Phase II Environmental Site Assessment

Former D.A. Stuart Oil Co.
2727 S. Troy Street
Chicago, Illinois 60623

Brecheisen Engineering, Inc.

Environmental Consulting & Engineering

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Former D.A. Stuart Oil Co.
2727 S. Troy Street
Chicago, Illinois 60623

Parcel Index Numbers:

16-25-304-009-0000

Prepared for:

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EXECUTIVE SUMMARY

Project Overview

Brecheisen Engineering, Inc. (BEI) was engaged by the City of Chicago Department of Environment (CDOE) to perform a Phase II Environmental Site Assessment (Phase II ESA) at the former D.A. Stuart Oil Co. Site located at 2727 South Troy Street in Chicago, Illinois (the Site). The performance of the Phase II ESA was necessary to characterize the nature and extent of petroleum impacts related to historical lubricating oil manufacturing operations at the Site in accordance with the recognized environmental conditions (RECs) identified during the completion of a Phase I Environmental Site Assessment (Phase I ESA) for the Site.

The purpose of the Phase II ESA was to characterize potential impacts related to the on-Site RECs through the advancement of test pits, soil borings, the installation of monitoring wells, and the laboratory analyses of soil and groundwater. Soil borings were intended to characterize both the fill materials and subsurface soils at the Site.

Site Description

The Site was located adjacent to a former spur of the Illinois Central Rail Road (I.C.R.R.) northeast of the intersection of West 28th Street and South Troy Street in Chicago, Illinois. The Site was situated in the southwest ¼ of Section 25, Township 39 North, and Range 13 East of the Third Principal Meridian in Cook County. The Site has been shown relative to surrounding geographical features on the Site Location Map included as Figure 1.

The Site was an approximate 0.54-acre triangular parcel of vacant land. The perimeter was secured with a fence. The Site was comprised of the following parcel:

Parcel Index Number (PIN)	Description
16-25-304-009	Complete PIN

Prior to the Site's vacancy, it was utilized as a lubricating oil & grease manufacturing facility from at least 1923 through 1988.

Based on a review of historical Sanborn maps, the Site was vacant in 1896. By 1923, the Site was occupied by D.A. Stuart & Co. and was described as "Lubricating Oil & Grease." Two (2) Site buildings existed. The main Site building occupied the west-central portion of the Site and was served by a rail spur inside the eastern Site boundary. The second building was described as "oil boiling kettles" and was located on the southernmost portion of the Site.

In 1950, the Site was occupied by D.A. Stuart Oil Co, Ltd. The facility had expanded since 1923. The original Site building was described as a "factory" and a new 3-story building with a basement was shown along the northern portion of the Site, which had been vacant in 1923.

Fifteen (15) lubricating oil tanks were shown outside the main Site building on the northeastern portion of the Site. The Site remained in this configuration until at least 1988.

In 1988 and 1989, at least two (2) subsurface investigations were conducted at the Site for Stuart-Ironsides, Inc. The soil boring investigation reports documented heavy visual and olfactory evidence of contamination and analytical confirmation of elevated levels of petroleum hydrocarbons related to the manufacturing and storage of oil and grease products. By 1999, certain portions of the Site buildings had been demolished. Only an approximate 35-feet by 125-feet rectangular Site building remained along the western Site boundary. The final Site building was demolished in 2008 and no structures currently exist at the Site.

In 2008, after the final Site building had been demolished, three (3) underground storage tanks (USTs) were removed from the Site. The USTs were formerly located on the southern portion of the Site (Figure 2). The USTs were removed in the presence of a CDOE Inspector. No release was reported for any of the three (3) USTs removed from the Site in 2008.

Based on a review of the standard environmental database, the Site was identified in the FINDS, UST and LUST databases. An October 27, 1953 permit was issued to install one 12,000-gallon fuel oil tank at the Site. A November 13, 1959 permit was issued for the installation of one 18,000-gallon lubricant oil tank. On April 8, 1992, the Illinois Emergency Management Agency (IEMA) was notified of a release of fuel oil at the Site and Leaking Underground Storage Tank (LUST) Incident No. 920922 was assigned to the Site. The LUST incident was assigned to GM Wrecking, Inc. located in Thornton, Illinois. The LUST incident is active.

Recognized Environmental Conditions from Phase I ESA

The Phase I ESA for the Site was completed on October 30, 2008 by Environmental Design International (EDI). The conclusions presented in the Phase I ESA identified the following RECs at the Site.

<u>On-Site</u>

- *Use of the subject site for industrial purposes since at least 1923;*
- *Historical presence of USTs and ASTs including UST removals in 2008;*
- *Visibly stained soil;*
- *Potential enforcement actions taken against the property;*

<u>Off-Site</u>

- *Presence of a neighboring Celotex Corporation Superfund site to the southeast of the Site*.

The on-site RECs have been shown on the Site Features Map, included as Figure 2.

Summary of Phase II ESA Results

BEI performed a Phase II ESA at the former D.A. Stuart Oil Co. Site located at 2727 S. Troy Street in Chicago, Illinois. The performance of the Phase II ESA was intended to establish the presence or absence of impacts associated with any of the on-site RECs identified during the completion of a Phase I ESA for the Site. The purpose of the Phase II ESA was to characterize potential impacts associated with the RECs through the excavation of test pits, the advancement of soil borings, the installation of monitoring wells, and the laboratory analyses of soil and groundwater samples.

Soil Investigation

Five (5) test pits were excavated to approximately 6-7 feet deep. Soil samples were collected at various locations along the test pits and analyzed for SVOCs and TPH. Twelve (12) soil borings were drilled in the areas most likely to have been impacted based on the historical Site operations. With the exception of Test Pit 4, at least two (2) soil samples from each test pit and soil boring were analyzed for various combinations of VOCs, SVOCs, PCBs, pesticides, herbicides, PNAs and RCRA Metals. The test pit and soil boring locations have been shown relative to the RECs for the Site on Figures 3 and 4, respectively. Photographs of Site investigation activities have been included in Appendix B. A complete description of field observations has been provided on the Test Pit Logs and Soil Boring Logs in Appendices C & D.

