Appendix E:
RIR

Remedial Investigation Report

Ebenezer Plaza 2
Brownfield Cleanup Program

NYSDEC Site No. C224241

68-78 New Lots Avenue
Brooklyn, Kings County, New York

February 2017

THE Chazen COMPANIES®
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I Kevin P. McGrath, PG, CPG certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Report was prepared in accordance with all applicable statues and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in general accordance with the DER-guidance and/or NYSDEC approved work plans.

_____
Kevin P. McGrath, PG, CPG

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EXECUTIVE SUMMARY

Ebenezer Plaza 2 (the "Site") is 0.86-acres (33,000 ft²) of developed land in the Brownsville District in Brooklyn, NY. It consists of one city block identified as Block 3861, Lot 1 on the NYC Tax Map. The Site is bounded by New Lots Avenue, Christopher Avenue, Sackman Street, and Hegeman Avenue.

The Site has been developed since circa 1930. Past commercial site uses include auto-wrecking, repair, and maintenance operations. The Site currently contains three single-story buildings with a combined footprint of 28,000 ft². The historic source of contaminants is past automotive-related activities, urban fill, and underground storage tanks. Site soils include urban fill materials overlying native sand. Groundwater is at approximately 15 feet below grade and flows slowly to the south-southeast.

The Remedial Investigation Report (RIR) is a compilation of previous site investigations that were completed prior to entry of the site into the Brownfields Cleanup Program (BCP) (BCP C224241). They were performed to evaluate and delineate the nature and extent of identified historic environmental impacts. This RIR complies the significant data collected and reported in the following documents:

- Limited Phase II ESA, Chazen, 2009
- Remedial Investigation (NYSDEC Spill No. 09-06674), Chazen, 2012
- Phase 1 ESA, Chazen, 2015

The primary site contaminants of concern are VOCs in the soil and groundwater related to the release of petroleum from underground storage tanks located beneath 90 New Lots Avenue, trace to minor concentrations of CVOCs from an unidentified source in groundwater within the western site area, and elevated concentrations of priority pollutant metals in shallow fill in the southwest quadrant of the site presumed to be from decaying vehicles and vehicle parts.

With the exception suspected releases of petroleum from the underground storage tank systems, there is no evidence of catastrophic or sustained releases of regulated substances or disposal of hazardous materials on-site. Impacts observed are likely the result of historic fill used when the site was constructed and lack of attention to housekeeping or environmental stewardship over the long history of Site usages. On site soils impacted with metals and SVOCs are likely associated with the urban fill and storage of motor vehicles. Some evidence of minor releases of dissolved CVOCs were observed beneath the western site area.

The remedial investigation objective for the site which is to sufficiently characterize the nature and extent of impacts so that remedial alternatives and objectives can be evaluated, has been substantially completed although some gaps in the data (see section 5.2) are noted. The

potential sources of contamination associated with former commercial site operations have been identified and impacts to the on-site soils and groundwater confirmed. The available historical data summaries provided to NYSDEC were sufficient for NYSDEC to conclude that Site was eligible for inclusion in the BCP.

A presumptive remedy for the site based on the proposed redevelopment plans for the property including NYCHPD requirements for the intended use (affordable housing) has been proposed by the owner and provided to NYSDEC.

The remedy includes:

- Site-wide excavation to not less than two feet below planned final floor grade with off-site disposal;
- Identification and removal as necessary of impacted soil "hot spots" that are more than 2 feet below grade that exceed the Track 2 clean-up criteria;
- Closure of any underground storage tanks (USTs) identified during the excavation remedy;
- Removal, treatment and permitted discharge of storm water and/or groundwater encountered during excavation;
- Monitoring of site conditions during and after the removal action, and,
- Construction of new buildings across the entire foot-print of the site.

The conceptual redevelopment plans for the Site include appropriate measures that should ensure the protection of public health and the environment by demonstration of at least a Track 2 clean-up for the on-site for soils and a substantial reduction in groundwater impacts and protection of water quality. The reduction of groundwater impacts to drinking water standards may not be achieved. However, since no groundwater users, discharge points, or potential receptors have been identified downgradient from the site, residual impacts will degrade naturally over time with minimal potential consequences.

No further remedial investigation is warranted for the site or adjoining properties. A Remedial Action Work Plan for implementation of the presumptive remedy will be prepared and submitted to NYSDEC for approval.

The plan should include a collection of minimum of 7 waste characterization profile samples of the urban fill with appropriate QA/QC samples with analysis for both Total and TCLP for TCL-VOCs, TCL-SVOCs, TAL-Metals, PCBS, Pesticides, Herbicides, NJ EPH/TPH, and RCRA toxicity characteristics with full Class B deliverable data for the Totals analyses. This sampling is required for identification of off-site disposal facilities and for the acceptance by those facilities and provides the data needed to close the data gaps.

1.0 INTRODUCTION

Ebenezer Plaza 2 (the "Site") identified as NYS BCP number C224241 is 0.46-acres (20,000 ft²) of developed land in the Brownsville District in Brooklyn, NY. The Site, combined with the adjacent city block to the east (Block 3860 Lot 1, a.k.a Ebenezer Plaza 1, BCP No. C224420) was formerly referred to as Linden Plaza.

The Site consists of one city block identified on the New York City Digital tax map as Block 3861, Lots 1 and 6. It is bounded by New Lots Avenue (N), Christopher Avenue (E), Hegeman Avenue (S) and Sackman Street (W). It is approximately 33,000 ft², with 28,000 square feet occupied by two one-story brick structures constructed circa 1930, and a 5,000 ft² dirt driveway and open-air vehicle storage area.

The Chazen Companies (Chazen), on behalf of Ebenezer Plaza Owner, LLC have completed this Remedial Investigation Report (RIR) to satisfy the requirements of the New York State Brownfields Cleanup Program (BCP). The RIR compiles the available environmental data collected from previous investigations and remedial actions into a format consistent with the requirements of Section 3.14 of DER-10. The RIR describes the site investigation activities that were performed to evaluate and delineate the nature and extent of historic environmental impacts and the results of the investigation(s).

