8	-162.0	-93.2

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 10/3/11.

Injection activities were conducted between November 17 and 18, 2011.

Table 3-14
MW-21D - Acetone Plume ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/3/2011*	12/1/2011	3/14/2012	6/12/2012
VOCs				
Acetone	65,100	232,000	338,000	421,000
Benzene	73.8	55.7	67.7	77.6
2-Butanone (MEK)	582[E]	151	1,390	ND
1,1-Dichloroethene	593[E]	202	158	163
cis-1,2-Dichloroethene	185,000	76,200	120,000	115,000
trans-1,2-Dichloroethene	3,600	1,080	ND	ND
4-Methyl-2-Pentanone (MIBK)	ND	ND	ND	11.4
Toluene	26.6	ND	5.5	ND
Trichloroethene	30,000	2,050	2,390	1,570
Vinyl Chloride	36,200	30,700	39,200	37,400
Xylenes	ND	11.5	ND	ND
Inorganics				
Iron, Total	27,800	25,200	22,200	25,600
Iron, Ferric	22,500	19,200	10,900	15,400
Iron, Ferrous	5,300	6,000	11,400	10,200
TPH	NA	NA	NA	NA
Alkalinity	562,000	652,000	176,000	700,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	ND	ND	ND
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.49	6.68	6.50	6.44
Temperature (°C)	11.59	12.55	12.42	12.71
Conductivity (mS/cm)	1.151	1.337	1.239	1.360
Dissolved Oxygen (mg/L)	0.54	0.56	0.86	0.97
ORP (mV)	-33.1	-64.3	-75.9	-60.5

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 9/21/11.

E = Analyte concentration exceeded the calibration range. The reported result is estimated.

Injection activities were conducted between November 17 and 18, 2011.

Table 3-15
MW-22D - Acetone Plume ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (μg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/3/2011*	12/1/2011	3/14/2012	6/12/2012
VOCs				
Acetone	ND	25.0	23.4	12.0
Benzene	2.2	4.4	1.2	ND
1,1-Dichloroethene	9.0	ND	ND	ND
cis-1,2-Dichloroethene	1,010	772	547	323
trans-1,2-Dichloroethene	8.7	31.1	12.9	ND
Trichloroethene	4,890	5,010	2,960	2,010
Vinyl Chloride	24.3	ND	9.9	5.6
Inorganics				
Iron, Total	5,110	942	247	242
Iron, Ferric	5,100	450	180	210
Iron, Ferrous	ND	490	ND	ND
TPH	NA	NA	NA	NA
Alkalinity	130,000	110,000	108,000	96,000
Sulfide	ND	ND	ND	ND
Sulfate	24,100	723,000	2,040,000	1,760,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.42	6.11	5.64	5.31
Temperature (°C)	10.93	12.07	11.94	11.74
Conductivity (mS/cm)	0.387	1.865	2.586	2.746
Dissolved Oxygen (mg/L)	0.59	1.34	1.02	8.76
ORP (mV)	85.3	82.0	-50.9	66.4

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*VOCs and Water Quality Data were collected on 9/21/11.

Injection activities were conducted between November 17 and 18, 2011.

Table 3-16
RW-6D - Acetone Plume ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (µg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/2/2011*	12/1/2011	3/20/2012	6/12/2012
VOCs				
Acetone	36,000	29,500	2,390	20,600
Benzene	36.7	21.7	25.2	23.9
2-Butanone (MEK)	192	147	40.2	259
1,1-Dichloroethene	53.0	120	42.4	28.9
cis-1,2-Dichloroethene	24,200	15,000	19,800	16,700
trans-1,2-Dichloroethene	297	137	317	181
Trichloroethene	3,510	6,570	3,560	3,900
Vinyl Chloride	2,990	2,470	2,650	3,390
Inorganics				
Iron, Total	7,350	13,000	5,320	11,900
Iron, Ferric	6,300	12,300	4,200	8,900
Iron, Ferrous	1,000	720	1,200	2,900
TPH	NA	NA	NA	NA
Alkalinity	354,000	370,000	358,000	477,000
Sulfide	ND	ND	ND	ND
Sulfate	ND	21,600	ND	ND
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.76	6.70	6.76	6.69
Temperature (°C)	12.82	11.93	10.55	17.09
Conductivity (mS/cm)	0.565	0.636	0.531	0.844
Dissolved Oxygen (mg/L)	0.15	0.27	0.40	0.50
ORP (mV)	-69.9	-118.7	-104.0	-130.4

Notes:
1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.
NA = Not Analyzed
ND = Non Detect
*VOCs were collected on 9/22/11.

Injection activities were conducted between November 17 and 18, 2011.

Table 3-17
PZ-6D - Acetone Plume ISCO
Monitoring Well Groundwater Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Groundwater Analytical Results[1] - (μg/L)			
	Baseline	Round 1	Round 2	Round 3
	11/3/2011	12/5/2011*	3/14/2012	6/12/2012
VOCs				
Acetone	ND	843,000	407,000	460,000
2-Butanone (MEK)	2,030	ND	1,850	ND
Carbon Disulfide	ND	68.4	ND	ND
Chloromethane	ND	8.7	ND	ND
cis-1,2-Dichloroethene	ND	ND	25.0	ND
4-Methyl-2-Pentanone (MIBK)	32.8	50.7	18.2	31.0
Vinyl Chloride	13.3	7.6	38.4	10.6
Inorganics				
Iron, Total	594,000	231,000	862,000	766,000
Iron, Ferric	588,000	230,000	852,000	761,000
Iron, Ferrous	5,100	550	10,000	5,300
TPH	NA	NA	NA	NA
Alkalinity	84,000	1,600,000	796,000	841,000
Sulfide	ND	1,000	ND	ND
Sulfate	ND	11,700,000	1,770,000	538,000
Parameter	**Water Quality Data - Field Measured - (units noted)**			
pH	6.60	NA	6.62	6.60
Temperature (°C)	11.90	NA	12.39	13.25
Conductivity (mS/cm)	0.383	NA	1.287	1.424
Dissolved Oxygen (mg/L)	0.23	NA	1.58	0.33
ORP (mV)	-50.7	NA	-240.3	-209.9

Notes:

1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.

NA = Not Analyzed

ND = Non Detect

*Water Quality Data not collected due to heavy silt blockage in meter flow thru cell and tubing.

Injection activities were conducted between November 17 and 18, 2011.

Table 4-1
Post-Treatment Test Borings - UST Area ISCO
Soil Analyses Summary
Essex/Hope Site
Jamestown, NY

Chemical Parameter[1]	Soil Analytical Results[1] - (μg/kg)													
	TBUST-100	TBUST-101	TBUST-102	TBUST-103	TBUST-104	TBUST-105	TBUST-106	TBUST-107	TBUST-108	TBUST-109	TBUST-110	TBUST-111	TBUST-112	TBUST-113
	8/16/2012	8/16/2012	8/16/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012	8/15/2012
VOCs														
Acetone	ND	145	ND	ND	26.6	157	39.1	13.7	ND	133	222	59.8	245	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	88.0	ND
2-Butanone (MEK)	ND	18.4	ND	ND	ND	18.7	ND	ND	ND	ND	15.2	ND	17.7	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	12.6	ND	16.1	ND	ND	54.7	ND	50.5	74.2	ND
Isopropylbenzene (Cumene)	ND	68.3	ND	ND	ND	56.1	ND	ND	ND	9.3	ND	11.6	95.7	ND
Methylene Chloride	ND	ND	3.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	20.9	ND	ND	ND	19.1	ND	10.6	ND	ND
Xylenes (total)	ND	5.9	ND	ND	82.0	ND	220	ND	ND	425	17.1	318	967	ND
TPH	1,070,000	208,000	220,000	206,000	2,790,000	224,000	506,000	213,000	293,000	175,000	127,000	252,000	993,000	316,000

Notes:
1. Data summary for VOCs presents only parameters detected above laboratory MDLs, all others ND.
NA = Not Analyzed
ND = Non Detect
Samples were collected from the 4' to 8' interval.

Injection activities were conducted between November 8 and 18, 2011.