No PCBs, pesticides, or herbicides were detected at levels exceeding the most stringent residential Tier 1 SROs in any of the soil samples analyzed. However, certain VOCs, SVOCs, PNAs and RCRA Metals were detected in the Site's surficial (0-3) and subsurface soils at levels exceeding the most restrictive Tier 1 SROs for various exposure pathways. In addition, elevated levels of TPH-DRO were detected at the Site.

The estimated extent of impacted soils exceeding the most restrictive Tier 1 SROs has been shown on Figures 6 – 8 for the various exposure pathways. Soil analytical results were compared to the most restrictive Tier 1 SROs for residential land use on Tables 1 – 6. A complete copy of the soil analytical reports has been provided in Appendix F. Chromatograms from the TPH-DRO analyses on the soil samples have been included in Appendix G.

Groundwater Investigation

Three (3) soil borings were completed as 1-inch diameter PVC monitoring wells in accordance with the site-specific SAP (Appendix A). Groundwater samples were collected from each monitoring well for various combinations of VOCs, SVOCs, PCBs, pesticides, herbicides, PNAs, and RCRA Metals. Monitoring well locations have been shown relative to the RECs for the Site on Figure 4. Monitoring well construction logs have been included in Appendix E.

Monitoring well top-of-casing elevations were surveyed and groundwater elevations were measured using a Solinst™ electronic water level meter in order to determine the regional groundwater flow direction beneath the Site. Based on the measured groundwater elevations beneath the Site, regional groundwater flow direction was determined to be westerly. A groundwater contour map illustrating groundwater flow direction has been provided as Figure 5.

No SVOCs, PNAs, PCBs, pesticides or herbicides were detected in the groundwater beneath the Site at levels exceeding the Tier 1 GROs for Class I groundwater. However, vinyl chloride and certain RCRA Metals, including lead and manganese, were detected at levels exceeding the Tier 1 GROs for Class I Groundwater. The estimated extent of groundwater impacts has been shown on Figure 9. Groundwater analytical results were compared to the Tier 1 GROs on Tables 7 – 12. A complete copy of the groundwater analytical reports has been provided in Appendix H.

Recognized Environmental Conditions

The results of the Phase II ESA confirmed that the Site's soil and groundwater have been impacted as a result of historical operations conducted at the Site, including, but not limited to the following on-site RECs:

- Use of the Site for industrial purposes since at least 1923;
- Historical presence of USTs and ASTs on the site including UST removals in 2008;
- Visibly stained soil observed during the site reconnaissance;
- Historic site building demolition and associated presence of demolition debris.

Contaminants-of-Concern

Based on the results of the Tier 1 Evaluation, the following contaminants-of-concern have been identified at the Site:

- 1,1,1-Trichloroethylene
- Vinyl Chloride
- 2,4-Dimethylphenol
- Carbazole
- 2,4,6-Trichlorophenol
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(a)pyrene
- Indeno(1,2,3-cd)pyrene
- Dibenzo(a,h)anthracene
- Benzo(k)fluoranthene
- Naphthalene
- Arsenic
- Chromium
- Lead
- Manganese
- Mercury

Exposure Pathways

Based on the results of the Tier 1 Evaluation, the following exposure pathways have been identified at the Site:

- Soil Ingestion (Residential)
- Construction Worker Inhalation
- Construction Worker Ingestion
- Soil Migration to Groundwater (Class I and Class II)
- Groundwater Ingestion (Class I)

1.0 INTRODUCTION

1.1 Project Overview

Brecheisen Engineering, Inc. (BEI) was engaged by the City of Chicago Department of Environment (CDOE) to perform a Phase II Environmental Site Assessment (Phase II ESA) at the former D.A. Stuart Oil Co. Site located at 2727 South Troy Street in Chicago, Illinois (the Site). The performance of the Phase II ESA was necessary to characterize the nature and extent of petroleum impacts related to historical lubricating oil manufacturing operations at the Site in accordance with the recognized environmental conditions (RECs) identified during the completion of a Phase I Environmental Site Assessment (Phase I ESA) for the Site.

The Phase I ESA was completed on October 30, 2008 by Environmental Design International (EDI). The Phase I ESA identified the following RECs for the Site:

- Use of the Site for industrial purposes since at least 1923;
- Historical presence of USTs and ASTs on the site including UST removals in 2008;
- Visibly stained soil observed during the site reconnaissance;
- Potential enforcement actions taken against the property;
- Neighboring Celotex Corporation superfund site east/southeast of the Site located at 2800 S. Sacramento Blvd.

The purpose of the Phase II ESA was to characterize potential impacts related to the on-Site RECs through the advancement of test pits, soil borings, the installation of monitoring wells, and the laboratory analyses of soil and groundwater. Soil borings were intended to characterize both the fill materials and subsurface soils at the Site.

1.2 Site Location

The Site was located adjacent to a former spur of the Illinois Central Rail Road (I.C.R.R.) northeast of the intersection of West 28th Street and South Troy Street in Chicago, Illinois. The Site was situated in the southwest ¼ of Section 25, Township 39 North, and Range 13 East of the Third Principal Meridian in Cook County. The Site has been shown relative to surrounding geographical features on the Site Location Map included as Figure 1.

1.3 Site Description

The Site was an approximate 0.54-acre triangular parcel of vacant land. The perimeter was secured with a fence. The Site was comprised of the following parcel:

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16-25-304-009	Complete PIN

North: North of the site was an unused former rail spur and a commercial studio beyond which was residential development.

South: South of the Site was a former portion of the Illinois Central Rail Road (I.C.R.R.) beyond which was a vacant lot associated with an abandoned warehouse east of the Site. Beyond the vacant lot was West 28th Street followed by residential development.

East: East of the Site was a former portion of the I.C.R.R. beyond which was an abandoned warehouse followed by the Celotex superfund site and a Cook County correctional facility.

West: West of the Site was South Troy Street beyond which was mixed residential and commercial beyond which was South Kedzie Avenue.

1.4 Recognized Environmental Conditions

The conclusions presented in the Phase I ESA identified the following RECs at the Site.