1.1 Remedial Investigation Objectives

The objective of the remedial investigations was to delineate the nature and extent of contaminant impacts to soil and groundwater for use in fate/transport assessment, and for use in evaluating and designing appropriate remedial methods, if needed. Investigation objectives were met through field screening of environmental borings and collection of soil and groundwater samples for laboratory analysis to determine the contaminants of concern, and evaluate the potential risks to human health and the environment associated with those risks.

1.2 Site Description

Extensive background information concerning the Site including historical development, usage history, potential site impacts, site description, site history, the area geology and hydrogeology, and known and suspected areas of concern is included in the Limited Phase II, Chazen 2009, Remedial Investigation, Chazen 2012, and Phase I ESA, Chazen 2015 included in **Appendix C** .

A brief summary of the information in those reports is included in the sections below.

1.2.1 Site Location

The Site is a 0.46-acre property situated between New Lots Avenue, Christopher Avenue, Sackman Street, and Hegeman Avenue in Brooklyn, Kings County, New York. The Site is identified

on the Kings County Real Property Tax map as Block 3862, Lots 1. A map illustrating the site location is attached as **Figure 1**. An orthophotograph of the Site and surrounding area is included as **Figure 2**. A NYC Digital Tax Map is included as **Figure 3**.

The Site is located in a dense urban area with highly diverse uses that includes a residences, commercial store fronts and offices, a community center, recreation/athletic fields, a park, an active rail yard, nursing home, and commercial warehouses. The Site is currently zoned M1-1 (Manufacturing District).

The intended future use is a mixed-use multi-story commercial/residential building complex with retail space at grade and high-rise multi-family affordable housing units above. The site will be rezoned to be consistent with the intended use.

1.2.2 Property Uses

The Site is currently commercially developed with single-story tenant spaces and one at grade open automotive storage yard area. The Site is unoccupied as of March 1, 2017.

1.2.2.1 Past Property Uses

Based on the historical sources reviewed as part of the 2015 Phase I ESA, as well as interviews conducted with knowledgeable individuals, former Site uses included auto repair and maintenance, and auto wrecking. Historic mapping indicates vehicle repair garages on Site as early as 1928, and an auto wrecking yard as early as 1950.

1.2.2.2 Current Property Use

The Site is commercially developed and historically occupied by various tenants. The Site most-recently contained automotive body repair shops, vehicle maintenance shops, an auto-dismantling yard, and automotive parts stores. All spaces are planned to be unoccupied as of March 1, 2017.

1.2.2.3 Proposed Future Property Uses

Conceptual redevelopment plans for the Site include the demolition of all existing structures and construction of new multi-story affordable housing complex with street-level retail spaces.

1.2.3 Environmental Setting

This section provides information on the site geology, soils, hydrogeology, surface water resources, and land uses in the site vicinity.

1.2.3.1 Geology

The Surficial Geologic Map of New York (Lower Hudson Sheet, 1989) identifies the native soils as glacially derived outwash sand and gravel. The Geologic Map of New York (Lower Hudson Sheet, 1970), indicates that bedrock is greater than 200 feet below grade and likely to be significantly deeper (up to 2,000 feet below grade). Based on property survey maps, the site is at an elevation of 19.87 to 18.10 feet above mean sea level (AMSL) slightly sloped from the northwest to the southeast corners.

Site soils consist of variable thicknesses of miscellaneous urban fill overlying a relatively well sorted fluvial sand deposit.

> The urban fill consists of a black and/or blackish orange silty-Sand with variable amounts of broken brick, concrete, and asphalt. The fill ranges from less than 1 foot to an observed maximum of seven feet in thickness.
>
> The sand is characterized as mostly medium-sized, with lesser but varying amounts of fine and coarse-sized sand.

Bedrock was not detected at depths up to 25 feet below grade in any boring completed on-site. Area geology maps indicate that bedrock beneath the site may be over 1000 feet below grade.

Available soil boring logs describing subsurface conditions are provided in **Appendix A**.

The locations of stratigraphic cross-sections developed from two intersecting diagonal transects are included **Figure 4.** The cross-sections are included as **Figures 5a and 5b**.

1.2.3.2 Hydrogeology

Groundwater is present at approximately 15 feet below grade (4-6 feet AMSL) across the site with minimal seasonal variation. The water table is relatively flat across the site with a very slight pitch to the south-southeast. The approximate direction of groundwater flow is depicted on **Figure 6**.

Groundwater flows towards the south-southeast with an approximate hydraulic gradient across the site of 0.005 ft/ft. The conductivity of the soils has not been determined but is estimated at 10^{-3} to 10^{-4} cm/sec based on the soil type. Based on this, groundwater flow is estimated between 15 and 150 feet per year.

Site contaminants do not present a direct groundwater exposure pathway due to direct human contact or ingestion. The water table is at fifteen feet below grade with no springs or discharge to surface waters and Site and surrounding area are supplied with municipal water and sewer.

1.2.3.3. Surface Water Resources

No surface water bodies are present on the Site or in the immediate area. The nearest surface water body is Fresh Creek, a tidal tributary to Jamaica Bay, located approximately 4,100 feet southeast of the Site.

1.2.4 Environmental History

Multiple previous investigations and limited remedial actions were conducted on the Site. The reports associated with these environmental actions are provided in **Appendix C**. A brief chronological summary of the completed actions are discussed below. Some items below reference former internal addresses recently consolidated to the site's current single tax parcel identity and address.

2009 Limited Phase II ESA, Chazen.

The Phase II ESA included a distribution of nine soil borings across the Site with collection of soil and groundwater samples for laboratory analysis. Sampling locations were focused on areas of concern identified by a Phase I ESA also completed by Chazen in 2009 (**Appendix C**). The investigation identified VOC-impacts in groundwater extending under the northern and western site areas, and metal impacts in shallow soil within the at-grade automotive yard area.