FIGURES

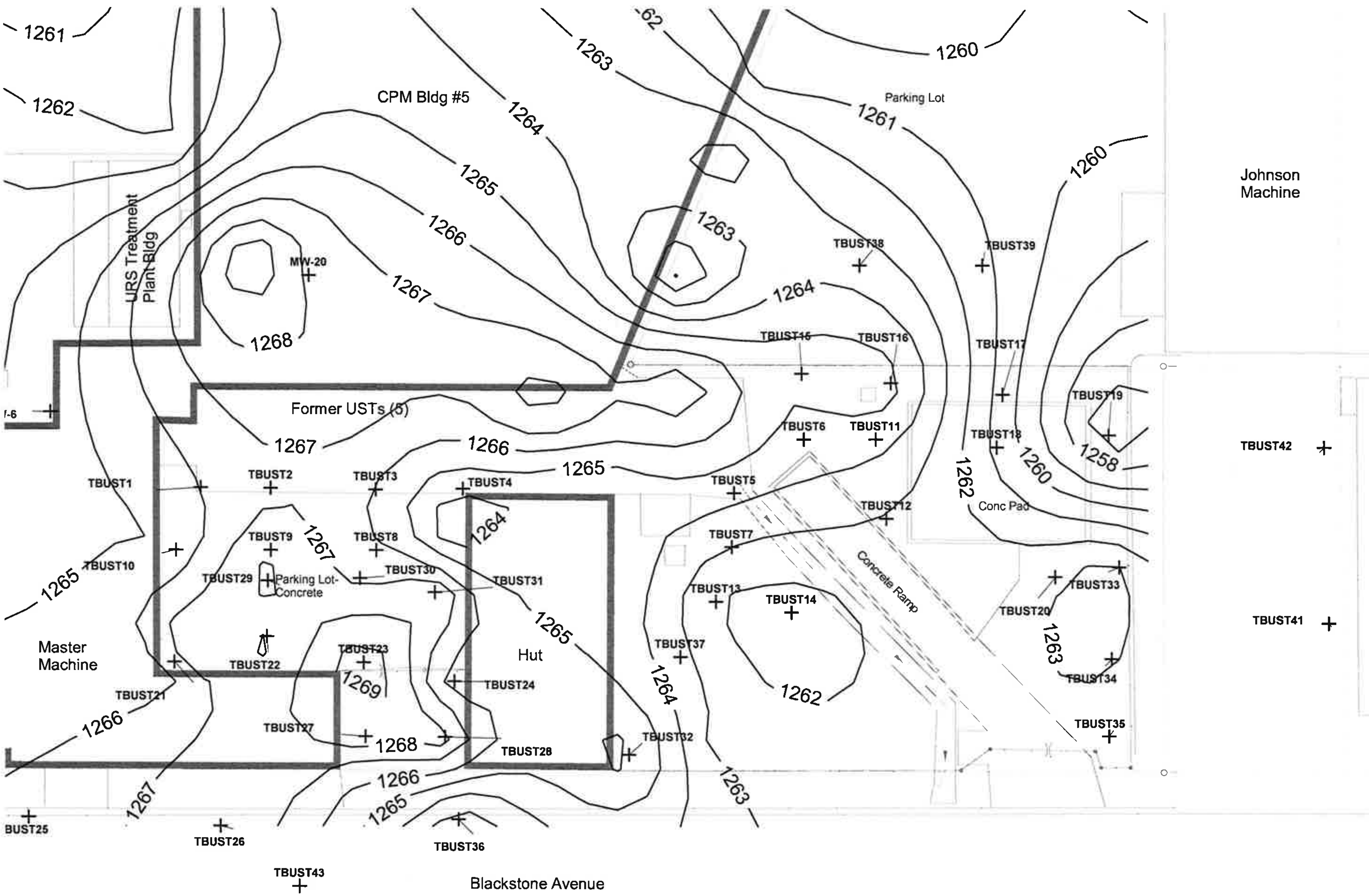


Figure 2-1- Upper Semi-Confining Layer Elevation

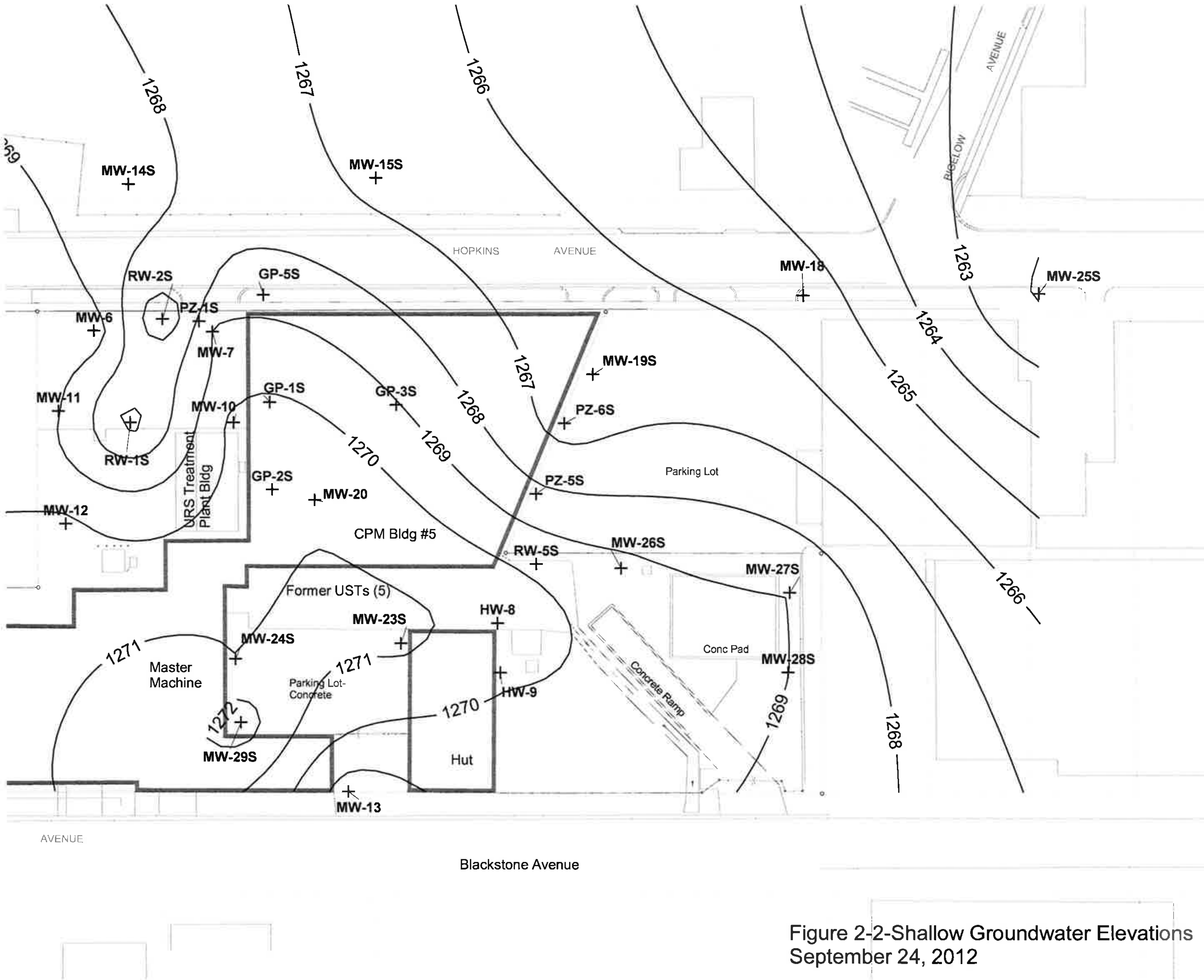


Figure 2-2-Shallow Groundwater Elevations
September 24, 2012

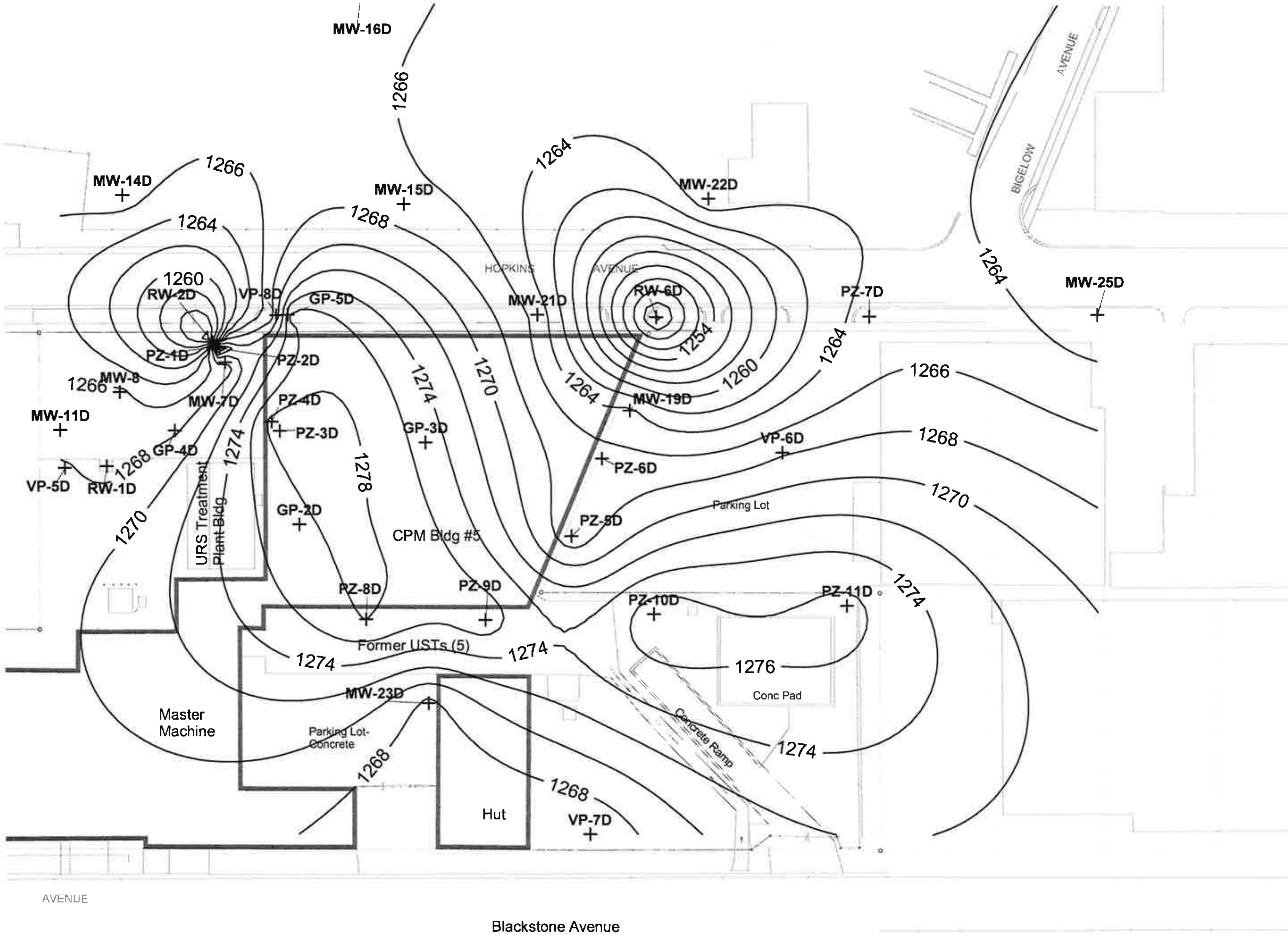
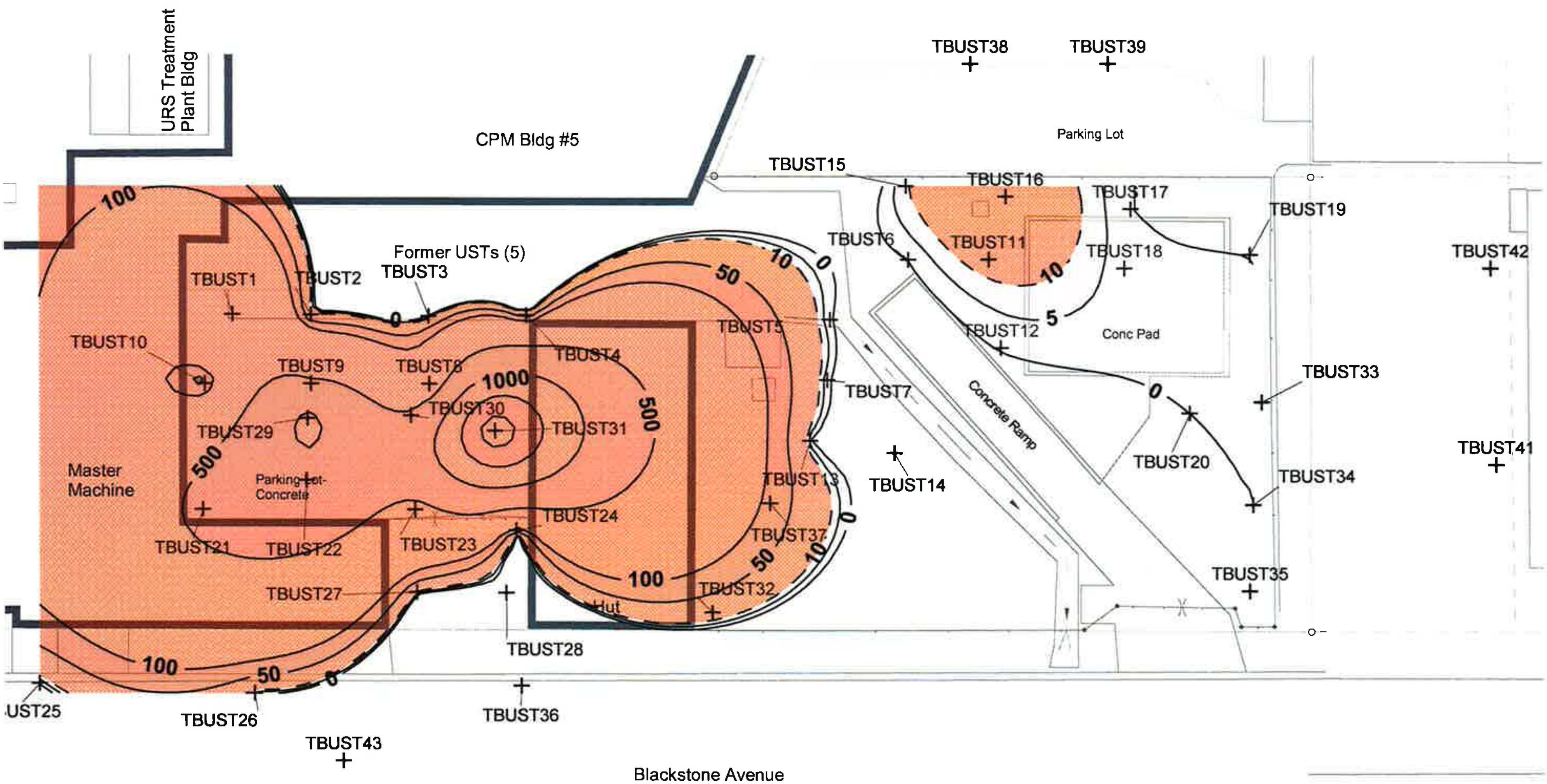


Figure 2-3- Deep Groundwater Elevations
September 24, 2012

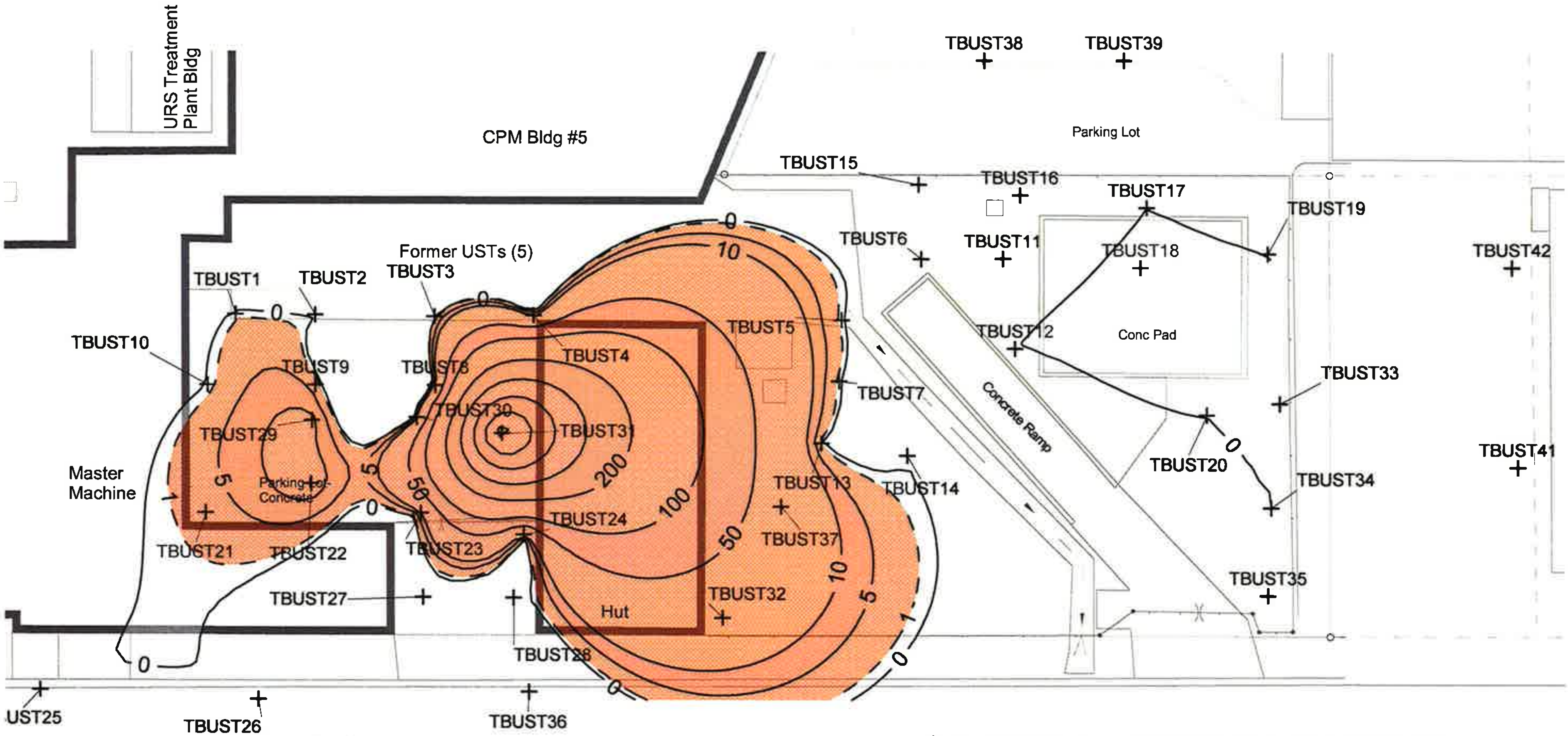


Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. Soil total VOCs of > 10 ppm shown as red-colored area.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

UST Area- Shallow Soils
Total CTEX, mg/kg
Historic Data, 2003-2006

Figure 3-1

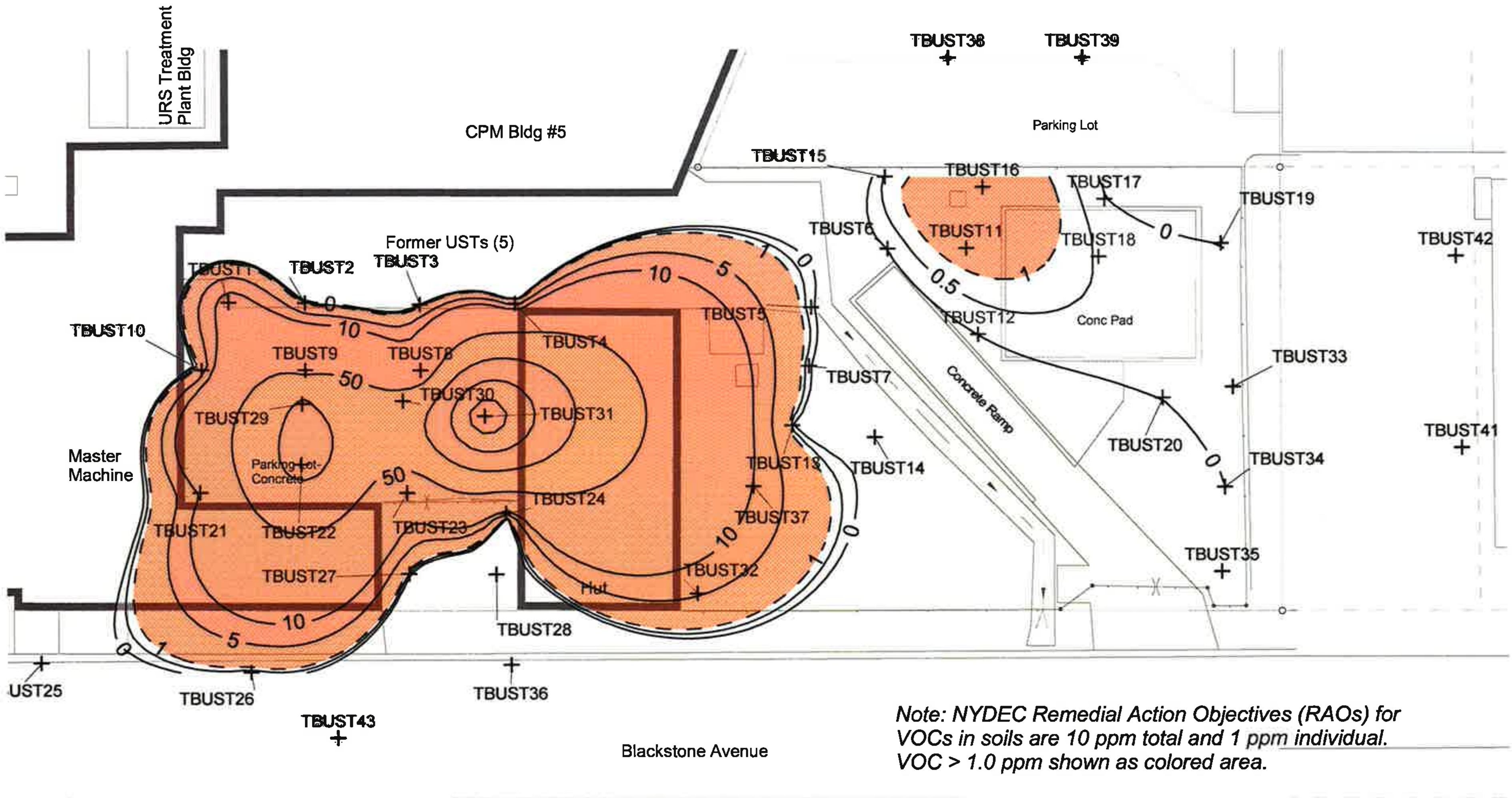


Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. VOC > 1.0 ppm shown as colored area.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