On-Site

- *Use of the subject site for industrial purposes since at least 1923;*
- *Historical presence of USTs and ASTs including UST removals in 2008;*
- *Visibly stained soil;*
- *Potential enforcement actions taken against the property;*

Off-Site

- *Presence of a neighboring Celotex Corporation Superfund site to the southeast of the Site*.

The on-site RECs have been shown on the Site Features Map, included as Figure 2.

1.5 Documents Reviewed

During the performance of the Phase II ESA, BEI referred to Illinois Administrative Code (IAC) Title 35 Part 740, *Site Remediation Program,* and Part 742, *Tiered Approach to Corrective Action Objectives* (TACO), and the IEPA-published "Chemicals Not in TACO" Tier I Tables. BEI reviewed the October 8, 2008 *Phase I ESA* prepared by EDI, the February 10, 2009 *Limited Phase II ESA* by EDI, and the December 2008 *Underground Storage Tank Removal Report* prepared by Aecom. BEI also reviewed the November 14, 1988 *Report for Soil Boring Investigation at Stuart Ironsides* and the August 15, 1989 *Draft Report for Soil Boring Installation at the Stuart-Ironsides Troy Street Facility* prepared by Maecorp.

1.6 Specific Tasks Undertaken

The Phase II ESA consisted of the following elements.

1.6.1 Site-Specific Sampling Plan

Based on the nature and locations of the RECs described in Section 1.4, BEI proposed a site-specific Sampling Plan to the CDOE for review and approval. Upon CDOE approval of the Sampling Plan, BEI performed the Phase II ESA.

1.6.2 Soil Investigation

Five (5) Test Pits were excavated and twelve (12) soil borings were drilled in the areas most likely to have been impacted by the RECs identified at the Site. With the exception of Test Pit 4, at least two (2) soil samples from each soil boring were analyzed for various combinations of total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, herbicides, polynuclear aromatic hydrocarbons (PNAs), RCRA Metals, and fraction of organic carbon (f_{oc}).

1.6.3 Groundwater Investigation

Three (3) soil borings were completed as 1-inch diameter PVC monitoring wells in the areas most likely to have been impacted from the RECs identified at the Site. Groundwater samples were collected from each monitoring well for various combinations of VOCs, SVOCs, PCBs, pesticides, herbicides, PNAs, and RCRA Metals. In addition, monitoring well top-of-casing elevations were surveyed and groundwater elevations were measured and the groundwater flow direction beneath the Site was determined.

1.6.4 Phase II ESA Report

The Phase II ESA Report has presented the methods and results of the field sampling activities, including a comparison of the laboratory analytical results to the applicable TACO Tier 1 Remediation Objectives. The analytical tables, figures and appendices have been included in conformance with the CDOE-prescribed report format.

1.7 Limitations and Exceptions

The purpose of the Phase II ESA was limited to the assessment of on-Site RECs and was not intended to assess off-Site RECs. No Plat of Survey was available to verify the Site boundary. The Site property line was estimated based on historical Sanborn fire insurance maps, and field measurements.

2.0 SITE CHARACTERIZATION

2.1 Physical Setting

2.1.1 Site Topography

Based on the 1997 United States Geological Survey (USGS) Englewood Quadrangle Map, the elevation of the Site appeared to be 593 feet above mean sea level (Figure 1). Based on field observations, the topography of the Site involved a gradual drop in elevation toward the west.

2.1.2 Site Geology/Hydrogeology

Based on the Illinois State Geological Survey (ISGS) Circular 460, the Site was situated on the Carmi Member of the Equality Formation. The Carmi Member of the Equality Formation was described as "largely quiet-water lake sediments; dominantly well bedded silt, locally laminated and containing thin beds of clay; local lenses of sand and sandy gravel along beaches."

2.1.3 Surface Water Bodies

According to the 1997 USGS Englewood Quadrangle Map, the closest surface water body was the Chicago Sanitary and Ship Canal, which was located approximately 1,800 feet south of the Site.

2.1.4 Wetlands

Wetland maps were not reviewed as part of the Phase II ESA.

2.1.5 Flooding

Floodplain maps were not reviewed as part of the Phase II ESA.

2.2 Site History

The Site is currently a vacant triangular parcel secured with a fence around its perimeter. Prior to the Site's vacancy, it was utilized as a lubricating oil & grease manufacturing facility from at least 1923 through 1988.

Based on a review of historical Sanborn maps, the Site was vacant in 1896. By 1923, the Site was occupied by D.A. Stuart & Co. and was described as "Lubricating Oil & Grease." Two (2) Site buildings existed. The main Site building occupied the west-central portion of the Site and was served by a rail spur inside the eastern Site boundary. The second building was described as "oil boiling kettles" and was located on the southernmost portion of the Site.

In 1950, the Site was occupied by D.A. Stuart Oil Co, Ltd. The facility had expanded since 1923. The original Site building was described as a "factory" and a new 3-story building with a basement was shown along the northern portion of the Site, which had been vacant in 1923.

Fifteen (15) lubricating oil tanks were shown outside the main Site building on the northeastern portion of the Site. The Site remained in this configuration until at least 1988.

In 1988 and 1989, at least two (2) subsurface investigations were conducted at the Site for Stuart-Ironsides, Inc. The soil boring investigation reports documented heavy visual and olfactory evidence of contamination and analytical confirmation of elevated levels of petroleum hydrocarbons related to the manufacturing and storage of oil and grease products. By 1999, certain portions of the Site buildings had been demolished. Only an approximate 35-feet by 125-feet rectangular Site building remained along the western Site boundary. The final Site building was demolished in 2008 and no structures currently exist at the Site.

In 2008, after the final Site building had been demolished, three (3) underground storage tanks (USTs) were removed from the Site. The USTs were formerly located on the southern portion of the Site (Figure 2). The USTs were removed in the presence of a CDOE Inspector. No release was reported for any of the three (3) USTs removed from the Site in 2008.

Based on a review of the standard environmental database, the Site was identified in the FINDS, UST and LUST databases. An October 27, 1953 permit was issued to install one 12,000-gallon fuel oil tank at the Site. A November 13, 1959 permit was issued for the installation of one 18,000-gallon lubricant oil tank. On April 8, 1992, the Illinois Emergency Management Agency (IEMA) was notified of a release of fuel oil at the Site and Leaking Underground Storage Tank (LUST) Incident No. 920922 was assigned to the Site. The LUST incident was assigned to GM Wrecking, Inc. located in Thornton, Illinois. The LUST incident is active.