2011-2012 Remedial Investigation, Chazen.

The Remedial Investigation (RI) was conducted to further delineate Site impacts identified by the 2009 Phase II ESA completed by Chazen. The RI included eleven additional soil borings, monitoring well installations, pilot injection well installations, and the collection of soil and groundwater samples for laboratory analysis. The remedial investigation provided the following conclusions:

- No evidence of VOC impacts were observed in shallow soils above the water table.
- Groundwater sample results confirmed the presence of an impacted area near the northern Site boundary with total VOC concentrations exceeding 100 ug/L (**Figure 5**). Soil and groundwater data from this area suggest a single point of release beneath the building at 90 New Lots Avenue. The associated area of groundwater impacts extends downgradient approximately 100 feet of the source. The sharply decreasing VOC concentrations in the direction of groundwater flow suggest impacts in this area are naturally attenuating within the boundaries of the site.

- Elevated lead, barium, and/or cadmium were reported in three locations (SS-2, SS-3, and SS-4) in surface soils within the auto-dismantling area located in the southern portion of the site (**Figure 4**) at concentrations greater than the NYSDEC Part 375 Restricted-residential Use Soil Cleanup Objectives (RRUSCOs). Neither lead nor barium was detected in groundwater samples collected from this site area during the 2009 Chazen Phase II investigation (SB-17 and SB-18).

- Elevated concentrations of lead and barium are commonly associated with urban soil where demolition debris and/or fill materials of unknown origin have been used. Fill materials and demolition debris was reported in many of the soil borings installed during the investigation.

- Tetrachloroethylene (PCE) was detected in monitoring wells MW-21 and MW-17 ranging from 6.8 µg/l to 25 µg/l, respectively. The distribution of PCE and relatively low reported concentrations indicate that there is no evidence of a significant release or definitive on-site source for PCE.

- The shape of the groundwater impact area extending beneath 90 New Lots Avenue appears consistent with radial diffusion from a point source under low advective transport suggesting a minor point source release may have occurred but was inconclusive.

- A pilot ISCO-injection study confirmed the use of catalyzed hydrogen peroxide as an effective remedy to mitigate VOC impacted groundwater.

2015 Phase I ESA, Chazen. Unknown Status of Underground Storage Tanks (USTs).

The 2015 Phase I ESA identified four historic gasoline USTs located near the northern site boundary. Based on a review of available documents, the status of these tanks is unknown and therefore is considered a significant data gap.

The following tables summarize the total number of discrete borings, temporary groundwater monitoring points (TGSPs), and permanent monitoring wells installed during the various investigations.

Table 1.2.4(a): Total Sampling Points

Investigation	Borings/Surface Sampling Locations		Wells		TGSPs	
	Installed	Samples	Installed	Samples	Installed	Samples
Chazen 2009	9	2	0	0	9	9
Chazen 2011	11	11	8	9	0	0

TOTALS	20	13	7	9	9	9

Table 1.2.4(b) Total Analyses						
Method	8260		8270		Metals	
Reporting List	TCL	CP-51	TCL	CP-51	TAL	RCRA(8)
Chazen 2009	2	0	0	2	0	2
Chazen 2011	7	0	7	0	0	4
TOTALS	9	0	7	2	0	6

Most recent groundwater data from wells sampled multiple times used in final site characterization evaluation.

2.0 SOIL AND GROUNDWATER INVESTIGATIONS

The 2009 Phase II ESA completed by Chazen was not conducted under NYSDEC's oversight. However, the report was subsequently submitted to NYSDEC's spills group and accepted.

The Remedial Investigation activities completed by Chazen between 2011-2012 were performed in general accordance with a Remedial Investigation Work Plan prepared by Chazen and approved by NYSDEC on October 25, 2011.

Field work for the two boring investigations was conducted between 2009 and 2011, resulting in the cumulative installation of twenty soil borings, seven monitoring wells, nine TGSPs, field screening of borings for VOCs, and the collection of soil and groundwater samples. One additional well (IW-2) was installed as part of the pilot ISCO-injection study. Sampling locations are shown on **Figures 4 and 5**.

Samples were shipped to York Analytical Laboratories, a New York State Environmental Laboratory Approval Program (NYS ELAP) certified laboratory, for analysis. Laboratory data result tables for the investigations and post-remedy monitoring completed between 2009 and 2011 are provided in **Appendix B**. The York analytical data reports are provided in **Appendix C**.

The data quality objectives for the investigation work completed to date included ASP Class A deliverable data only. Class B data deliverables with third-party validation and data usability summary reports are not available. NYSDEC EDDs are not available for the existing data but may be created from the existing data reports if necessary.

2.1 Soil Quality Investigations

The field work phases of the two completed boring investigations included soil sampling at a total of 16 boring and 4 surface soil sampling locations.

2.1.1 Soil Boring Installations

All soils borings were installed with a Geoprobe Systems® 6620DT direct push machine. The soil core samples were collected utilizing a Geoprobe® Macro-Core® sampler. The Macro-Core sampler was lined with plastic sleeves which, when removed from the sampler, were cut open vertically to allow examination of relatively undisturbed samples. Geologic observations are presented in Section 1.2.3.1 and in the boring logs included in **Appendix A**.

Soil borings were installed to various depths up to 25 feet below ground surface (bgs). Refusal was not encountered in any boring.

2.1.2 Soil Boring Sampling

At each boring, the soil profile was evaluated and field screened, and select laboratory soil samples were collected consistent with the planned investigation activities. Samples were collected from the depth interval exhibiting the greatest degree of impacts based on field screening. In the absence of field evidence of impacts, samples were taken from the depth interval representing the greatest potential for impacts (bottom depth or water table intersection).