UST Area- Shallow Soils
Toluene, mg/kg
Historic Data, 2003-2006

Figure 3-2

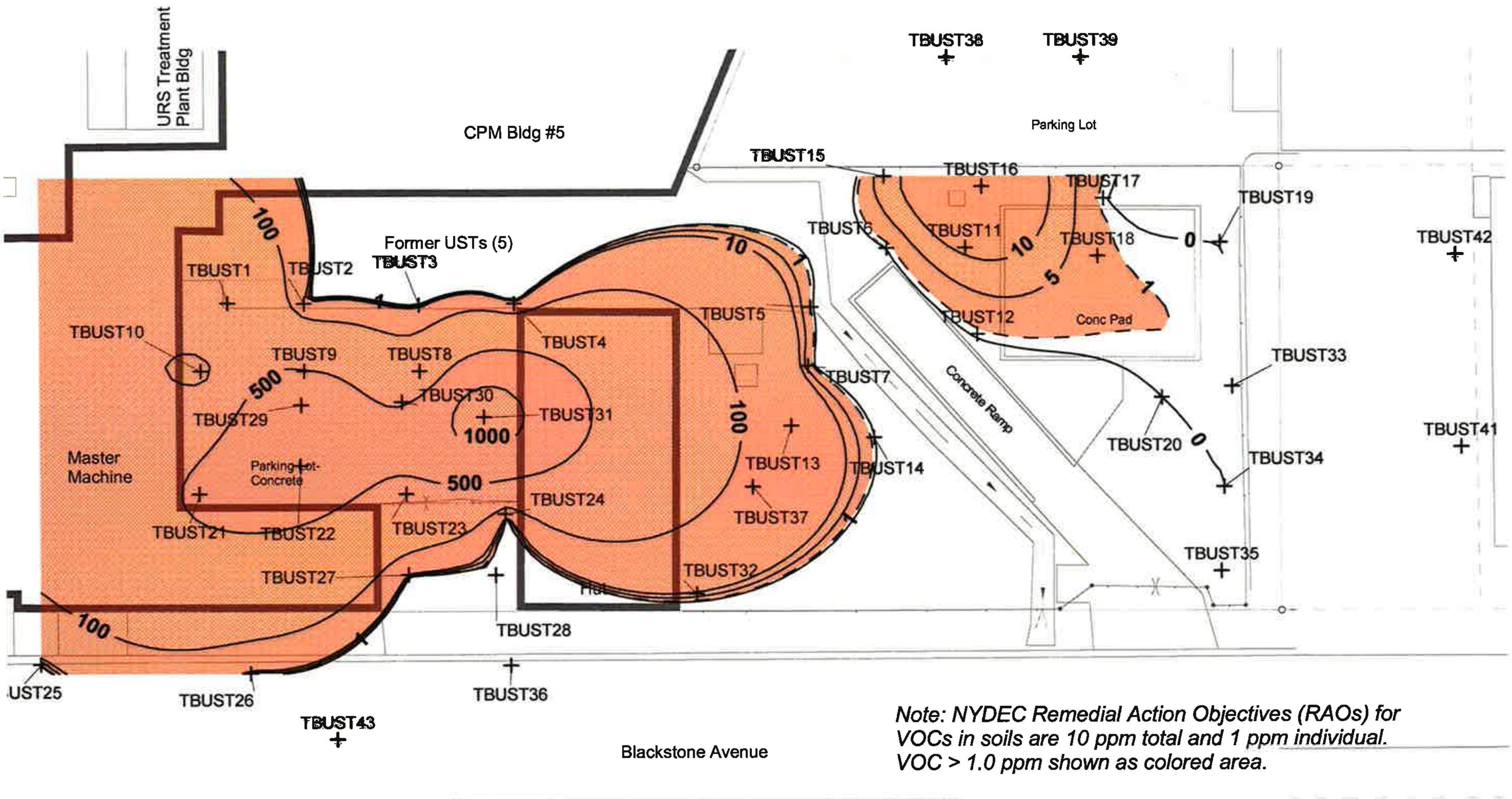


Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. VOC > 1.0 ppm shown as colored area.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

UST Area- Shallow Soils
Ethylbenzene, mg/kg
Historic Data, 2003-2006

Figure 3-3

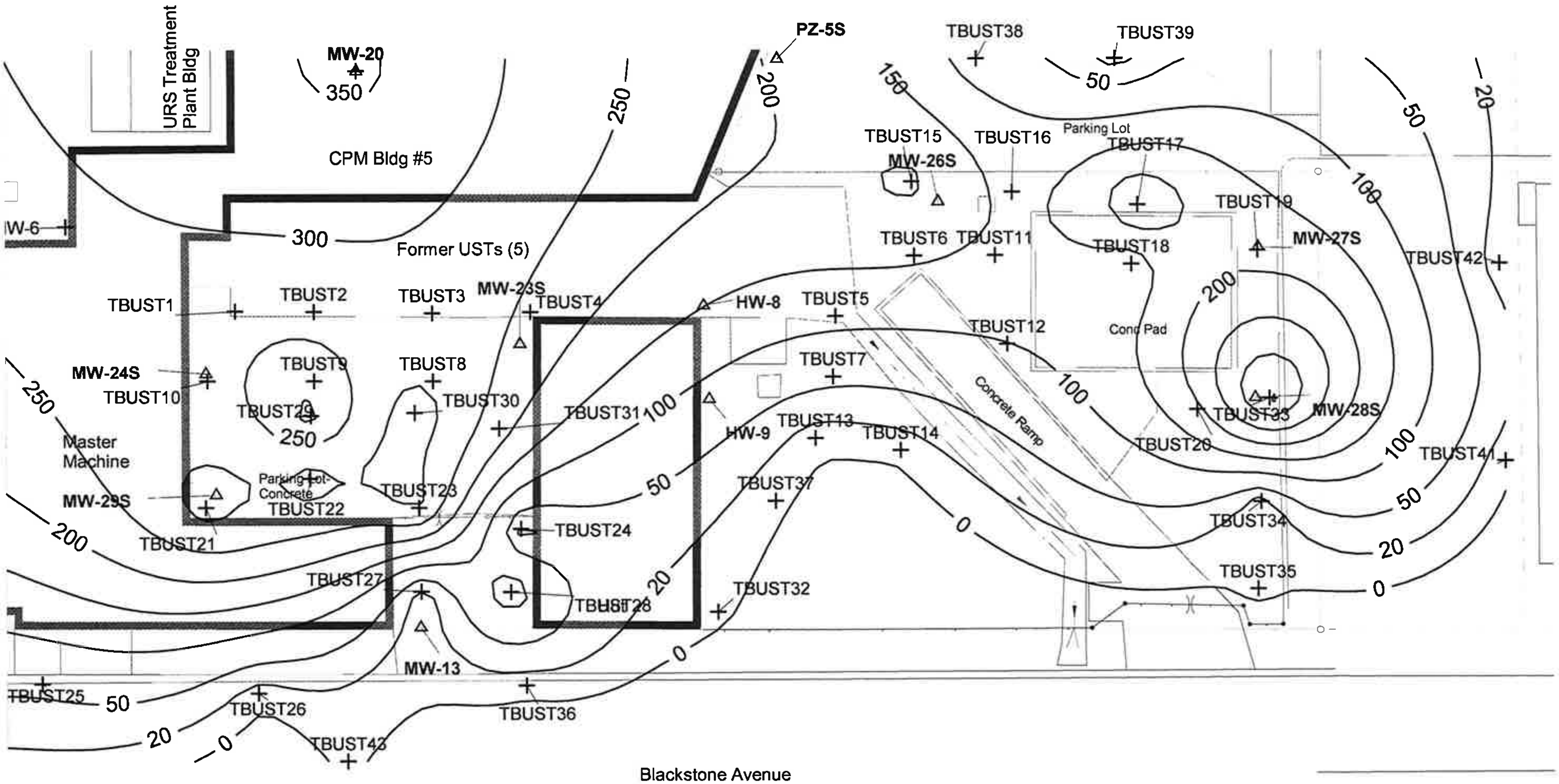


Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. VOC > 1.0 ppm shown as colored area.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