3.0 SITE INVESTIGATION

3.1 Site-Specific Sampling Plan

In order to investigate the RECs identified in the Phase I ESA, BEI prepared a site-specific Sampling and Analysis Plan (SAP). The SAP consisted of two components. The first component involved the excavation of multiple test pits over various portions of the Site in order to identify remnant foundations and demolition debris. The second component involved the completion of twelve (12) soil borings and three (3) one-inch monitoring wells to assess the potential impacts to soil and groundwater. A copy of the site-specific SAP has been included in Appendix A.

3.1.1 Test Pits

Five (5) test pits were excavated as part of the Phase II ESA to determine the soil types and contaminant concentrations over different areas of the Site. Soil samples were collected at various locations along the test pits using the bucket of the backhoe. Soil samples were collected from the surficial soils (0-3 feet BSG) and from a deeper soil horizon (3-6 feet BGS) at each test pit sampling location. The test pit soil samples were analyzed for SVOCs, TPH-DRO, and TPH-GRO.

Three (3) test pits were originally specified to be excavated to the water table. The test pit locations were specified in the vicinity of where potential foundation or demolition debris may have been present within areas of known or potentially contaminated soils (Appendix A). Based on field conditions encountered, Test Pit 1 was not excavated in its entirety due to the presence of a 12-inch thick reinforced concrete slab. As a result, Test Pit 4 and Test Pit 5 were field-specified and excavated. Five (5) test pits were excavated as summarized on the following Table 3.1.1.

Table 3.1.1
Amended Test Pit Sampling and Analysis Plan

REC	PIN	Test Pit ID	Soil Samples	Analyses Performed
Former Lubricating Oil ASTs/Cleaning & Painting	16-25-304-009-0000	TP-1A[1] TP-1B TP-1C[1]	6	TPH - GRO/DRO SVOCs
Former Building Foundation C&D Volume Stained Soil	16-25-304-009-0000	TP-2A TP-2B TP-2C	6	TPH - GRO/DRO SVOCs
Former Oil Boiling Kettles	16-25-304-009-0000	TP-3A TP-3B	4	TPH - GRO/DRO SVOCs
Former Oil ASTs Barrel Cleaning & Painting Former Building Foundation C&D Volume	16-25-304-009-0000	TP-4[2]	Not Sampled	--
Former Building Foundation C&D Volume Stained Soil	16-25-304-009-0000	TP-5A[2] TP-5B[2]	4	TPH - GRO/DRO SVOCs

[1]Not Performed due to the presence of a 12-inch thick reinforced concrete slab.

[2]Test Pits 4 & 5 were field-specified based on site-specific conditions encountered February 17, 2010.

On February 17, 2010, BEI mobilized to the Site to direct the excavation of the test pits specified in the SAP (Appendix A), as amended per Table 3.1.1. Subsurface excavation was achieved with a CAT 315 track-mounted backhoe. The test pits were typically excavated to a depth of approximately 6-7 feet, which was where a native silty clay soil was encountered. Test Pit 3 was excavated to approximately 12 feet BSG in the vicinity of TP-3B. Zachery Clayton from the CDOE and Meredith Westover from RMT, Inc. were present on-site during the test pit excavation activities. Photographs of the test pit excavation activities have been provided in Appendix B.

Visual staining and strong petroleum odors were observed in the Site's soils throughout the duration of the test pit excavation activities. Based on the field observations, impacted soil appeared to exist from surface grade to a depth of approximately 6-7 feet below grade, where the brown/gray native silty clay horizon was encountered. Soil samples were retrieved from

the test pit floor and sidewalls using the bucket of the backhoe. The soil samples were transferred directly from the bucket of the backhoe into the laboratory-provided sample jars. A duplicate portion of sampled soil was then sealed in a pre-labeled plastic bag and set aside to be field screened. Soil samples were classified by BEI using the United Soil Classification System (USCS).

After a sufficient time had elapsed to allow the soil vapors to equilibrate with the air in the sample bags, the sealed soil vapors were field screened using a MiniRae 3000 Photo-ionization Detector (PID). This device was sensitive to vapor phase VOCs and SVOCs, and provided a preliminary indication of soil quality by quantifying the hydrocarbon vapors trapped in the headspace of the bags. A complete description of field observations has been provided on the Test Pit Logs included in Appendix C. The actual test pit sampling locations have been shown on Figure 3.

3.1.2 Soil Borings

Twelve (12) soil borings were drilled as part of the Phase II ESA to characterize impacts associated with the Site's historic use and identified RECs for both the fill material and subsurface material at the Site. In general, the soil borings were intended to establish the presence or absence of soil impacts associated with the Site's RECs. Therefore, sampling locations were chosen in the areas most likely to have been impacted based on the on-Site RECs. The purpose of each soil boring has been summarized on Table 3.1.2.

Table 3.1.2
Soil and Groundwater Sampling and Analysis Plan

REC	PIN	SBs	MWs	Soil Samples	Groundwater Samples	Analyses Performed[1]
Former Lubricating Oil ASTs/Cleaning & Painting	16-25-304-009-0000	B-1 B-2 B-3 B-4 B-5 B-6	MW-1	12	1	VOCs SVOCs Pesticides/PCBs TAL Inorganics Herbicides TPH - GRO/DRO
Former Fuel Oil & Gas Powered Steam Electric	16-25-304-009-0000	B-7	MW-2	2	1	VOCs PNAs RCRA 8 Metals TPH - GRO/DRO
Former Building Foundation C&D Volume	16-25-304-009-0000	B-8 B-9 B-10 B-11	-	8	0	VOCs SVOCs Pesticides/PCBs TAL Inorganics Herbicides TPH - GRO/DRO Waste Characterization[2]
Former Oil Boiling Kettles	16-25-304-009-0000	B-12	MW-3	2	1	VOCs PNAs RCRA 8 Metals TPH - GRO/DRO

[1] B-1/MW-1 and B-10 selected for TCL analyses (VOCs, SVOCs, Pesticides/PCBs, TAL Inorganics & Herbicides). Remaining soil and groundwater samples analyzed for reduced list of VOCs, PNAs, & RCRA 8 Metals.