Consistent with planned investigation activities, soil was screened for VOCs using a photoionization detector (PID). Total VOC readings were measured within the headspace above the soil.

Soil samples for analysis were collected into laboratory-supplied containers, which were then labeled and placed in a cooler with ice before being shipped to the analytical laboratory. Standard chain-of-custody procedures were followed. Soil samples were analyzed for contaminants of concern which included VOCs, SVOCs, and/or the eight Resource Conservation and Recovery Act (RCRA) metals.

2.1.3 Surface Soil Sampling

During the 2011 Remedial Investigation, four surface soil samples (SS-1 through SS-4) were collected to confirm the extent of metal impacts within the auto-dismantling yard area that were previously identified by the 2009 Phase II ESA. Samples were collected using hand tools, from depth ranges not exceeding 0 to 2 feet bgs, and placed into laboratory-supplied containers, which were then labeled and placed in a cooler with ice before being shipped to the analytical laboratory. Standard chain-of-custody procedures were followed. Soil samples were analyzed for contaminants for the eight Resource Conservation and Recovery Act (RCRA) metals.

2.1.4 Soil Sampling Results

Analytical soil sampling results with comparison to NYSDEC Part 375 Unrestricted Use (UU) and Restricted-Residential Use (RRU) Soil Cleanup Objectives (SCOs) are provided in attached **Tables 1 through 3**. Hit summaries are included as **Tables 2.1.4a through 2.1.4c**. The hit summary tables include any compound reported in one or more samples at a concentration that exceeds the UUSCO.

Sample results exceeding RRUSCOs are depicted on **Figure 4**. Sample analyses and results for each AOC are discussed below in the following sections. Several trace methylene chloride concentrations were reported below the UUSCO; as methylene chloride is a common laboratory artifact it is not considered a site contaminant or discussed further.

Northern Area. Nine borings were installed (SB-13, SB-14, SB-39, SB-41, SB-42, SB-43, SB-44, SB-45, and SB-46) in exterior sidewalk and interior building areas. Borings SB-14, SB-39, SB-41, SB-43, SB-44, and SB-45 exhibited obvious field evidence of impacts at or above the water table. Soil samples were collected from seven of the nine borings at depth intervals intersecting the water table for analysis of full list VOCs and SVOCs. The results are discussed below with comparison to NYSDEC Part 375 SCOs.

- VOC sample results were less than UUSCOs in four of the seven samples. Petroleum-range VOCs were present in three samples (SB-43, SB-44, SB-45) at concentrations greater than the than UUSCOS, with only trimethylbenzene compounds reported above the RRUSCOs in two samples (SB-43 and SB-44).

- SVOC sample results were less than UUSCOs in five of the seven samples. Napthalene concentrations exceeded the UUSCO in two samples (SB-43 and SB-45) but were below the RRUSCOs.

The VOC and SVOC soil concentrations in this area generally meet the RRUSCOs, with few detected VOCs reported above this threshold in an apparently limited area beneath 90 New Lots Avenue.

Southern Area. This area includes the at-grade automotive dismantling yard. Seven borings total were installed: SB-12, SB-16, SB-19, SB-20, and SB-22 in either sidewalk or interior building areas; and, SB-17 and SB-18 within the automotive yard area. Surface soil samples SS-1 through SS-4 were also collected within the automotive yard area. Borings SB-17, SB-18, and SB-22 exhibited field evidence of VOC impacts based on olfactory and PID screening. Analytical soil samples were limited to the automotive yard area and included six shallow samples (SB-17, SB-18, SS-1 through SS-4) representing soil conditions between grade and five feet bgs. Samples were analyzed for RCRA metals, with the SB-17 and SB-18 samples additionally analyzed for full-list VOCs and NYSDEC CP-51-list SVOCs. The results are discussed below with comparison to NYSDEC Part 375 SCOs.

- VOC sample results were less than UUSCOs in the SB-17 and SB-18 samples.

- Two petroleum-range SVOCs were reported in the SB-17 sample at concentrations exceeding the UUSCOs. One compound, benzo(a)anthracene, also exceeded the RRUSCO.

- Arsenic, barium, cadmium, chromium, and/or lead concentrations exceeded the UUSCOs in all six samples. Barium, cadmium, and/or lead exceeded the RRUSCO in five of the six samples.

The results indicate the presence of select elevated metals and SVOCs in shallow soils within the automotive dismantling yard area. These impacts are likely associated with observed fill soils and/or historic operations within the area.

Table 2.1.4(a)

VOCs in Soil > UUSCOs

Investigation Year:	NYSDEC 6 NYCRR Part 375 SCOs		2011 Remedial Investigation		
Sample Location:			SB-43	SB-44	SB-45
Sampling Date	Unrestricted Use or CP-51 SCLs	Restricted-residential Use	11/22/11	11/22/11	11/22/11
Sample Depth			15-20'	15-20'	15-20'
Units	ppm	ppm	mg/kg	mg/kg	mg/kg
VOCs					
1,2,4-Trimethylbenzene	3.6	52	100	57	51
1,3,5-Trimethylbenzene	8.4	52	58	13	13
Ethylbenzene	1	41	46	22	19
Isopropylbenzene	2.3	100	9.1	12	6.3
naphthalene	12	100	43	36	38
n-Butylbenzene	12	100	15	22	13
n-Propylbenzene	3.9	100	29	33	24
p- & m- Xylenes		100*	58	3.8	16

Table 2.1.4(b)

SVOCs in Soil > UUSCOs

Investigation Year:	NYSDEC 6 NYCRR Part 375 SCOs		2009 Phase II ESA	2011 Remedial Investigation	
Sample Location:			SB-17	SB-43	SB-45
Sampling Date	Unrestricted Use or CP-51 SCLs	Restricted-residential Use	12/24/09	11/22/11	11/22/11
Sample Depth			0-5'	15-20	15-20'
Units	ppm	ppm	mg/kg	mg/kg	mg/kg
SVOCs					
Benzo(a)anthracene	1	1	1.6	nd	nd
Chrysene	1	3.9	1.8	nd	nd
naphthalene	12	100	nd	31.7	17.8