UST Area- Shallow Soils
Total Xylenes, mg/kg
Historic Data, 2003-2006

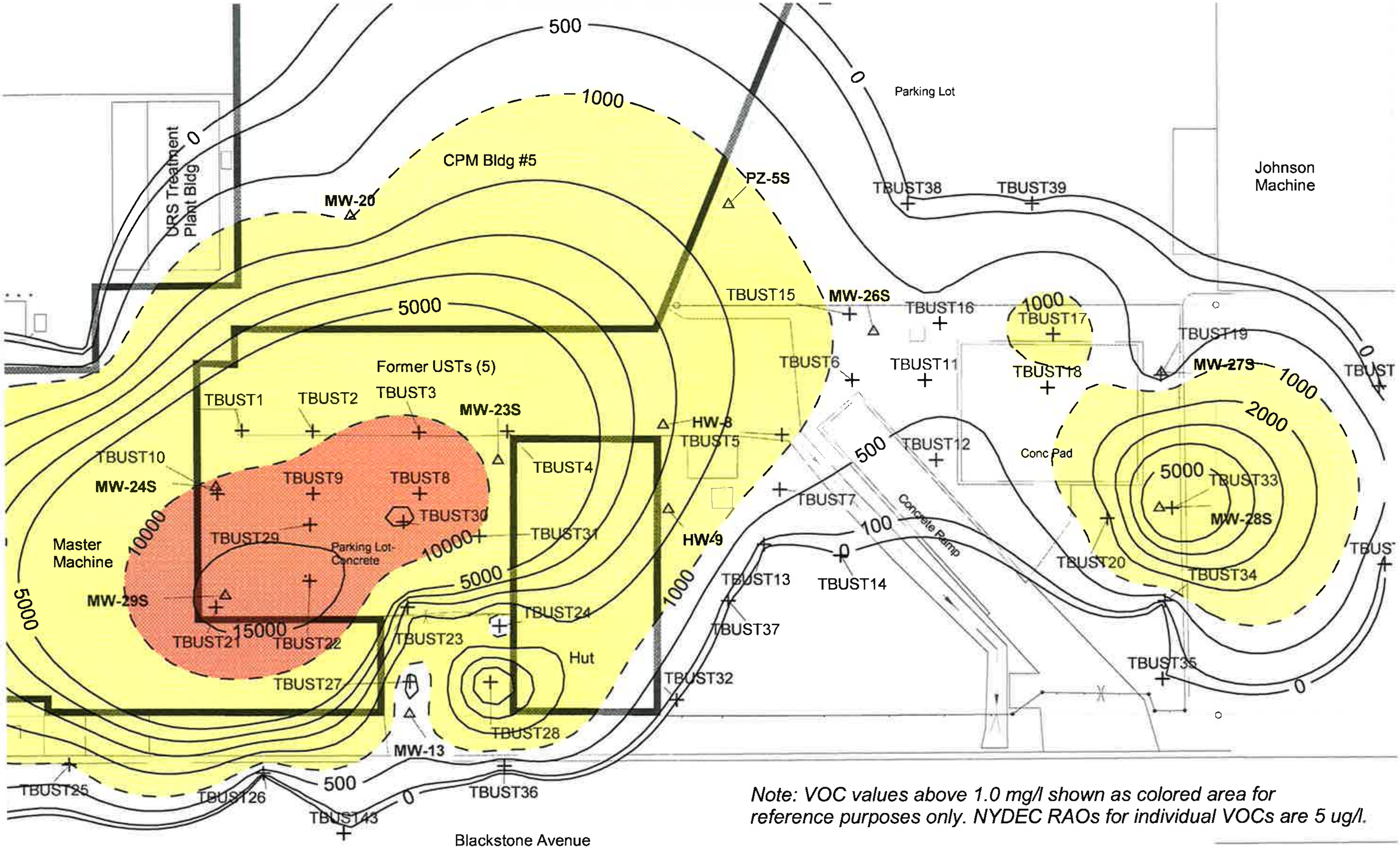
Figure 3-4



Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

UST Area- Shallow Groundwater
Cumene, ug/l
Historic Data, 2005-2006

Figure 3-5

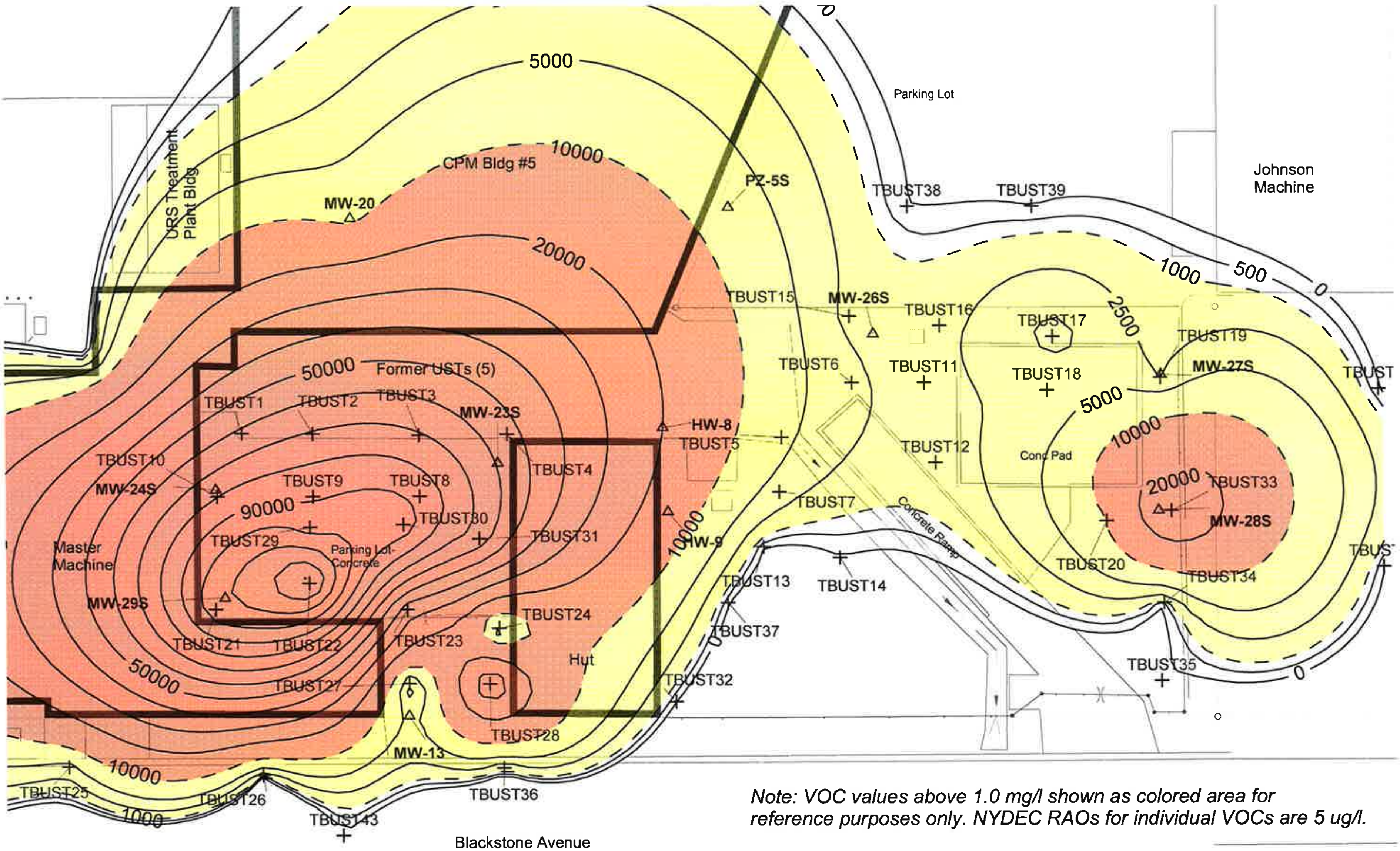


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
ꞦS 41569123

UST Area- Shallow Groundwater DP
Ethylbenzene, ug/l
Historic Data, 2005-2006

Figure 3-6

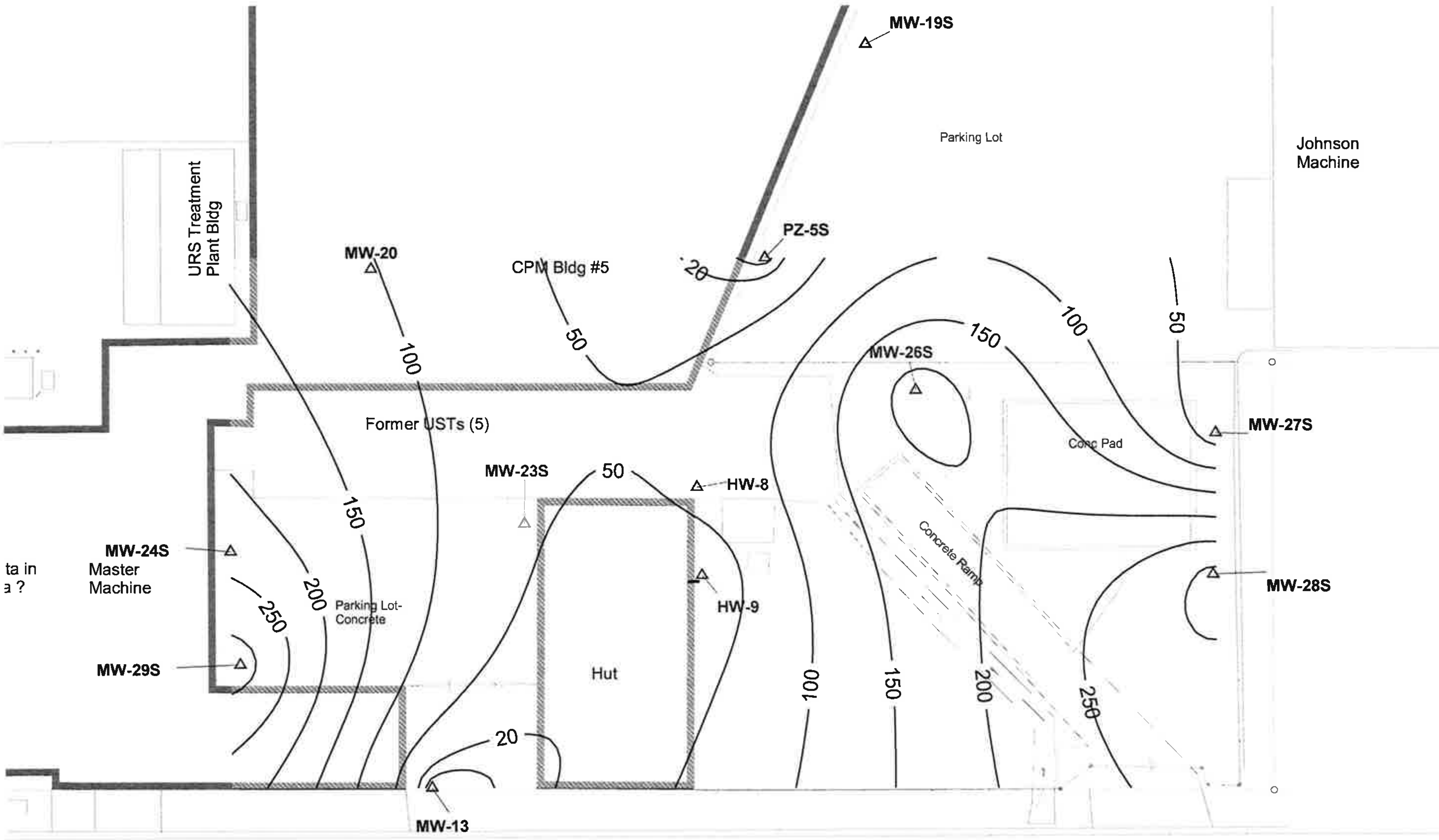


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
ꓘS 41569123

UST Area- Shallow Groundwater DP
Total Xylenes, ug/l
Historic Baseline, 2005-2006