[2] B-8 selected for waste scan analysis (Illinois Green Sheet).

On February 26, 2010, BEI managed the advancement of soil borings B-1 through B-12 at the Site. One (1) soil boring was advanced to a terminal depth of 24-feet to characterize the Site's geology and to determine the location of potential water bearing units. Eight (8) soil borings were advanced to a terminal depth of 16-feet. Three (3) soil borings were advanced to a terminal depth of 6-feet due to refusal. Subsurface penetration was achieved using a truck-mounted Geoprobe using standard dual-tube sampling techniques. Soil samples were retrieved from each depth interval in sterile PVC liners. Soil samples were collected continuously at 3-foot intervals and classified by BEI using the USCS. Geoprobe drill rods and sampling barrels were decontaminated between soil borings using an on-site steam cleaner. Zachery Clayton from the CDOE and Meredith Westover from RMT were present on-site during the soil sampling activities. Photographs of Site Investigation activities have been included in Appendix B.

Free-phase oil was observed in contact with the Site's soils at B-1 (6-9) and B-2 (6-9). Soil samples were transferred directly from the geoprobe liner sleeve into the laboratory-provided sample containers using dedicated latex gloves for each sample interval, labeled, designated for potential analysis, and placed in a cooler on ice to maintain a temperature of 4^{o}C. A duplicate portion of sampled soil was sealed in a pre-labeled plastic bag and set aside to be field screened. Soil samples from each depth interval were classified according to their predominant geological characteristics. After a sufficient time had elapsed to allow the soil vapors to equilibrate with the air in the sample bags, the sealed soil vapors were field screened using the PID. A complete description of field observations has been provided on the Soil Boring Logs in Appendix D. The soil boring locations have been shown on Figure 4.

3.1.3 Monitoring Wells

Three (3) soil borings were completed as 1-inch PVC monitoring wells. The monitoring well locations have been shown on Figure 4. The purpose of each monitoring well was summarized on Table 3.1.2. In general, the monitoring wells were intended to establish the presence or absence of groundwater impacts associated with the RECs illustrated on Figure 2. Thus, monitoring well locations were chosen in the areas most likely to have been impacted.

On February 26, 2010, soil borings B-1, B-7 and B-12 were completed as monitoring wells MW-1, MW-2 and MW-3, respectively. Monitoring wells were constructed of 1-inch diameter Schedule 40 PVC materials and included a 10-foot screen with 0.010-inch slotted openings. The screened interval was constructed from approximately 5 – 15 feet below grade in order to intersect the water table. Annular space surrounding the well screen was filled with filter sand (quartz #5) and then sealed with bentonite pellets. Monitoring wells were completed with flush mount vaults held in-place with concrete. Zachery Clayton from the CDOE and Meredith Westover from RMT were present on-site during the monitoring well construction activities. Monitoring well construction logs have been provided in Appendix E.

Upon completion of well installation activities, top-of-casing elevations were surveyed relative to an arbitrarily assigned datum of 100.00-feet. Monitoring wells were developed by

purging groundwater from each well using a dedicated disposable bailer and dedicated sterile latex sampling gloves. Groundwater was purged until each well was dry.

On March 10, 2010, after sufficient time had elapsed to allow groundwater to charge the monitoring wells, BEI mobilized to the Site to collect groundwater samples. Dedicated bailers and latex gloves were then used to extract groundwater from the monitoring wells. The entire well volume of groundwater was required to fill the laboratory-provided sample bottles. Therefore, monitoring wells were not purged prior to the collection of groundwater samples because the slow recharge rate would have prevented the collection of all the necessary groundwater samples.

Groundwater was transferred directly from the dedicated bailer into the laboratory-provided sample bottles. In addition, a small section of plastic sheeting was placed on the ground as a liner to prevent the bailer twine from imparting any surficial sediment into any of the groundwater monitoring wells. All groundwater samples were labeled and placed in a cooler on ice to maintain the required temperature of 4^{o}C until they were delivered to an Illinois-accredited laboratory under standard chain-of-custody procedures. Free-phase oil was observed within MW-1 during groundwater sampling activities. BEI was accompanied by Meredith Westover from RMT, Inc. during the groundwater sampling activities.

On March 18, 2010, after sufficient time had elapsed to allow groundwater levels to equilibrate, BEI mobilized to the Site and collected groundwater elevation data using a Solinst^{TM} electronic water level meter. To minimize the potential for cross contamination, monitoring wells were gauged in the following order: MW-2, MW-3, and MW-1. In addition, the water level meter was decontaminated after its use in each well using an Alconox^{TM} solution and distilled rinse-water. Based on the top-of-casing elevations and the depth-to-water measurements, groundwater elevations beneath the Site were calculated and have been summarized on the following table.

Table 3.1.3
Groundwater Elevation Summary (March 18, 2010)

Monitoring Well ID	MW-1	MW-2	MW-3
Top-of-Casing Elevation (ft)	100.00	98.96	99.64
Depth-to-Groundwater (ft)	3.04	7.90	9.79
Groundwater Elevation (ft)	96.96	91.06	89.85

Based on the hydraulic gradient beneath the Site, groundwater flow is to the west. A Groundwater Contour Map depicting the groundwater flow direction has been provided as Figure 5.

3.1.4 Soil Sample Selection

The analyses performed and the associated rationale for each soil sample has been summarized on the following table.