Table 2.1.4(c)

Metals in Soil > UUSCOs

Investigation Year:	NYSDEC 6 NYCRR Part 375 SCOs		2009 Phase II ESA		2011 Remedial Investigation			
Sample Location:			SB-17	SB-18	SS-1	SS-2	SS-3	SS-4
Sampling Date	Unrestricted Use or CP-51 SCLs	Restricted-residential Use	12/24/09	12/24/09	11/22/11	11/23/11	11/23/11	11/23/11
Sample Depth			0-5'	0-5'	0-1'	0-2'	0-2'	0-2'
Units	ppm	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals								
Arsenic	13	16	14.2	7.28	10	15	9	11
Barium	350	400	1,310	635	111	3,500	478	1,030
Cadmium	2.5	4.3	13.2	3.97	nd	7	7	8
Chromium	30	180	39.3	16.4	21	34	18	43
Lead	63	400	2,600	666	280	1,260	611	1,330

2.2 Groundwater Investigations

2.2.1 Groundwater Sampling

A total of eighteen groundwater samples were collected for laboratory analysis from sixteen locations during the various investigations completed to date for the Site. Sample locations included a mix of temporary groundwater sampling points and permanent monitoring wells. Chazen's 2009 Phases II ESA and 2011 Remedial Investigation, together, provided comprehensive site-wide groundwater sampling.

Samples were generally collected from temporary or semi-permanent flush-mounted 1-inch diameter PVC wells installed by Chazen. The PVC sampling wells were constructed with 0.010-inch slotted screens set at depth intervals intersecting the water table.

Chazen collected groundwater samples using low-flow purging methods, with dedicated, disposable polyethylene tubing and a peristaltic pump. Groundwater was transferred directly into laboratory-supplied bottles, immediately placed on ice, and shipped overnight or by courier service to the environmental laboratory under standard chain-of-custody procedures.

> All groundwater samples were analyzed by Method 8260 Target Compound List (TCL) VOCs and by method 8270 for either TCL or CP-51 list SVOCs. Samples collected during the 2009 Phase II ESA were also analyzed for total RCRA metals.

2.2.2 Groundwater Sampling Results

Analytical groundwater sampling results are summarized in attached **Tables 4 through 6** with comparison to NYSDEC Part 703.5 standards, criteria, and guidance values (SCGs).

Hit summaries are provided in **Tables 2.2.2a through 2.2.2c** and include any compound detected in one or more samples at a concentration that that exceeds NYSDEC 703.5 SCGs. The most recent available data is presented for locations sampled on more than one occasion. The sample results for compounds that exceeding the SCGs are also included on **Figure 5**.

Table 2.2.2(a)

VOCs in Groundwater > Part 703.5 SCGs

Investigation Year:	NYSDEC Part 703.5 SCGs	2009 Phase II ESA		2011 Remedial Investigation								
Sample Location:		SB-14	SB-16	MW-14	MW-16	MW-17	MW-18		MW-19	MW-20		MW-21
Sample Date:		12/23/09	12/23/09	11/21/11	11/21/11	11/21/11	11/22/11	11/28/11	11/28/11	11/22/11	11/28/11	11/28/11
Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOCs												
1,2,4-Trimethylbenzene	5	3,400	8	nd	nd	nd	1,800	1,400	150	1,000	580	nd
1,3,5-Trimethylbenzene	5	730	nd	nd	nd	nd	410	320	13	110	72	nd
Ethyl Benzene	5	3,000	nd	nd	nd	nd	2,200	1,400	210	800	320	nd
Isopropylbenzene	5	nd	nd	nd	3	nd	76	76	45	75	46	nd
Methylene chloride	5	nd	nd	5.6	3.9	3.8	4.4	140	3.2	4.3	110	1.6
naphthalene	10	810	nd	nd	nd	nd	870	630	170	660	320	nd
n-Butylbenzene	5	nd	nd	nd	nd	nd	nd	26	16	nd	24	nd
n-Propylbenzene	5	310	nd	14	6.7	nd	180	180	130	240	140	nd
o-Xylene	5	nd	nd	nd	nd	nd	30	27	0.96	nd	nd	nd
p- & m- Xylenes	5	4,300	nd	nd	nd	nd	3,200	2,200	18	560	270	nd
sec-Butylbenzene	5	nd	nd	nd	nd	nd	nd	nd	8.6	13	nd	nd
Tetrachloroethylene	5	nd	7	nd	nd	25	nd	nd	nd	nd	nd	6.8
Toluene	5	nd	nd	nd	0.93	nd	57	54	nd	nd	nd	0.67

Table 2.2.2(b)

SVOCs in Groundwater > Part 703.5 SCGs

Investigation Year:	NYSDEC Part 703.5 SCGs	2009 Phase II ESA	2011 Remedial Investigation				
Sample Location:		SB-14	MW-18		MW-19	MW-20	
Sample Date:		12/23/09	11/22/11	11/28/11	11/28/11	11/22/11	11/28/11
Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
SVOCs							
naphthalene	10	530	572	308	102	355	137

Table 2.2.2(c)

Metals in Groundwater > Part 703.5 SCGs

Investigation Year:	**NYSDEC Part 703.5 SCGs**	**2009 Phase II ESA**
Sample Location:		**SB-14**
Sample Date:		**12/23/09**
Units:	ug/L	ug/L
Metals		
Lead	25	32

Sample analyses and results are discussed below.

- Petroleum-range VOCs exceeding standards have been detected in groundwater at eight sampling locations since 2009, within a limited plume area beneath the northern portion of the Site in the vicinity of 90 New Lots Avenue. Post ISCO injection sampling documented VOC reductions in the plume area as a result the remedial pilot study conducted by Chazen. As of 2011, total remaining VOC concentrations ranged from 20 µg/L to 6,453 µg/L within the estimated plume area.