Figure 3-7

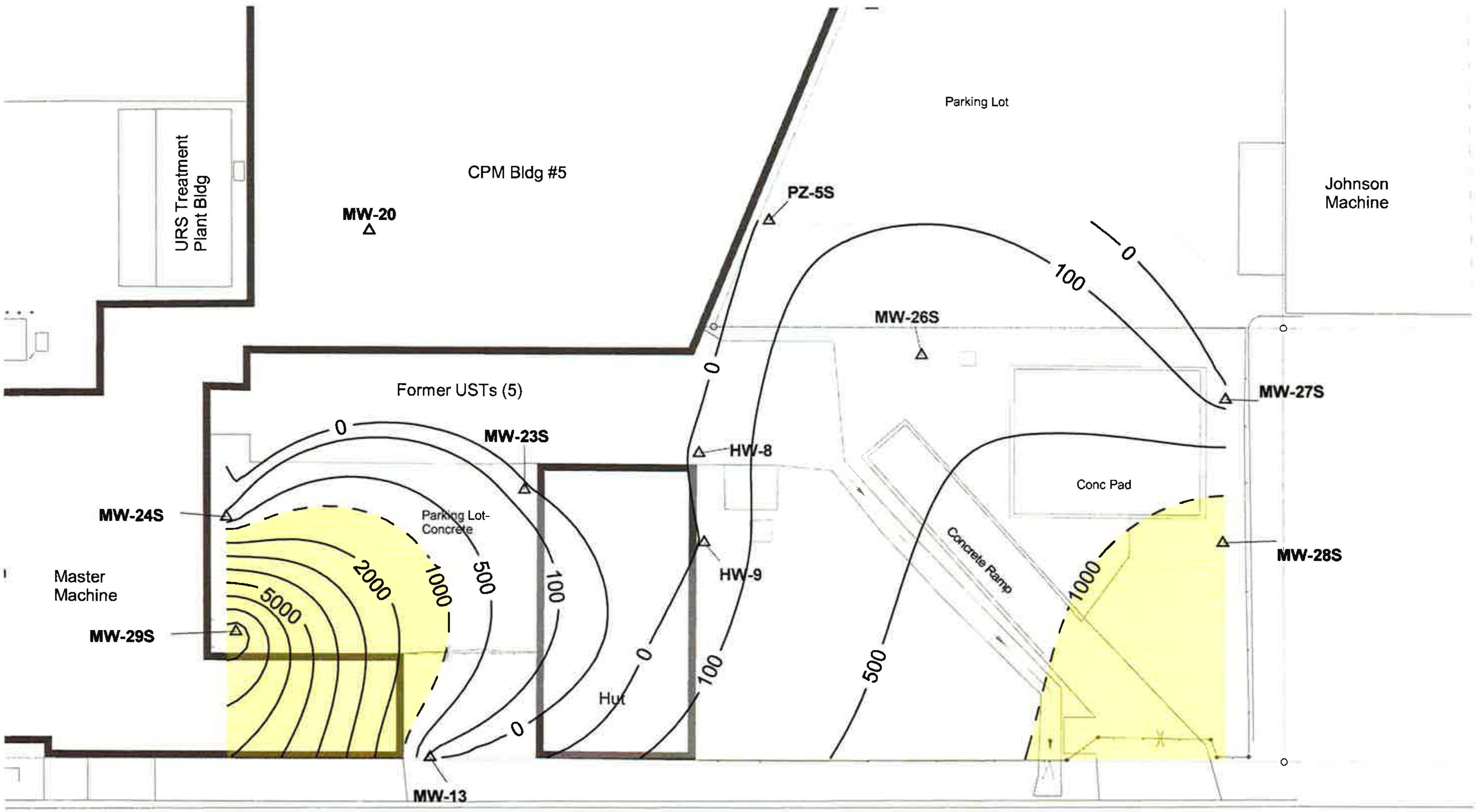


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
RS 41569123

UST Area-Shallow Groundwater
Cumene (Isopropylbenzene), ug/l
Baseline, 11/3/11

Figure 3-8

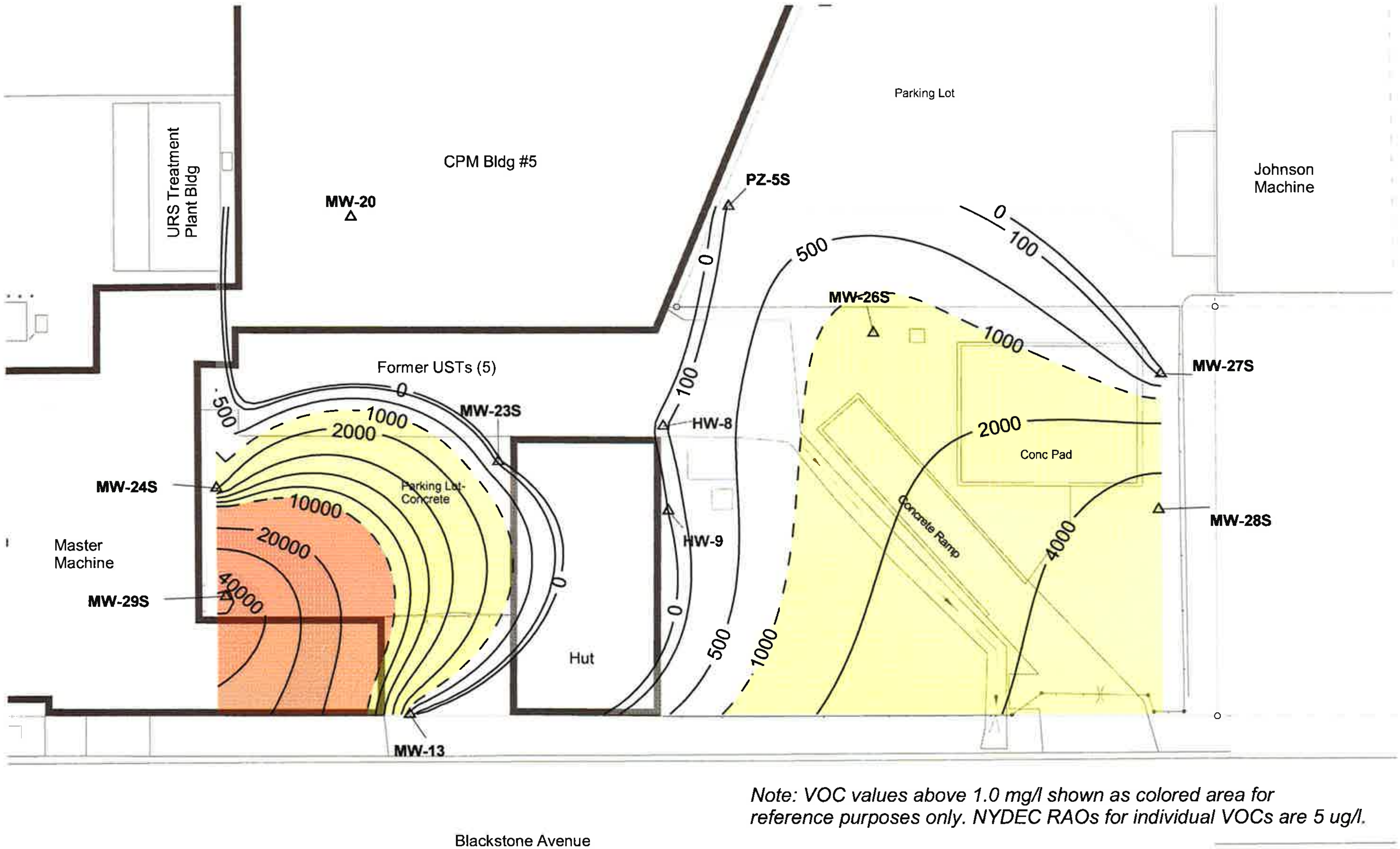


Note: *VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.*

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
S 41569123

UST Area-Shallow Groundwater
Ethylbenzene, ug/l
Baseline, 11/3/11

Figure 3-9

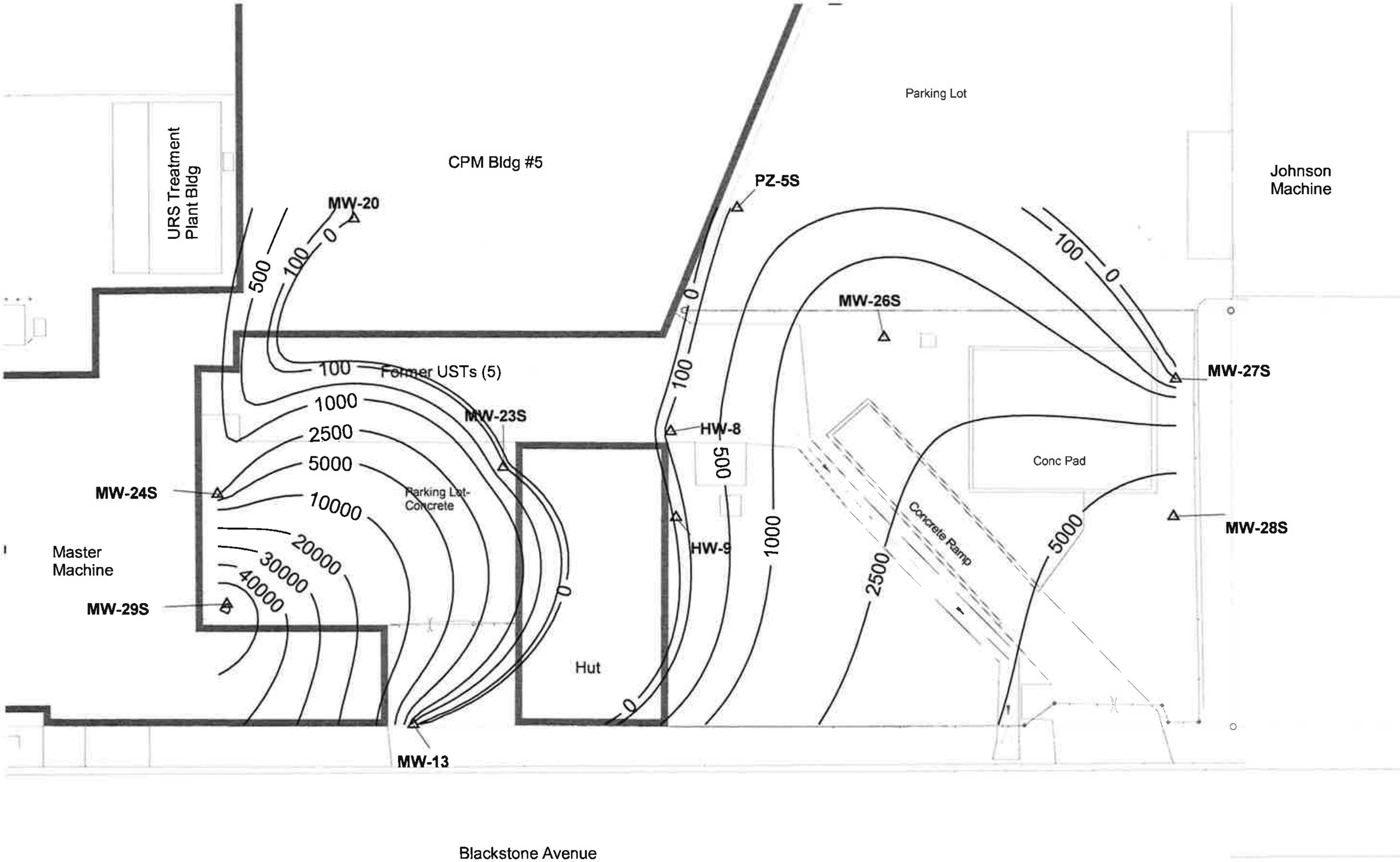


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
?S 41569123

UST Area-Shallow Groundwater
Xylenes, Total, ug/l
Baseline, 11/3/11

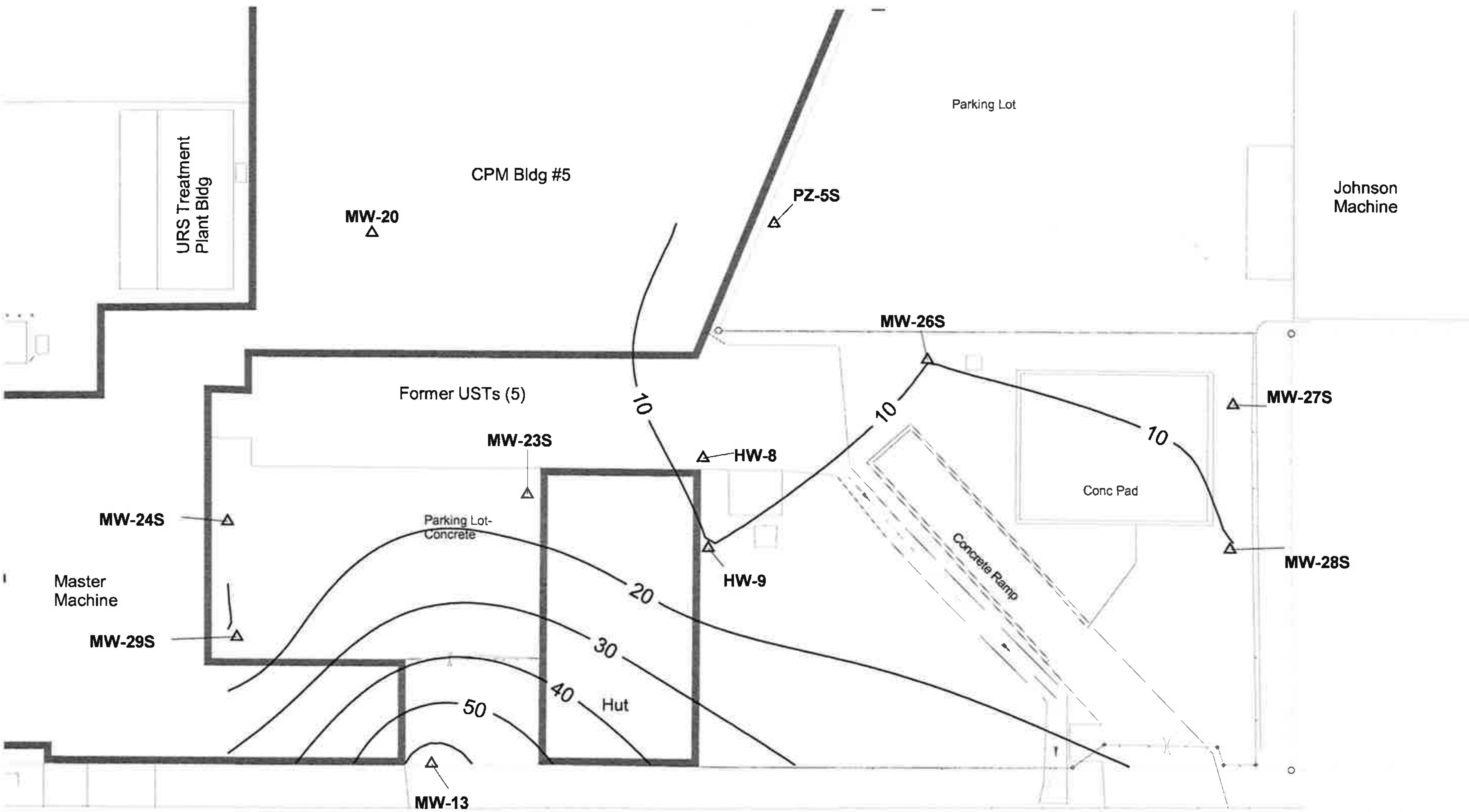
Figure 3-10



sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
{S 41569123

UST Area-Shallow Groundwater
Total CTEX, ug/l
Baseline, 11/3/11

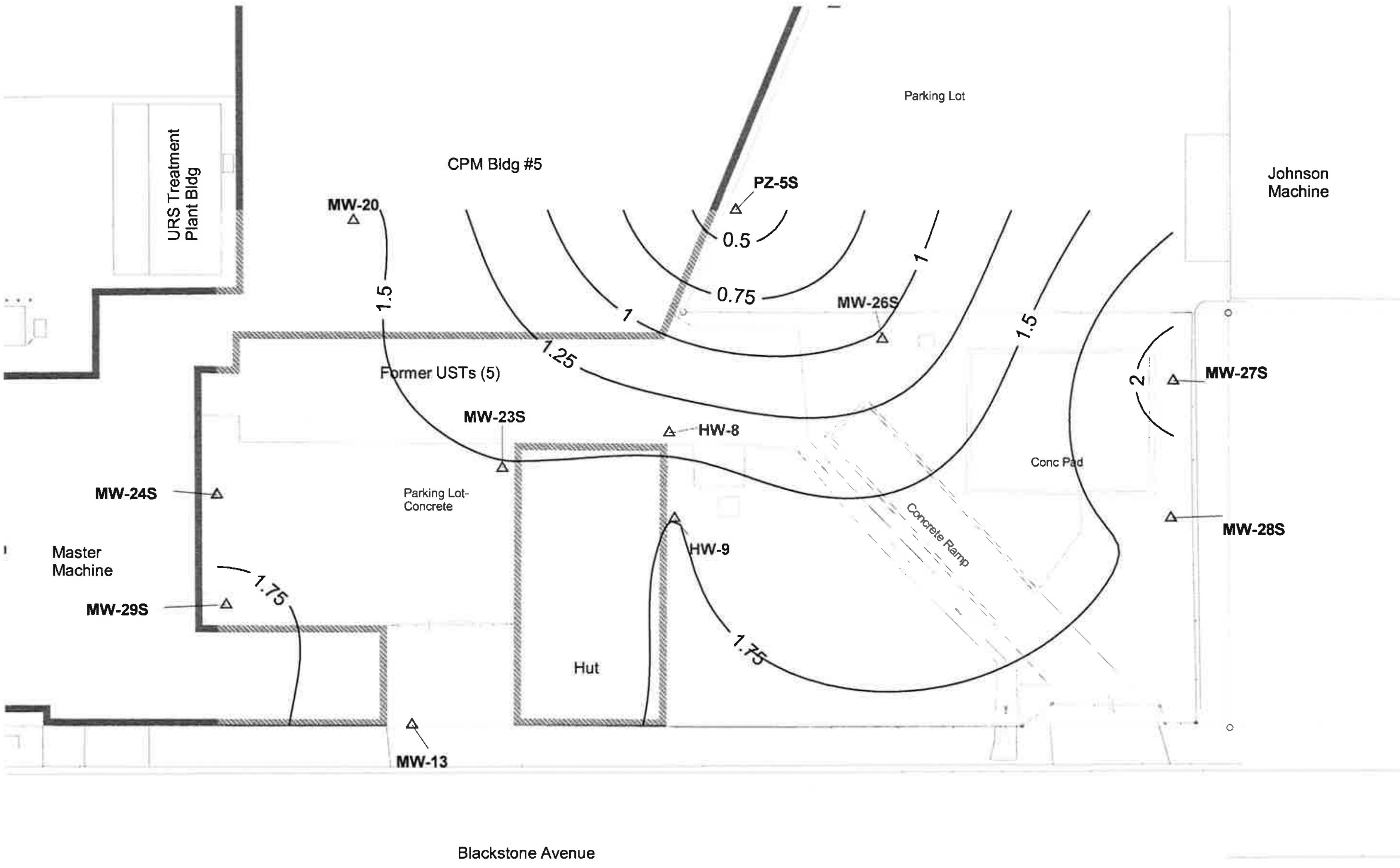
Figure 3-11



sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
RS 41569123

UST Area-Shallow Groundwater
Sulfate, mg/l
Baseline, 11/3/11

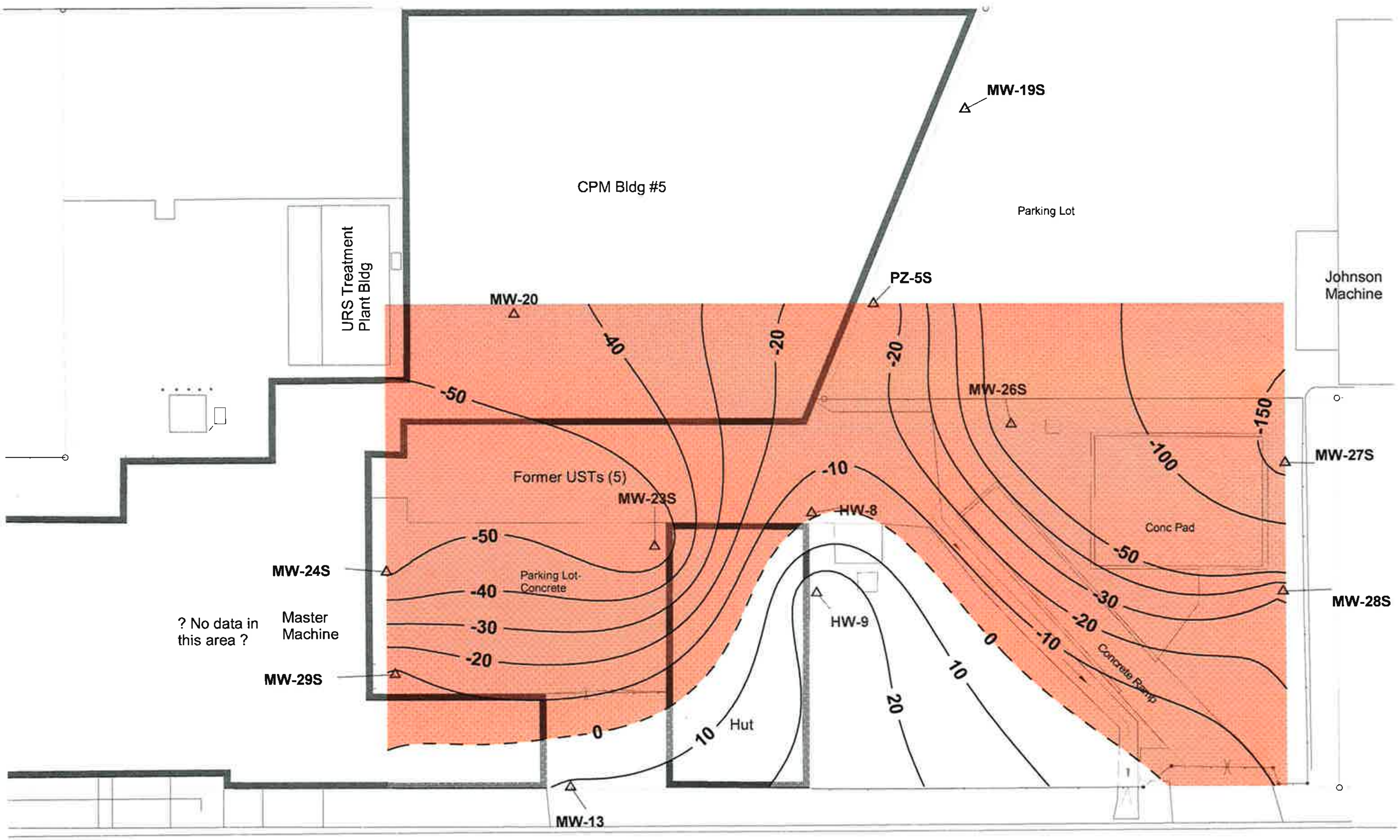
Figure 3-12



sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
ꞦS 41569123

UST Area-Shallow Groundwater
Fe+3/Fe+2 Ratio
Baseline, 11/3/11

Figure 3-14

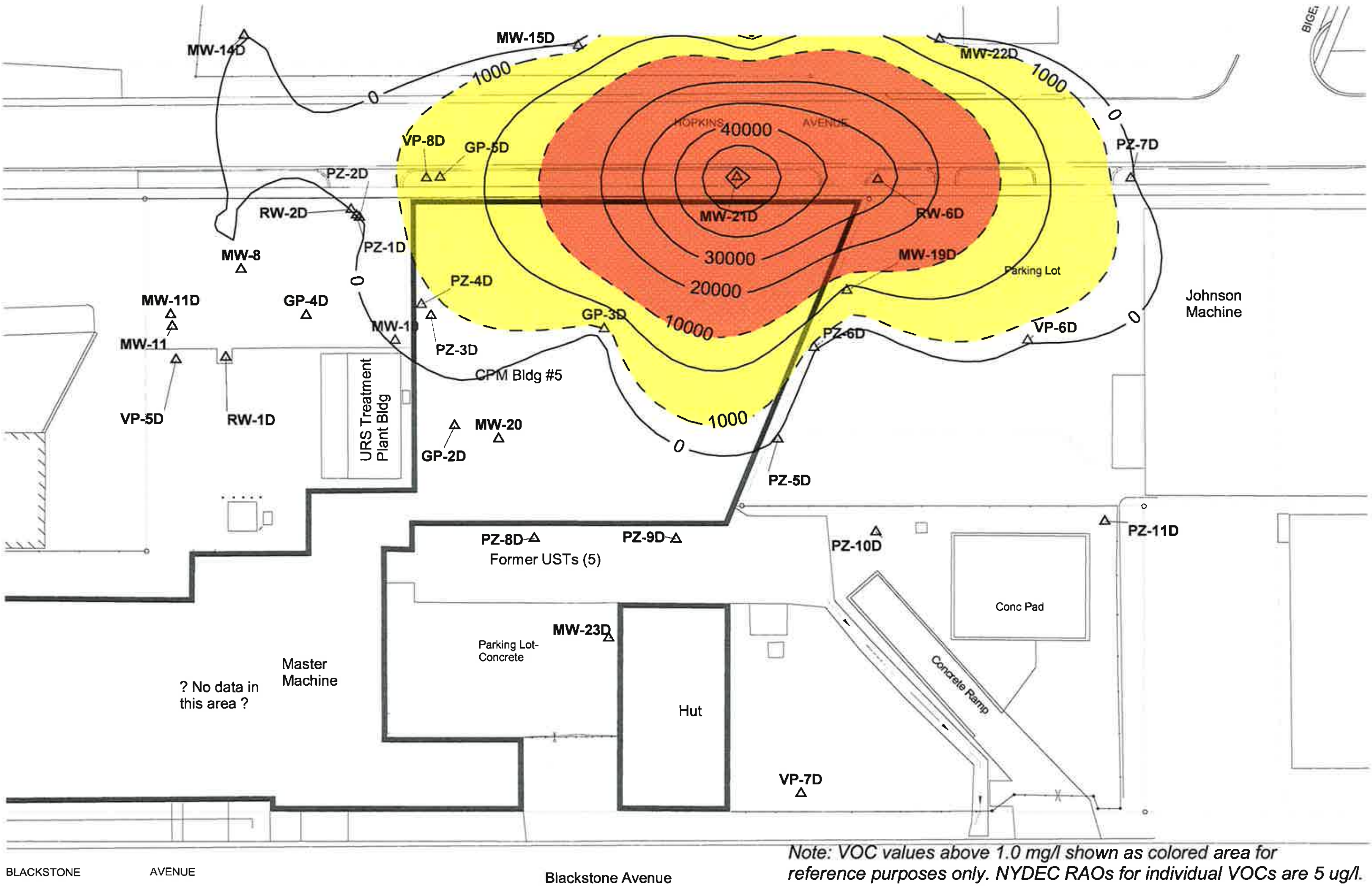


Note: Negative ORP (reducing conditions) shown as colored (red) area.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