Table 3.1.4
Soil Sample Selection Rationale

Boring ID	Analyses Performed				Rationale
	Shallow	Depth	Deep	Depth(s)	
TP-1	SVOCs, TPH	2	SVOCs, TPH	5	Former Lubricating Oil ASTs; Potential Demolition Debris
TP-2A	SVOCs, TPH	1	SVOCs, TPH	4	Building Demolition Debris
TP-2B	SVOCs, TPH	2	SVOCs, TPH	6	Stained Soil
TP-2C	SVOCs, TPH	2	SVOCs, TPH	5	Potential Demolition Debris; Stained Soil
TP-3A	SVOCs, TPH	3	SVOCs, TPH	6	Former Oil Boiling Kettles; Potential Demolition Debris
TP-3B	SVOCs, TPH	2	SVOCs, TPH	5	Former Oil Boiling Kettles; Potential Demolition Debris
TP-4	Not Sampled	NA	Not Sampled	NA	Potential Demolition Debris
TP-5A	SVOCs, TPH	2	SVOCs, TPH	5	Stained Soil
TP-5B	SVOCs, TPH	2	SVOCs, TPH	5	Potential Demolition Debris
B-1	VOCs, SVOCs, Pest/PCBs, Herbicides, TAL Metals, TPH	3-6	VOCs, SVOCs, Pest/PCBs, Herbicides, TAL Metals, TPH	6-9	Former Lubricating Oil ASTs; Former Barrel Cleaning & Painting; Potential Demolition Debris
B-2	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	3-6 6-9	Former Lubricating Oil ASTs; Former Barrel Cleaning & Painting; Potential Demolition Debris
B-3	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	9-12	Former Lubricating Oil ASTs; Former Barrel Cleaning & Painting; Potential Demolition Debris
B-4	VOCs, PNAs, RCRA 8 Metals, TPH	3-6	VOCs, PNAs, RCRA 8 Metals, TPH	6-9	Former Lubricating Oil ASTs; Former Barrel Cleaning & Painting; Potential Demolition Debris
B-5	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	3-6	Former Lubricating Oil ASTs: Former Barrel Cleaning & Painting Potential Demolition Debris
B-6	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	3-6	Former Lubricating Oil ASTs: Former Barrel Cleaning & Painting Potential Demolition Debris
B-7	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	6-9	Potential Demolition Debris
B-8	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	3-6 6-9	Stained soils; Potential Demolition Debris
B-9	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	6-9	Former Building Demolition Debris
B-10	VOCs, SVOCs, Pest/PCBs, Herbicides, TAL Metals, TPH	0-3	VOCs, SVOCs, Pest/PCBs, Herbicides, TAL Metals, TPH	6-9	Former Site USTs; Potential Demolition Debris
B-11	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	3-6	Former Building Demolition Debris
B-12	VOCs, PNAs, RCRA 8 Metals, TPH	0-3	VOCs, PNAs, RCRA 8 Metals, TPH	6-9	Former Oil Boiling Kettles; Potential Demolition Debris

Note: All depths are measured in feet.

With the exception of Test Pit 4, at least two (2) soil samples were submitted from each test pit and soil boring for laboratory analyses of the targeted analytes. One (1) shallow soil sample was collected from the surficial soils (typically 0'-3') and one (1) deeper soil sample was collected from the soil horizon potentially impacted based on field observations and PID readings. If no potential impacts were observed, the soil sample just above the soil-groundwater interface was collected for analysis. No soil samples were submitted for analysis from Test Pit 4.

A total of four (4) soil samples were submitted for laboratory analyses of the constituent lists specified in 35 IAC 740, Appendix A (VOCs, SVOCs, Pesticides/PCBs and TAL Metals) and Herbicides. Forty (40) soil samples were analyzed for TPH-DRO and TPH-GRO. Twenty (20) soil samples were analyzed for VOCs, twenty-two (22) soil samples were analyzed for PNAs and RCRA 8 Metals/pH. One (1) soil sample was analyzed for fraction organic carbon (f_{oc}). One (1) soil sample was analyzed for the Illinois Greensheet waste disposal parameters. One (1) soil sample was analyzed for TCLP lead. The soil sample with the highest detected concentration of total lead was designated for TCLP lead analyses in order to determine whether the soil at the Site exhibited hazardous toxicity characteristics. All soil samples selected for laboratory analyses were labeled and maintained at 4^{o}C until they were delivered to an Illinois-accredited laboratory under the appropriate chain-of-custody procedures.

3.1.5 Groundwater Sample Selection

The analyses performed and the associated rationale for the groundwater sample selection has been summarized on the following table.

Table 3.1.5
Groundwater Sample Selection Rationale

Well ID	Analyses Performed	Rationale
MW-1	VOCs, SVOCs, Pest/PCBs, Herbicides, TAL Metals	Former Lubricating Oil ASTs; Former Barrel Cleaning & Painting; Potential Demolition Debris
MW-2	VOCs, PNAs, RCRA 8 Metals	Potential Demolition Debris
MW-3	VOCs, PNAs, RCRA 8 Metals	Former Oil Boiling Kettles; Potential Demolition Debris

One (1) groundwater sample was submitted for laboratory analyses of the constituent lists specified in 35 IAC 740, Appendix A (VOCs, SVOCs, Pesticides/PCBs and TAL Metals) and Herbicides. Two (2) groundwater samples were analyzed for a reduced list of VOCs, PNAs and RCRA (8) Metals.

3.2 Analytical Results

3.2.1 Soil Tier 1 Evaluation

Soil analytical results were compared to the residential Tier 1 Soil Remediation Objectives (Tier 1 SROs) published in 35 IAC 742 (TACO). Soil analytical results were also compared to the construction worker Tier 1 SROs in consideration of future redevelopment activities. The Tier 1 SROs represent acceptable baseline contaminant concentrations that are based on a conservative exposure scenario.

No PCBs, pesticides, or herbicides were detected in any of the soil samples analyzed. However, certain VOCs, SVOCs, PNAs, and RCRA metals were detected at levels exceeding the most stringent residential Tier 1 SROs for various exposure pathways. In addition, elevated levels of TPH-DRO were detected in the Site's soils. The highest levels of TPH-DRO were detected immediately west and south of the former lubricating oil ASTs. The highest detected concentration of TPH-DRO was 196,000 mg/kg at B-8 (3-6). The fraction of organic carbon was 0.02%. Soil analytical results have been summarized on Tables 1 - 6, and the complete soil laboratory analytical reports have been included in Appendix F. Chromatograms from the TPH-DRO analyses have also been provided in Appendix G.

Tier 1 exceedances for each exposure pathway have been discussed individually in the following subsections.

Soil Ingestion Exceedances

Certain PNAs and RCRA Metals were detected at levels exceeding the Tier 1 SROs for the Soil Ingestion Exposure Pathway at the locations summarized on the following table.