- Tetrachloroethene (PCE) were detected at three sampling locations in the western portion of the Site at relatively low concentrations exceeding the ambient water quality standard. The highest reported PCE detection was 25 µg/l in MW-17 in November 2011. The distribution and relatively low concentrations do not indicate evidence of a significant release or onsite source of PCE.

- Methylene chloride was reported in all samples collected during 2011 of at concentrations ranging from 1.6 µg/l to 140 µg/l. The concentration exceeded the water quality standard in three of the nine samples. The highest concentrations were reported in the samples collected from beneath the floor of 90 New Lots Avenue.

- With the exception of naphthalene, no SVOCs were detected in the on-site groundwater at concentrations at concentrations above the ambient water quality standards.

- Lead was detected in one out of nine groundwater samples collected by Chazen in 2009. The concentration (32 µg/l) exceeded the standard (25 µg/l) in the sample collected from SB-14, located in the northern portion of the site within the mapped VOC plume area.

3.0 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSEMENT

3.1 Human Health Exposure Assessment

3.1.1 Contaminant Sources

3.1.1.1 Soil

The primary contaminant sources for VOCs, SVOCs, and metals is believed to be from historic automotive dismantling operations, vehicle maintenance and repair activities performed on-site, one or more historic releases from underground petroleum storage tanks, and urban fill materials.

The metal and SVOC impacts to soils are most prominent in exposed surface and near surface soils (in the top soil and/or urban fill) in the area of the at-grade automotive yard. Soils impacted by VOCs are most prominent beneath 90 New Lots Avenue and extend to the water table. The urban fill ranges from one to 7 feet thick across the site, and mostly consists of sand with occasional brick, concrete, asphalt, and ash.

Specific contaminants are addressed below:

- VOC impacts associated with underground releases and exceeding RRUSCOs were identified at depths ranging from 15 to 20 feet in two locations in the northern half of the site. No VOC impacts were identified in soil samples collected from less than 10 feet below grade.

- SVOCs. Benzo(a)anthracene, a polycyclic aromatic hydrocarbon (PAH) exceeded the RRUSCO at one surface soil location within the automotive dismantling area. Several other PAHs were reported in this sample, but were below UUSCOs. The PAHs were identified where vehicles were staged suggesting that non-point sources of vehicle fluids and combustion exhausts may be the source of these PAHs.

- Barium, cadmium, and/or lead concentrations exceeding the RRUSCO were identified in five shallow soil locations within the automotive dismantling yard area.

3.1.1.2 Groundwater

The primary contaminant source of VOCs appears to be from a past underground release of petroleum from storage tanks located beneath the floors near the north end of the site. VOC impacts greater than the NYSDEC 703.5 SCGs are present beneath 650 Powell Street and extend downgradient towards the southeast.

No evidence of a concentrated release of chlorinated solvents has been identified. The presence of low concentrations of CVOCs in groundwater beneath western site area suggest one or more releases of dissolved compounds may have occurred in this area, or compounds have migrated from offsite sources.

With the exceptions of naphthalene, no SVOCs have been identified in the on-site groundwater above standards.

3.1.2 Media and Transport Mechanisms

The VOCs, SVOC, and metals contamination identified at the site could be released or migrate in the following ways:

- The continued release of contaminants leaching from any impacted soils into the on-site groundwater can occur over time. Because much of the site is currently covered by buildings, the vertical migration of any COCs from infiltrating precipitation would be very limited. The absence of elevated metals in groundwater beneath the at-grade automotive yard area suggest surface metals are not leaching due to infiltration. Additionally due to the age of the historic petroleum releases, site conditions are either in stable equilibrium or improving.

- The data suggest VOC-impacted groundwater is attenuating to below standards within the site footprint. The site is located in a heavily urbanized area with municipally supplied water and sewer services. There are no known groundwater usages in the area.

- There are no surface waters or groundwater springs on site or in the vicinity. Storm water from the site is routed through an area-wide storm water sewer system. There is some potential for releases of impacted soils containing SVOCs and/or metals by particle transport during heavy storm events.

- The potential migration of sub-slab soil vapors into on-site buildings has not been evaluated. The CVOC concentrations in the soils and groundwater of compounds identified and managed by NYS DOH as potential SVI concerns would not suggest elevated soil gasses beneath the buildings. Redevelopment plans for the site include the complete removal of all existing structures, removal of urban fill, and targeted hot-spot removal of any discovered impacted soils that could generate CVOC vapors.

- When soil is disturbed, it can release dust into the air. The site is mostly covered by buildings, therefore, current potential off-site migration of surface soil via dust is minimized. VOC impacted soil found on the site has generally been found within a few feet of the water table which is not anticipated to be disturbed.

3.1.3 Potential Exposure Points

The Site and surrounding properties around the site receive potable water from a municipal water system. Therefore there is no current or likely future potential exposure to groundwater.

During redevelopment of the Site, excavation in areas of impacted soil, soil vapor, and/or groundwater would present the potential for direct contact to impacted soils and groundwater by site construction workers, and inhalation exposure to dust particles generated during excavation and disposal actions. Specific measures to monitor and manage potential exposures to construction workers and the surrounding community will be implemented.

Future Use: Redevelopment plans for the site include excavation and removal of site soils to two feet below grade, spot removal of any deeper impacted soils, dewatering and management of any impacted groundwater encountered during redevelopment, and placement of a site-wide building with impermeable basement concrete building slabs across the entire footprint of the Site. All potential human health risks should be effectively eliminated by this redevelopment plan.

3.1.4 Routes of Exposure

People are not currently coming into contact with contaminated soil because the Site is currently covered with buildings, or has restricted access (fences, gates, etc) to uncapped soils.

The site and nearby properties are connected to municipal water; therefore, impacted water is not being used for drinking water and there are no related routes of exposure.