UST Area-Shallow Groundwater
ORP, mV
Baseline, 11/3/11

Figure 3-15

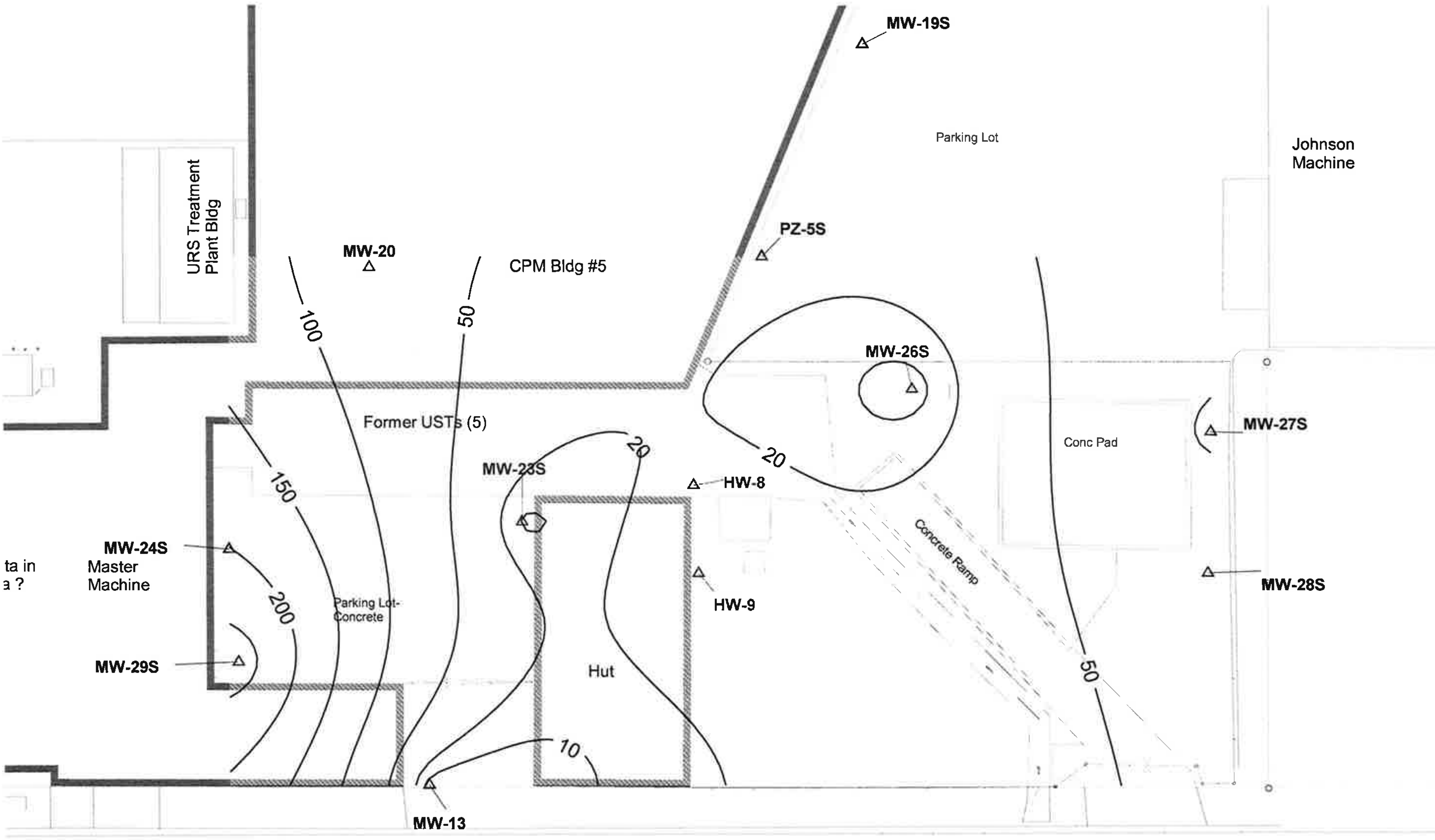


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
URS 41569123

RW-6D Area- Deep Groundwater
Acetone, ug/l
Baseline, 11-12/11

Figure 3-16

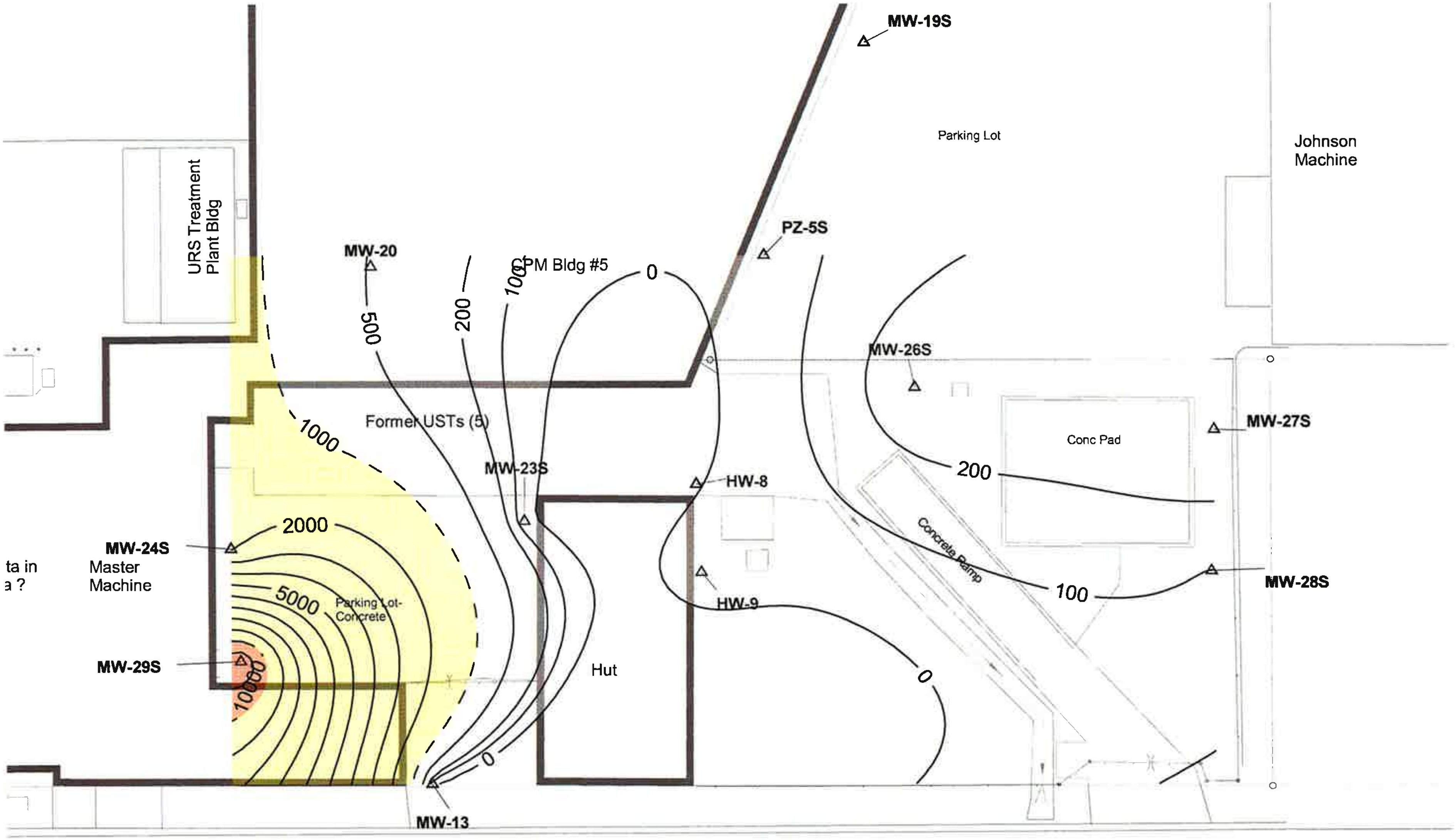


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
RS 41569123

UST Area-Shallow Groundwater
Cumene (Isopropylbenzene), ug/l
Round 3, 6/13/12

Figure 3-17

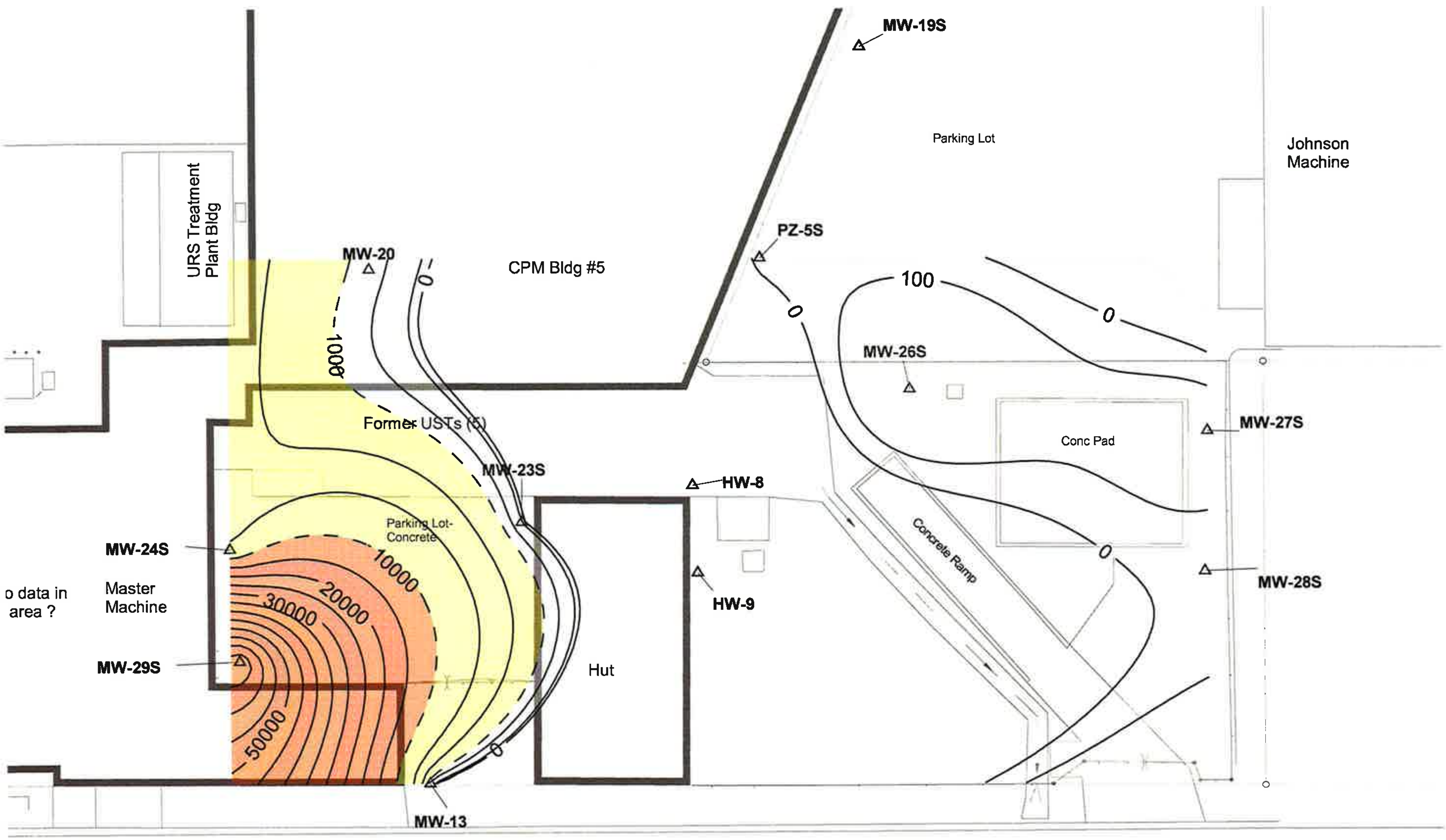


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
RS 41569123

UST Area-Shallow Groundwater
Ethylbenzene, ug/l
Round 3, 6/13/12

Figure 3-18

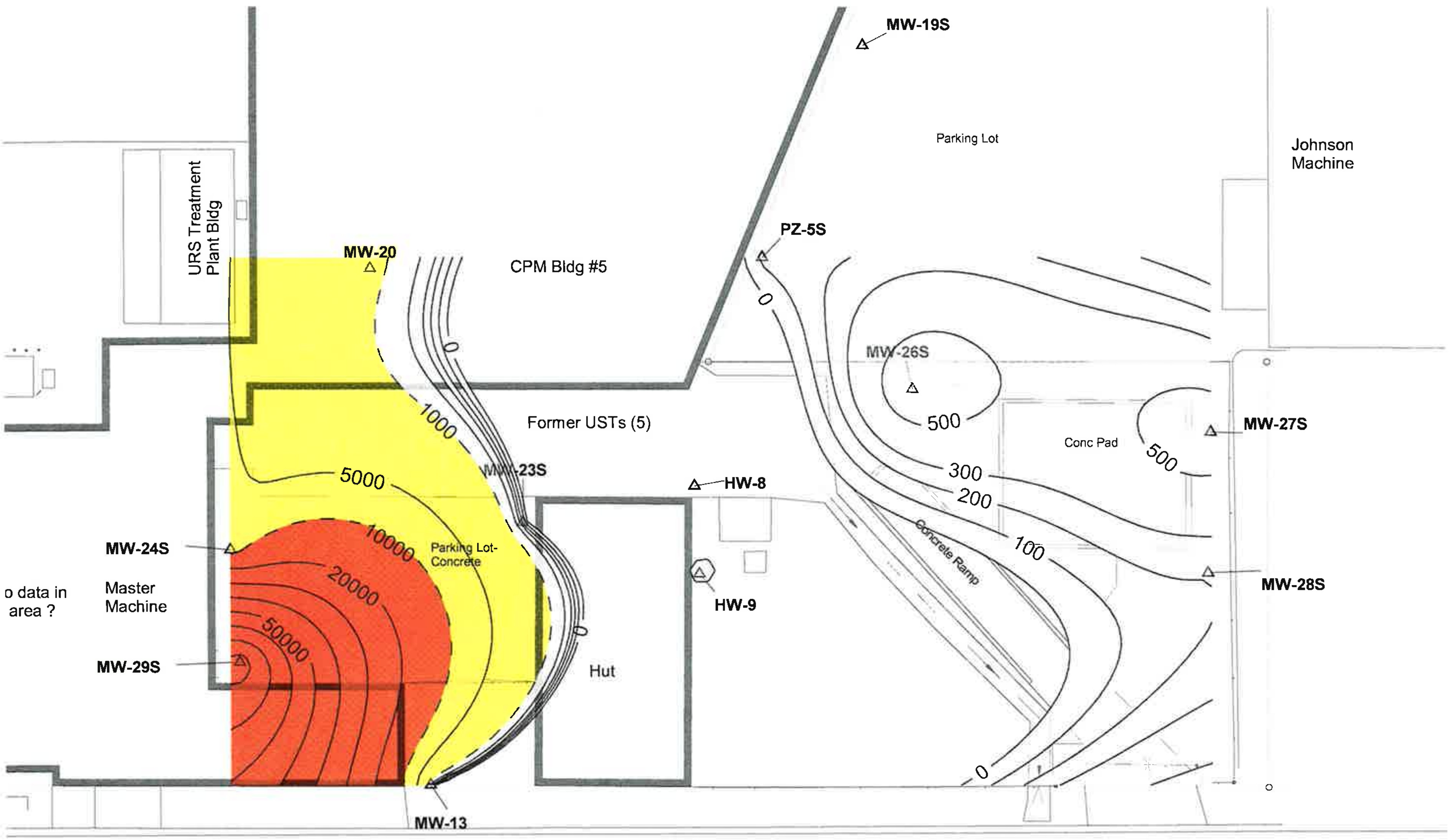


Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

sex Specialty Products, Inc.
sex/Hope Site, Jamestown, NY
emical Oxidation Remedial Action Report
?S 41569123