Table 3.2.1
Soil Ingestion Exceedances

Sample ID	Depth (ft)	Contaminant(s) exceeding Tier 1 SROs for Soil Ingestion
TP-1	2	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene
TP-2A	4	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
TP-2B	2	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene
TP-2C	2	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
TP-2C	5	Benzo(a)pyrene
TP-3A	3	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
TP-3B	2	Benzo(a)anthracene
TP-3B	5	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene
TP-5A	2	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene

Sample ID	Depth (ft)	Contaminant(s) exceeding Tier 1 SROs for Soil Ingestion
TP-5A	5	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene
TP-5B	2	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
TP-5B	5	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-1	3-6	Pentachlorophenol
B-1	6-9	Pentachlorophenol
B-2	0-3	Lead
B-3	0-3	Benzo(b)fluoranthene, Dibenzo(a,h)anthracene
B-4	3-6	Arsenic
B-5	0-3	Benzo(b)fluoranthene, Benzo(a)pyrene, Arsenic, Lead
B-5	3-6	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-6	0-3	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-6	3-6	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-7	0-3	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-9	0-3	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-10	0-3	Benzo(b)fluoranthene, Benzo(a)pyrene, Pentachlorophenol, Lead
B-11	3-6	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene
B-12	0-3	Benzo(b)fluoranthene, Lead

The estimated extent of impacted soils exceeding the Tier 1 SROs for the soil ingestion exposure pathway has been shown on Figures 6A (surficial soils from 0-3 feet below grade) and 6B (subsurface soils from 3-6 feet below grade). The TPH-DRO results for surficial and subsurface soil have also been summarized on respective Figures 6A and 6B.

Construction Worker Exceedances

Naphthalene, mercury and lead were detected at levels exceeding the construction worker Tier 1 SROs for the soil inhalation and soil ingestion exposure pathways at the sampling locations summarized on the following table.

Table 3.2.2
Construction Worker Exceedances

Boring ID	Sample Depth (ft)	Contaminant(s)	Pathway Exceeded
TP-1	2	Naphthalene	Inhalation
TP-2B	2	Naphthalene	Inhalation
TP-5A	2	Naphthalene	Inhalation
TP-5A	5	Naphthalene	Inhalation
B-2	0-3	Lead	Ingestion
B-3	0-3	Mercury	Inhalation
B-5	3-6	Mercury	Inhalation
B-6	0-3	Mercury	Inhalation
B-6	3-6	Mercury	Inhalation
B-11	3-6	Mercury	Inhalation
B-12	0-3	Lead Mercury	Ingestion Inhalation

The estimated extent of impacted soils exceeding the Tier 1 SROs for Construction Worker Inhalation and Ingestion exposure pathways has been shown on Figure 7.

Soil Inhalation Exceendances
None of the targeted analytes were detected in the Site's soils at levels exceeding the Tier 1 SROs for the residential soil inhalation exposure pathway. This exposure pathway was eliminated from further consideration.

Soil Migration to Groundwater Exceedances
Certain VOCs, SVOCs, PNAs, and RCRA Metals were detected at levels exceeding the Tier 1 SROs for the Soil Migration Groundwater at the locations summarized on the following table.

Table 3.2.3
Soil Migration to Groundwater Exceedances

Sample ID	Depth (ft)	Contaminant(s) exceeding Soil Migration to Groundwater	Class
TP-1	2	Benzo(a)anthracene Benzo(b)fluoranthene	I & II
TP-2A	4	Benzo(a)anthracene Benzo(b)fluoranthene	I
TP-2C	2	Benzo(a)anthracene	I
TP-3B	2	Benzo(a)anthracene	I
TP-5A	5	2,4-Dimethylphenol	I & II

Sample ID	Depth (ft)	Contaminant(s) exceeding Soil Migration to Groundwater	Class
TP-5B	2	Benzo(a)anthracene Benzo(b)fluoranthene	I
TP-5B	5	Benzo(a)anthracene Benzo(b)fluoranthene Carbazole	I
B-1	3-6	2,4,6-Trichlorophenol Pentachlorophenol	I & II
B-1	6-9	Pentachlorophenol	I & II
B-2	0-3	Lead	I & II
B-3	0-3	Chromium	I
B-4	3-6	1,1,1-Trichloroethane	I & II
B-5	0-3	Chromium Lead	I
B-5	3-6	Benzo(a)anthracene Benzo(b)fluoranthene Lead	I
B-6	0-3	Lead	I
B-6	3-6	Benzo(a)anthracene Benzo(b)fluoranthene Benzo(a)pyrene Chromium	I & II
B-7	0-3	Benzo(a)anthracene	I
B-8	0-3	Lead	I
B-9	0-3	Benzo(a)anthracene	I
B-10	0-3	Pentachlorophenol Lead	I & II
B-11	0-3	Chromium	I
B-11	3-6	Benzo(a)anthracene	I
B-12	0-3	Lead	I

The estimated extent of impacted soils exceeding the Tier 1 SROs for Soil Migration to Groundwater has been shown on Figure 8.

Toxicity Characteristic Leaching Procedure

The soil sample exhibiting the highest detected level of total lead was designated for TCLP lead analyses to determine if soil at the Site exhibited hazardous toxicity characteristics. Soil sample B-2 (0-3) contained the highest detected lead concentration of 1,260 mg/kg. This soil sample was then analyzed for TCLP lead. The TCLP lead result was 4.11 mg/L, which was less than the hazardous toxicity threshold criteria of 5.0 mg/L pursuant to 40 CFR 261. In addition, the waste characterization sample analyzed for the Illinois Greensheet waste disposal parameters did not exhibit hazardous toxicity characteristics pursuant to 40 CFR 261. Therefore, no hazardous materials were identified at the Site.

3.2.2 Groundwater Tier 1 Evaluation

Groundwater analytical results were compared to the Tier 1 Groundwater Remediation Objectives (Tier 1 GROs) published in 35 IAC 742. The Tier 1 GROs represent acceptable baseline contaminant concentrations based on a conservative exposure scenario. No SVOCs, PNAs, PCBs, pesticides or herbicides were detected at levels exceeding the Tier 1 GROs. However, the groundwater analytical results indicated that vinyl chloride and certain RCRA Metals (lead and manganese) were detected in the Site's groundwater at levels exceeding the Tier 1 GROs for Class I groundwater at the locations summarized on the following table.