The groundwater is the primary mechanism for migration off-site. However, it is not locally used for any known purpose, does not it discharge to any surface water within ½ a mile of the site, and would mix with groundwater from runoff from Linden Boulevard and the LIR Rail yard prior to surface water discharge into Jamaica Bay.

The highest potential exposure potential with impacted site media will result from redevelopment activities.

3.1.5 Receptor Population

Potential receptors include site workers during site redevelopment as they perform ground intrusive work in site areas where soil and soil/subslab vapor impacts may be present. Since the site is currently being vacated of all tenants, there are currently or will shortly be no building occupants to present a potential receptor population.

No off-site receptors have been identified.

3.2 Water Well Survey

The Site and surrounding community receive water from the City of New York municipal water supply system. Building code in NY prevents the installation or use of private potable water supply wells in areas accessible to and serviced by the municipal water supply system no potable Consequently, no private water well survey was included in the RI nor considered necessary.

4.0 FISH AND WILDLIFE RESOUCE IMPACT ANALYSIS (FWRIA)

A Fish and Wildlife Resources Impact Analysis is not needed for this project given the Site and urban area usage, and the lack of evidence of site contamination having migrated off of the Site to surface water and/or ecologically sensitive areas. The Site does not provide any significant habitat for any listed protective species of flora or fauna.

5.0 REMEDIAL INVESTIGATION SUMMARY

5.1 AREAS OF CONCERN

The Site cannot be readily divided into discrete Areas of Concern. The northern site area contains elevated concentrations of VOCs and/or lead in soil and groundwater. The western site area contains CVOCs in groundwater. The southern site area contains metals and SVOC impacts in the shallow soils located within the open-air automotive dismantling yard and access road.

Since there is a one to seven foot thick layer of urban fill across the footprint of the entire site and the fill is associated with elevated metal and SVOC concentrations, it is likely that the soils beneath the floor of the buildings across the site are also impacted with metals and SVOCs. Therefore, elevated metals and SVOCs can be encountered in near surface and shallow soils at concentrations that exceed a Track 2 clean-up objective for the Site anywhere within the footprint of the Site. Consequently, the entire site should be treated as a single Area of Concern with respect to the urban fill.

The following sections presents a summary of compounds of concern with reported concentrations that exceed the SCOs and SCGs.

5.1.1 Soil

VOCs, SVOCs, and metals were identified as site contaminants in soil.

<u>Northern Area</u>

- Petroleum-range VOCs were present in three samples (SB-43, SB-44, SB-45) at concentrations greater than the than UUSCOS, with only trimethylbenzene compounds reported above the RRUSCOs in two samples (SB-43 and SB-44).

- SVOC sample results were less than UUSCOs in five of the seven samples. Napthalene concentrations exceeded the UUSCO in two samples (SB-43 and SB-45) but were below the RRUSCOs.

The VOC and SVOC soil concentrations in this area generally meet the RRUSCOs, with few detected VOCs reported above this threshold in an apparently limited area beneath 90 New Lots Avenue.

Southern Area

- Two petroleum-range SVOCs were reported in the SB-17 sample at concentrations exceeding the UUSCOs. One compound, benzo(a)anthracene, also exceeded the RRUSCO.

- Arsenic, barium, cadmium, chromium, and/or lead concentrations exceeded the UUSCOs in all six samples. Barium, cadmium, and/or lead exceeded the RRUSCO in five of the six samples.

The results indicate the presence of select elevated metals and SVOCs in shallow soils within the automotive dismantling yard area. These impacts are likely associated with observed fill soils and/or historic automotive operations within the area.

5.1.2 Groundwater

VOCs, SVOCs, and lead were identified as site contaminants in groundwater.

- Petroleum-range VOCs exceeding standards were found in groundwater within a limited plume area beneath the northern portion of the Site in the vicinity of 90 New Lots Avenue. As of 2011, total remaining VOC concentrations ranged from 20 µg/L to 6,453 µg/L within the estimated plume area.

- Tetrachloroethene (PCE) was detected in the western portion of the Site at relatively low concentrations exceeding the ambient water quality standard. The highest reported PCE detection was 25 µg/l in MW-17 in November 2011. The distribution and relatively low concentrations do not indicate evidence of a significant release or onsite source of PCE.

- Methylene chloride, a chlorinated VOC, was reported in all samples collected during 2011 of at concentrations ranging from 1.6 µg/l to 140 µg/l. The concentration exceeded the water quality standard in three of the nine samples. The highest concentrations were reported in the samples collected from beneath the floor of 90 New Lots Avenue.

- With the exception of naphthalene, no SVOCs were detected in the on-site groundwater at concentrations at concentrations above the ambient water quality standards.

- Lead was detected in one out of nine groundwater samples collected by Chazen in 2009. The concentration (32 µg/l) exceeded the standard (25 µg/l) in the sample collected from SB-14, located in the northern portion of the site within the mapped VOC plume area.

5.2 DATA GAPS

The following gaps in the historical data record for the Site were identified by review of the historical investigation reports and comparison to DER-10 guidance.

1. No Class B data deliverable packages, validation, or data usability summaries are available at this time. Historical investigations completed to date were conducted voluntarily under the approval and oversight of NYSDEC Region 2 Spills Bureau prior to Site inclusion in the BCP.

2. No waste characterization profile samples or RCRA toxicity characteristics are available at this time.

3. Due to the presence of the buildings and occupancy during the investigations, the soils beneath the floors were not fully characterized and some areas of the Site have limited data sets available.

4. The size of the available data set (6 samples) for metals is too small to demonstrate site-wide characterization of the soils for metals. No specific criteria for the number of samples required to characterize a site is available. EPA guidance indicates 8 samples per acre (a total of 7 samples) and NYC OER guidance requires a minimum of one sample per 5,000 ft^2 of Site area (8 samples total).