UST Area-Shallow Groundwater
Xylenes, Total, ug/l
Round 3, 6/13/12

Figure 3-19



Blackstone Avenue

Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

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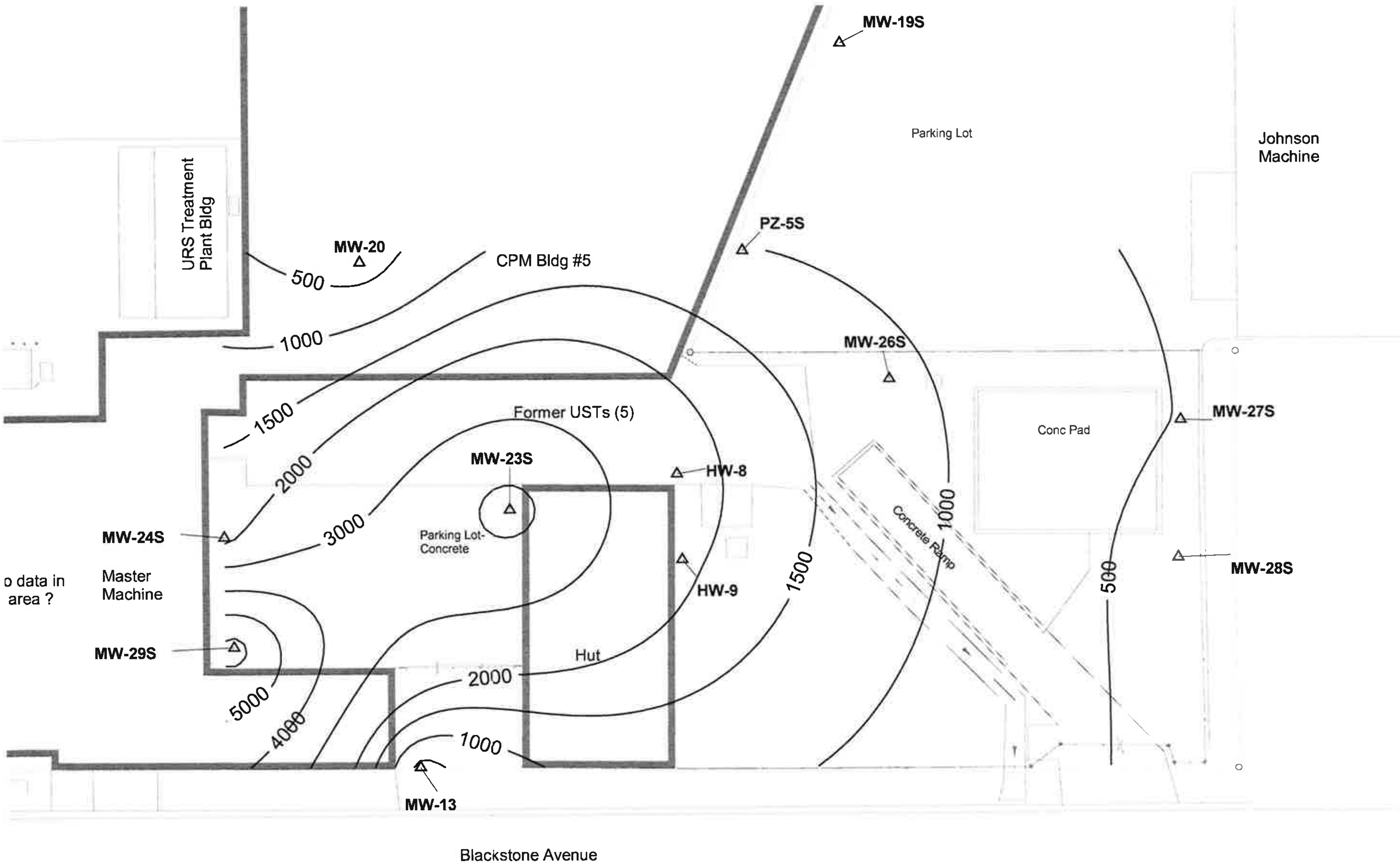
UST Area-Shallow Groundwater
Total CTEX, ug/l
Round 3, 6/13/12

Figure 3-20



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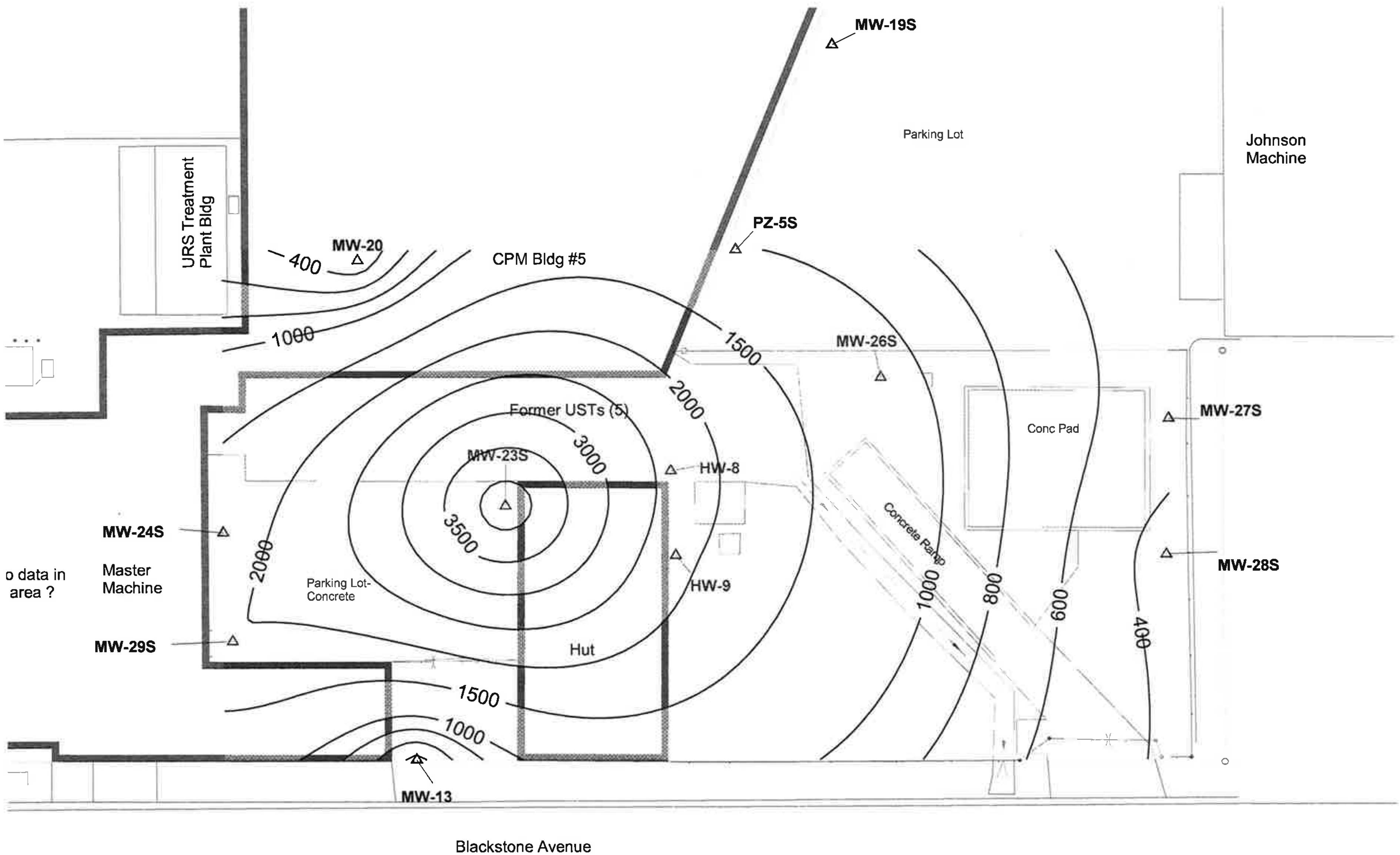
UST Area-Shallow Groundwater
Sulfate, mg/l
Round 3, 6/13/12

Figure 3-21



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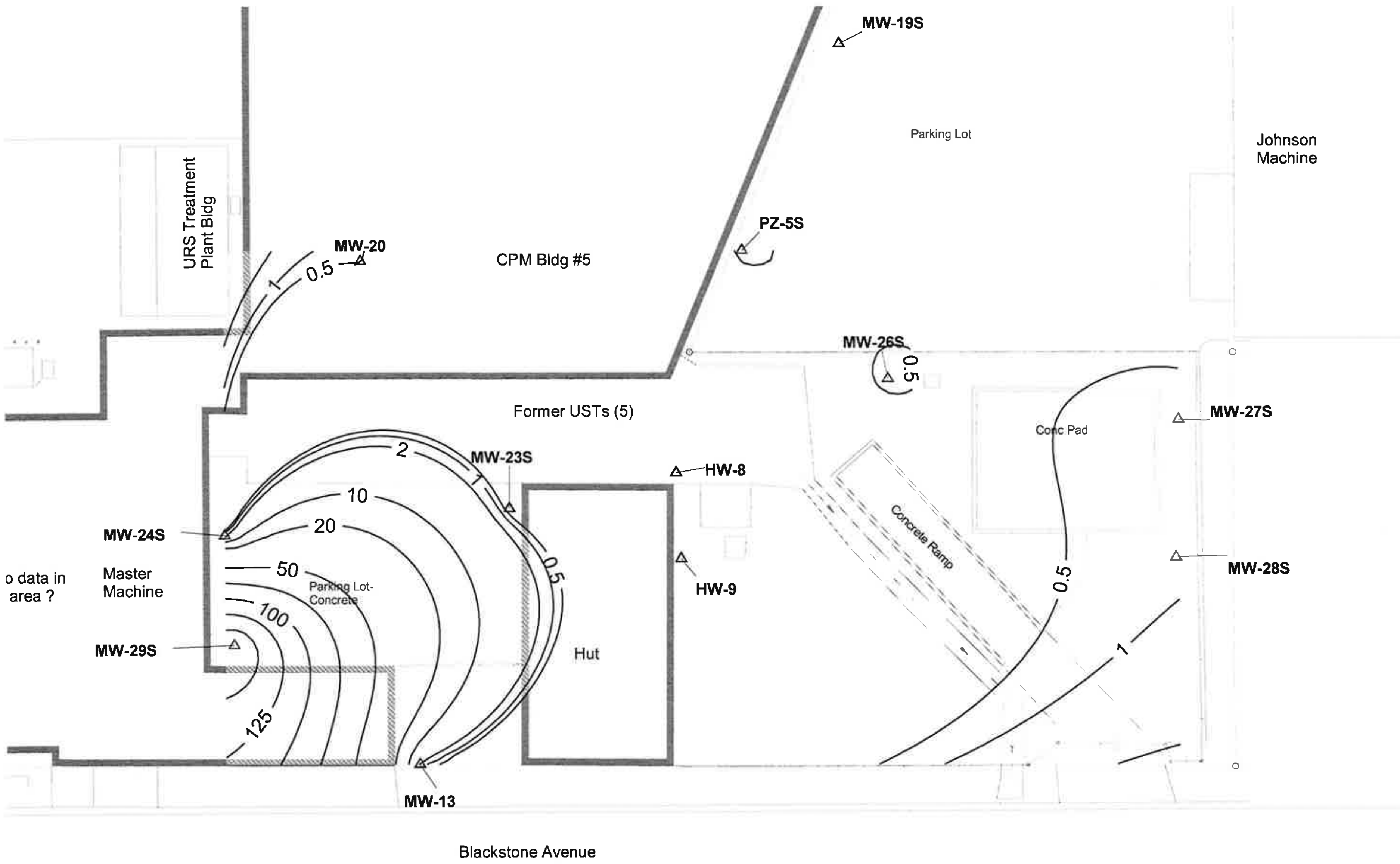
UST Area-Shallow Groundwater
Sulfate /Sulfide Ratio
Round 3, 6/13/12