Table 3.2.4
Groundwater Ingestion Exceedances

Well ID	Contaminant(s)	Class
MW-1	Lead Manganese	I
MW-3	Vinyl Chloride	I

The estimated extent of groundwater impacts exceeding the Tier 1 GROs for Class I groundwater has been shown on Figure 9. Groundwater analytical results have been summarized on Tables 7 through 12. The complete groundwater laboratory analytical reports have been included in Appendix H.

4.0 SUMMARY AND CONCLUSIONS

4.1 Overview

BEI performed a Phase II ESA at the former D.A. Stuart Oil Co. Site located at 2727 S. Troy Street in Chicago, Illinois. The performance of the Phase II ESA was intended to establish the presence or absence of impacts associated with any of the on-site RECs identified during the completion of a Phase I ESA for the Site. The purpose of the Phase II ESA was to characterize potential impacts associated with the RECs through the excavation of test pits, the advancement of soil borings, the installation of monitoring wells, and the laboratory analyses of soil and groundwater samples.

4.1.1 Soil Investigation

Five (5) test pits were excavated to approximately 6-7 feet deep. Soil samples were collected at various locations along the test pits and analyzed for SVOCs and TPH. Twelve (12) soil borings were drilled in the areas most likely to have been impacted based on the historical Site operations. With the exception of Test Pit 4, at least two (2) soil samples from each test

pit and soil boring were analyzed for various combinations of VOCs, SVOCs, PCBs, pesticides, herbicides, PNAs and RCRA Metals. The test pit and soil boring locations have been shown relative to the RECs for the Site on Figures 3 and 4, respectively. Photographs of Site investigation activities have been included in Appendix B. A complete description of field observations has been provided on the Test Pit Logs and Soil Boring Logs included as Appendix C and Appendix D, respectively.

No PCBs, pesticides, or herbicides were detected at levels exceeding the most stringent residential Tier 1 SROs in any of the soil samples analyzed. However, certain VOCs, SVOCs, PNAs and RCRA Metals were detected in the Site's surficial (0-3) and subsurface soils at levels exceeding the most restrictive Tier 1 SROs for various exposure pathways. In addition, elevated levels of TPH-DRO were detected at the Site.

The estimated extent of impacted soils exceeding the most restrictive Tier 1 SROs has been shown on Figures 6 – 8 for various exposure pathways. Soil analytical results were compared to the most restrictive Tier 1 SROs for residential land use on Tables 1 – 6. A complete copy of the soil analytical reports has been provided in Appendix F. Chromatograms from the TPH-DRO analyses on the soil samples have been included in Appendix G.

4.1.2 Groundwater Investigation

Three (3) soil borings were completed as 1-inch diameter PVC monitoring wells in accordance with the site-specific SAP (Appendix A). Groundwater samples were collected from each monitoring well for various combinations of VOCs, SVOCs, PCBs, pesticides, herbicides, PNAs, and RCRA Metals. Monitoring well locations have been shown relative to the RECs for the Site on Figure 4. Monitoring well construction logs have been included in Appendix E.

No SVOCs, PNAs, PCBs, pesticides or herbicides were detected in the groundwater beneath the Site at levels exceeding the Tier 1 GROs for Class I groundwater. However, vinyl chloride and certain RCRA Metals, including lead and manganese, were detected at levels exceeding the Tier 1 GROs for Class I Groundwater. The estimated extent of groundwater impacts has been shown on Figure 9. Groundwater analytical results were compared to the Tier 1 GROs on Tables 7 – 12. A complete copy of the groundwater analytical reports has been provided in Appendix H.

Monitoring well top-of-casing elevations were surveyed and groundwater elevations were measured using a Solinst™ electronic water level meter in order to determine the regional groundwater flow direction beneath the Site. Based on the measured groundwater elevations beneath the Site, regional groundwater flow direction was determined to be westerly. A groundwater contour map illustrating groundwater flow direction has been provided as Figure 5.

4.2 Recognized Environmental Conditions

The results of the Phase II ESA confirmed that the Site's soil and groundwater have been impacted as a result of historical operations conducted at the Site, including, but not limited to the following on-site RECs:

- Use of the Site for industrial purposes since at least 1923;
- Historical presence of USTs and ASTs on the site including UST removals in 2008;
- Visibly stained soil observed during the site reconnaissance;
- Historic site building demolition and associated presence of demolition debris.

4.3 Contaminants-of-Concern

Based on the results of the Tier 1 Evaluation, the following contaminants-of-concern have been identified at the Site:

- 1,1,1-Trichloroethylene
- Vinyl Chloride
- 2,4-Dimethylphenol
- Carbazole
- 2,4,6-Trichlorophenol
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(a)pyrene
- Indeno(1,2,3-cd)pyrene
- Dibenzo(a,h)anthracene
- Benzo(k)fluoranthene
- Naphthalene
- Arsenic
- Chromium
- Lead
- Manganese
- Mercury

4.4 Exposure Pathways

Based on the results of the Tier 1 Evaluation, the following exposure pathways have been identified at the Site:

- Soil Ingestion (Residential)
- Construction Worker Inhalation
- Construction Worker Ingestion
- Soil Migration to Groundwater (Class I and Class II)
- Groundwater Ingestion (Class I)

5.0 CLOSING REMARKS

No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a Site. The performance of this Phase II ESA was intended to reduce, but not eliminate, uncertainty regarding the potential for soil and / or groundwater contamination in connection with this Site within reasonable limits of time and cost. The information presented herein was based field observations and analytical results from the areas of the Site and media that were actually investigated. BEI makes no express or implied warranties regarding the absence or existence of recognized environmental conditions in areas and/or media that were not investigated as part of this Phase II ESA. This report was prepared exclusively for the City of Chicago Department of Environment and is not for the use or benefit of any other person or entity. The contents of this report may not be quoted in whole or in part. Furthermore, this report may not be relied upon by any person or entity without the express written consent of BEI.

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