5. The potential for Soil Vapor Intrusion has not been evaluated. Given the reported concentrations of CVOCs in the soils and groundwater, SVI is not expected to be an issue.

6. Chazen's 2015 Phase I ESA identified four historic gasoline USTs near the northern site boundary. The status of these tanks is unknown based on review of available documentation.

5.3 CONCEPTUAL SITE MODEL

The Conceptual Site Model takes into consideration sources of contamination, fate and transport processes, potential receptors, exposure pathways, and exposure points. Impacted media associated with the Site include soil and groundwater.

The Site and surrounding area that has been used for manufacturing (light industrial), commercial and residential purposes for more than 100 hundred years. Present and past on-site operations including automotive repair and maintenance shops, automotive dismantling, and auto parts sales. Historic fill of varying thickness is found throughout the site, overlying native sand.

The primary site contaminants of concern are VOCs in groundwater and soil related to the underground release of petroleum beneath 90 New Lots Avenue, and elevated metals and SVOCs in the shallow fill, and trace to low levels of CVOCs were found in groundwater within the western half of the site.

With the exception of the suspected underground release of petroleum, there is no evidence of catastrophic or sustained release of regulated substances or disposal of hazardous materials on-site. Impacts observed are likely the result of historic fill used when the site was constructed and lack of attention to housekeeping or environmental stewardship over the long history of Site usages. On site soils are impacted with metals and SVOCs are likely associated with the urban fill and storage of motor vehicles. Some evidence of minor releases of dissolved CVOCs were observed beneath the western site area.

The Conceptual Site Model table below provides a summary of the contamination sources, migration pathways and potential receptors based on existing data gathered in the field and from laboratory analysis. No off-site receptors have been identified.

Figures 4 and 5 show the distribution of site-wide sampling results that exceeded RRSCOs and Part 703.5 groundwater SCGs, described in Section 2.

Table 5.3 Conceptual Site Model Table

Media	Known or Suspected source of contamination	Type of Contaminant (General)	Contaminants of Potential Concern (COPCs)	Primary or Secondary Source Release Mechanism	Migration Pathways	Potential Receptors
Soil	Historic Fill Material, Automotive Operations, USTs	Fill material, petroleum products,	VOCs, SVOCs, Metals	Release of dust into the air, volatilization	Airborne	Human: direct contact/inhalation from intrusive activities in impacted area
Groundwater	Historic fill, surface and underground spills	Petroleum products, chlorinated solvents, fill material	VOCs, CVOCs, lead	Volatilization	Groundwater flow, migration into soil vapor	Human and ecological receptors are not expected to be exposed
Sub-Slab and Soil Vapor	Soil/subslab vapor VOC-impacts	VOCs and CVOCs (minor)	VOCs and CVOCs	Soil vapor impacted by volatilization of VOCs/CVOCs from soil/gw.	Direct contact during excavation	Human: direct contact from intrusive activities in impacted areas
Indoor Air					Migration into buildings partitioning to air	Human: Inhalation by building occupants
Surface Water/ Sediment	No surface water on Site Impacted particulate runoff possible	SVOCs Metals	BNA Metals	Physical transport	Sheet wash to local storm sewers	Human or Ecological Receptors are not expected to be exposed
Building	No continuing sources of contamination identified	NA	NA	NA	NA	NA

5.4 CONCLUSIONS

The remedial investigation objective for the site which is to sufficiently characterize the nature and extent of impacts so that remedial alternatives and objectives can be evaluated, has been substantially completed. The potential sources of contamination associated with current and former commercial site operations have been identified and impacts to the on-site soils and groundwater confirmed. The available historical data summaries provided to NYSDEC were sufficient for NYSDEC to conclude that Site was eligible for inclusion in the BCP.

A presumptive remedy for the site based on the proposed redevelopment plans for the property including NYCHPD requirements for the intended use (affordable housing) has been proposed by the owner and provided to NYSDEC.

The remedy includes:

- Site-wide excavation and off-site disposal of urban fill;
- Closure of any USTs encountered;
- Identification and removal of impacted native soil "hot spots" beneath the fill;
- Removal, treatment and permitted discharge of storm water and/or groundwater encountered during excavation;
- Monitoring of site conditions during and after the removal action, and,
- Construction of new buildings across the entire foot-print of the site.

The conceptual redevelopment plans for the Site include appropriate measures that should ensure the protection of public health and the environment by demonstration of at least a Track 2 clean-up for the on-site for soils and a substantial reduction in groundwater impacts and protection of water quality. The reduction of groundwater impacts to drinking water standards may not be achieved. However, since no groundwater users, discharge points, or potential receptors have been identified downgradient from the site, residual impacts will degrade naturally over time with minimal potential consequences.

Data gaps were identified in Section 5.2. However, these gaps are considered insufficient to warrant additional investigation or substantial alteration to the presumptive remedy. The identified will be included in the Remedial Action Work Plan for the Site and addressed during the redevelopment phase.

Although full characterization of the urban fill is incomplete, since the presumptive remedy is the removal off all urban fill from the site, this point is moot. There is no reason to suspect that site conditions will be encountered during the redevelopment phase that are substantially different from what we currently know.

5.5 RECOMENDATIONS

No further remedial investigation is warranted for the site or adjoining properties.

A minimum of 7 waste characterization profile samples of the urban fill with appropriate QA/QC samples should be collected and analyzed for Totals and TCLP for TCL-VOCs, TCL-SVOCs, TAL-Metals, PCBS, Pesticides, Herbicides, NJ EPH/TPH, and RCRA toxicity characteristics with full Class B deliverable data for the Totals analyses. This sampling is required for identification of off-site disposal facilities and for the acceptance by those facilities. Additionally, it provides the data needed to close data gaps 1-4. This should be completed AFTER demolition and removal of all on-site structures but prior to excavation of soils.

A Remedial Action Work Plan for implementation of the presumptive remedy will be prepared and submitted to NYSDEC for approval.

Figures