Figure 3-22



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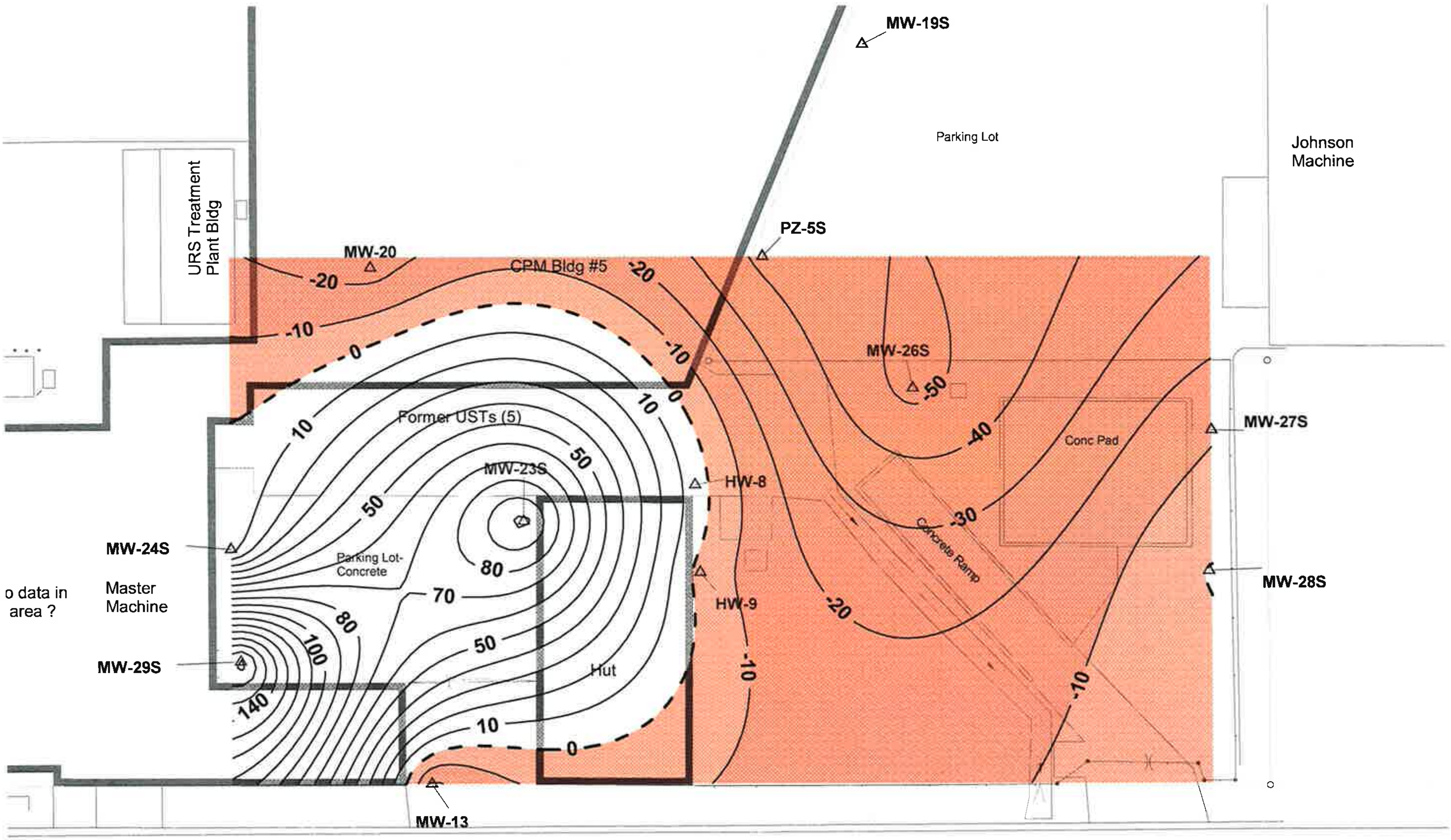
UST Area-Shallow Groundwater
Fe+3/Fe+2 Ratio
Round 3, 6/13/12

Figure 3-23



Blackstone Avenue

Note: Negative ORP (reducing conditions) shown as colored (red) area.

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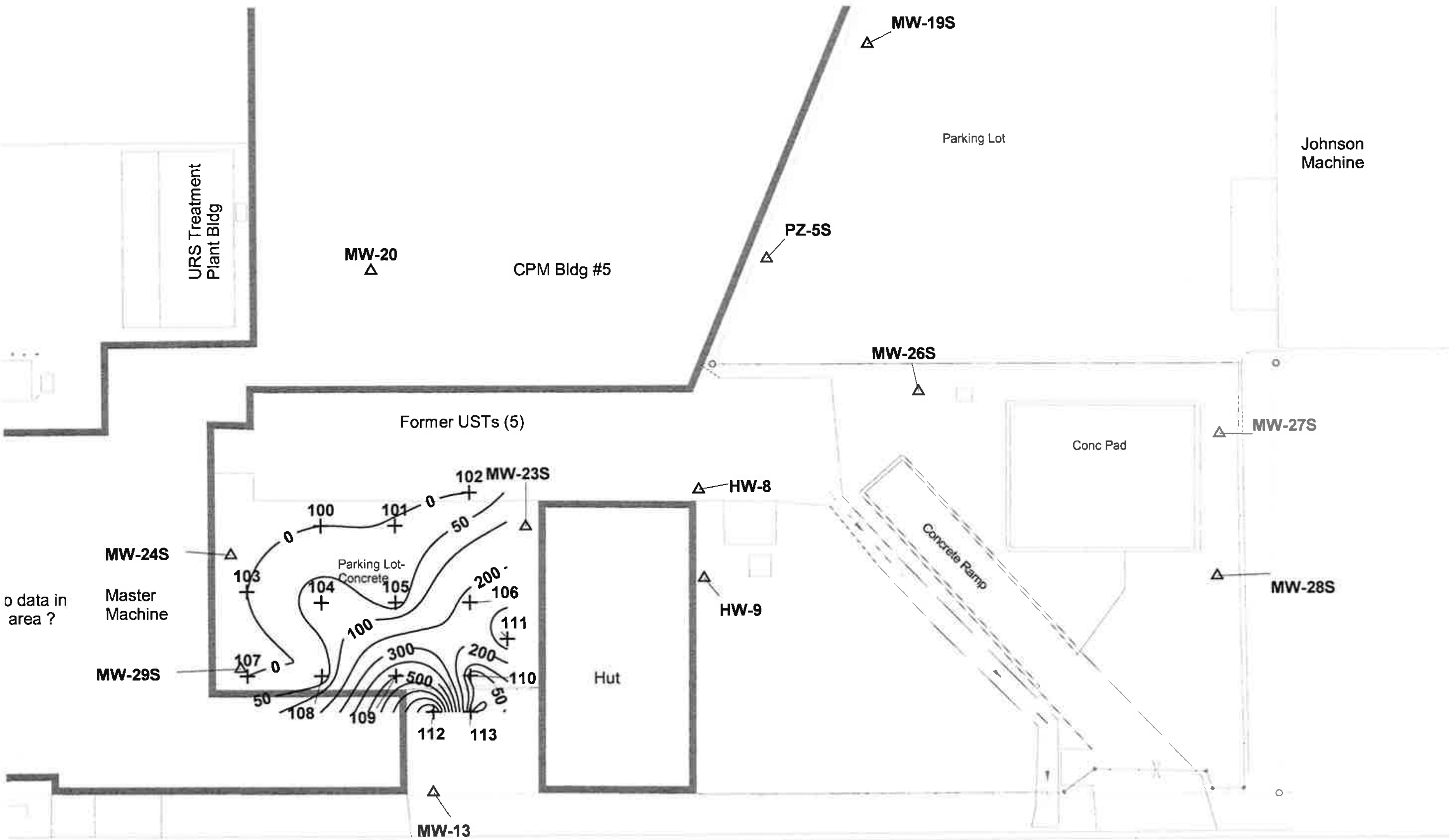
UST Area-Shallow Groundwater
ORP, mV
Round 3, 6/13/12

Figure 3-24



Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. Soil total VOCs of > 10 ppm shown as red-colored area.

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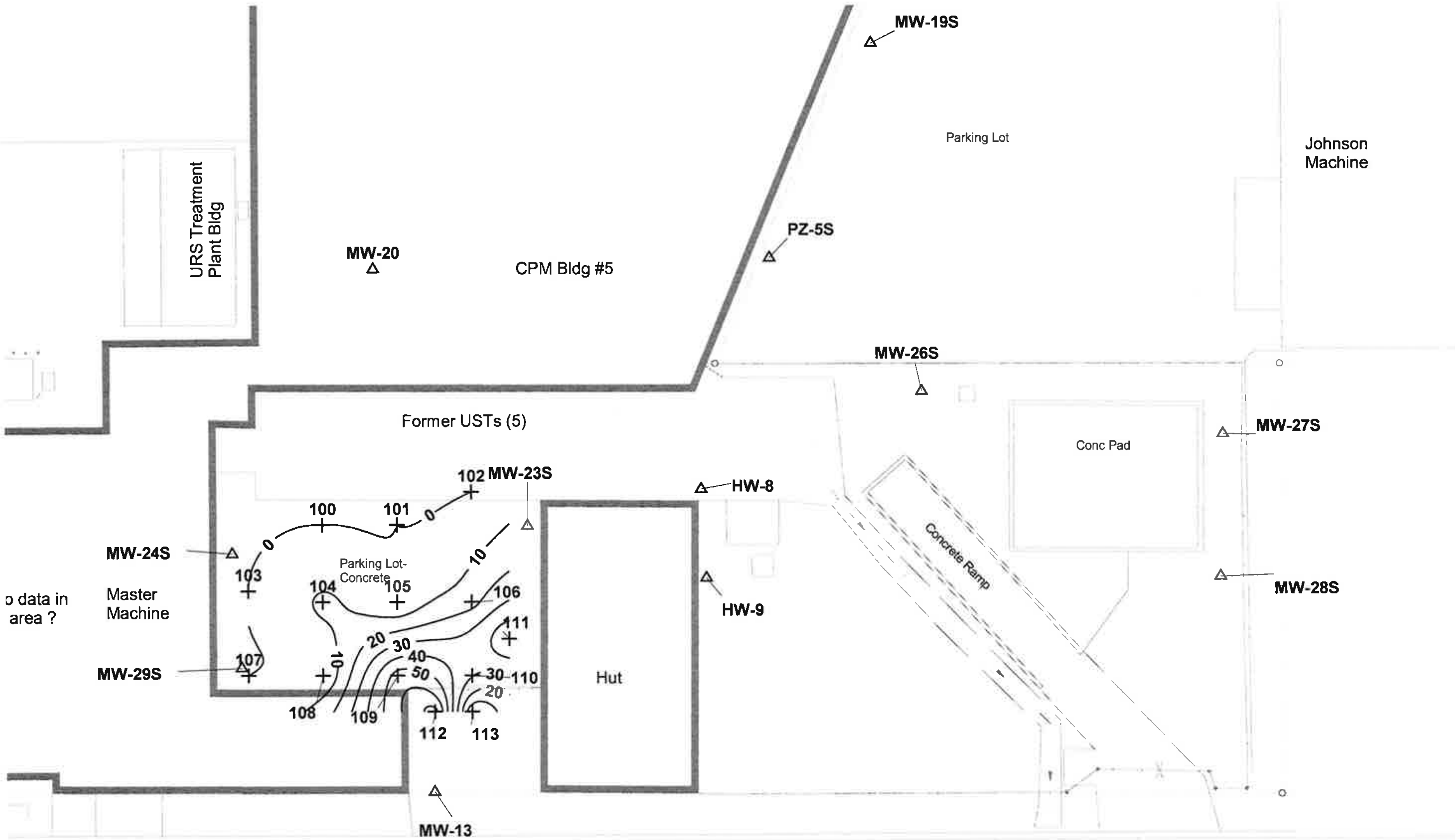
UST Area- Shallow Soils
Total CTEX, ug/kg
Post-Treatment, August, 2012

Figure 3-25



Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. VOC > 1.0 ppm shown as colored area.

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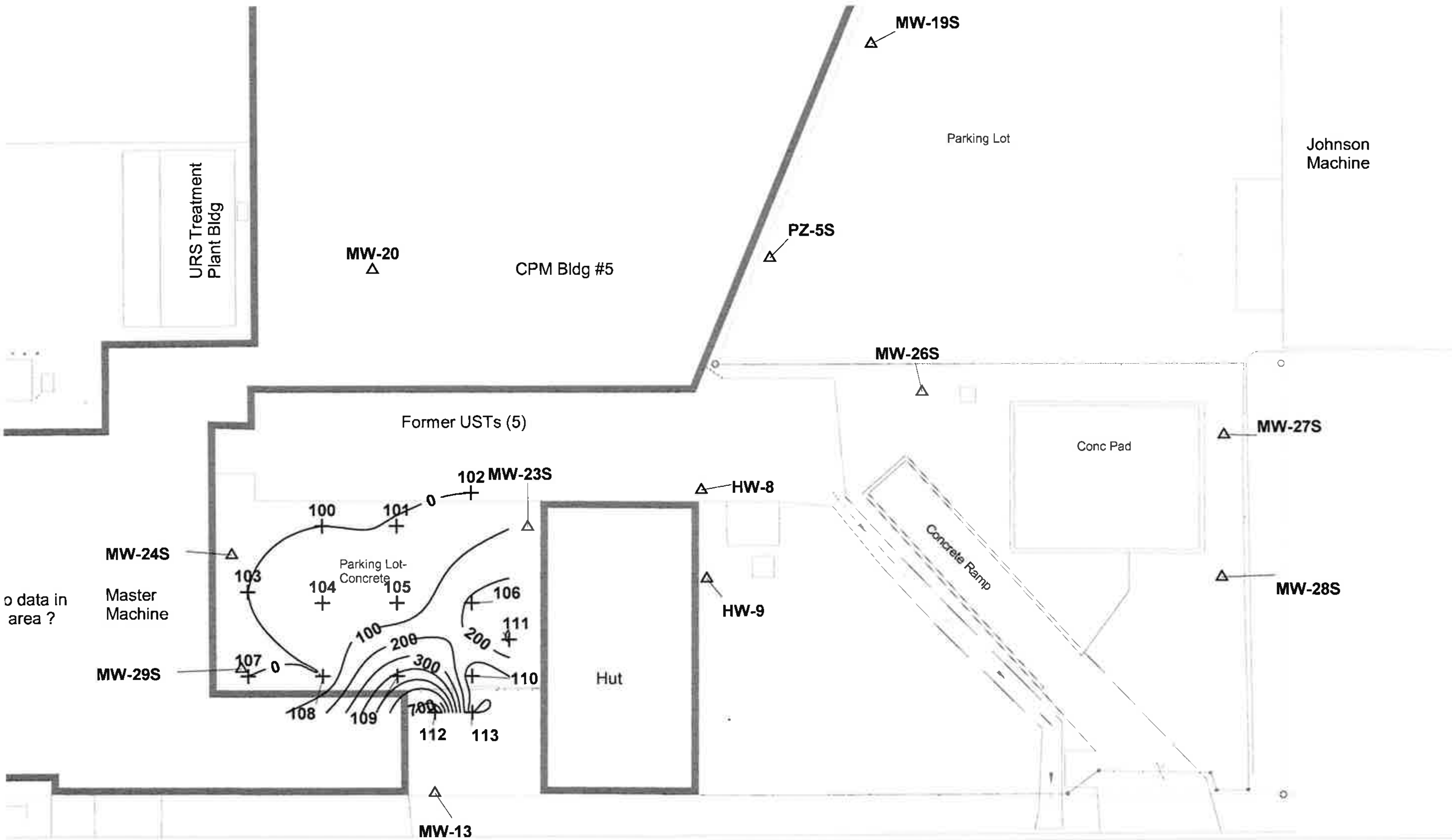
UST Area- Shallow Soils
Ethylbenzene, ug/kg
Post-Treatment, August, 2012

Figure 3-26



Note: NYDEC Remedial Action Objectives (RAOs) for VOCs in soils are 10 ppm total and 1 ppm individual. VOC > 1.0 ppm shown as colored area.

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UST Area- Shallow Soils
Total Xylenes, ug/kg
Post-Treatment, August, 2012

Figure 3-27

Note: VOC values above 1.0 mg/l shown as colored area for reference purposes only. NYDEC RAOs for individual VOCs are 5 ug/l.

Essex Specialty Products, Inc.
Essex/Hope Site, Jamestown, NY
Chemical Oxidation Remedial Action Report
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RW-6D Area-Deep Groundwater
Acetone, ug/l
Round 3, 6/13/12

Figure 3-28