November 19, 2013

FEASIBILITY STUDY

Powers Chemco Site
a.k.a. Columbia Ribbon
and Manufacturing Company Site
71 Charles Street
Glen Cove, New York
Site No. 1-30-028

Prepared for

KONICA MINOLTA HOLDINGS U.S.A., INC.
71 Charles Street
Glen Cove, New York

Remedial Engineering, P.C.

Environmental Engineers

and ROUX ASSOCIATES, INC.

209 Shafter Street, Islandia, New York 11749 ♦ 631-232-2600

2020.0001Y.127/CV

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

TABLE OF CONTENTS

(Continued)

CERTIFICATION

I, Omar Ramotar, certify that I am currently a NYS registered professional engineer and that this Feasibility Study Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

STATE OF NEW YORK
OMAR RAMOTAR
No. 077995
LICENSED PROFESSIONAL ENGINEER

077995	11/19/13	
NYS Professional Engineer #	Date	Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

LIST OF KEY ACRONYMS

Acronym	Definition
AS	Air Sparging
AWQSGV	Ambient Water Quality Standards and Guidance Values
CAMP	Community Air Monitoring Plan
COCs	Chemical of Concerns
DER	Division of Environmental Remediation
ERH	Electric Resistance Heating
FS	Feasibility Study
GRA	General Response Action
HUS	Konica Minolta Holdings U.S.A., Inc.
ISCO	*In situ* Chemical Oxidation
O&M	Operation and Maintenance
NCP	National Contingency Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PCU	Power Control Unit
POTW	Public Owned Treatment Works
RA	Remedial Action
RAO	Remedial Action Objection
RI	Remedial Investigation
SCG	Standards, Criteria and Guidance
SCO	Soil Cleanup Objective
SOE	Support of Excavation
SVE	Soil Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
TAGM	Technical Administrative Guidance Memorandum
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Roux Associates, Inc. and Remedial Engineering, P.C. (hereafter referred to as Roux Associates) have prepared this Feasibility Study (FS) for the Powers Chemco Site on behalf of Konica Minolta Holdings U.S.A., Inc. (HUS). The Site is located at 71 Charles Street, Glen Cove, New York (Figure 1). Konica Minolta Graphics Imaging, U.S.A. had been responsible for the investigation and remediation of the Site. HUS dissolved KMGI on March 31, 2012. In connection with such dissolution, HUS has assumed responsibility for the investigation and remediation of the Site as of December 21, 2011.

The purpose of this FS was to identify, evaluate, and select an appropriate remedial action alternative for addressing of the residual contamination impacting soil and groundwater beneath the North Parking Lot area (North Lot) of the Site. The Site is listed in the New York State Department of Environmental Conservation Registry of Inactive Hazardous Waste Sites as the Powers Chemco, a.k.a. Columbia Ribbon and Manufacturing Company Site (Site Code 1-30-028).

1.1 Objectives and Scope of the FS

The media of concern consists of residual impacts to soil and groundwater beneath boundary portion of the North Lot, as shown on Figure 2. The primary objective of this FS will be to determine the most appropriate remedial alternative to address the media of concern. The FS will achieve this objective through the identification, development, and evaluation of alternatives to remediate the impacted soil and groundwater beneath the North Lot.

The identification and analyses of remedial alternatives in the FS will be performed in accordance with the New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) #4030, “Selection of Remedial Actions at Inactive Hazardous Waste Sites, September 13, 1989 (revised May 15, 1990)” (NYSDEC, 1990), the NYSDEC Division of Environmental Remediation (DER) guidance document titled, “DER-10, Technical Guidance for Site Investigation and Remediation” (NYSDEC, 2010), and the Inactive Hazardous Waste Disposal Site Program regulation (6 NYCRR Section 375-1.10).

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The subject property is located at 71 Charles Street in Glen Cove, New York. The entire property is approximately 15 acres in size. The facility is no longer active, and most of the former manufacturing area buildings were demolished in 2012. The area of the property impacted by historical disposal of industrial wastes is approximately 1.4 acres and located in the northwest section of the property (the North Lot) and formerly served as an employee parking area when the facility was active. The area of concern is one-third (1/3) of an acre within the north-northeast portion of the North Lot. Surrounding the property to the north and east are residential areas, to the south and west are industrial properties, including four other inactive hazardous waste disposal sites.

2.2 Summary of Site History and Previous Remedial Actions

The following summary was presented previously to the NYSDEC in the Historical Remediation and Data Review Report, April 2010, prepared by Konica Minolta Graphics Imaging, U.S.A. (KMGI).

- The Record of Decision (ROD) for the former Columbia Ribbon and Carbon Manufacturing Company site (aka Powers Chemco Site) was prepared by NYSDEC and dated March 1991. Pertinent information identified in the ROD is summarized below.

- For an undetermined period of time prior to 1979, the Columbia Ribbon and Carbon Manufacturing Company (Columbia) disposed of wastes from the production of blue printing inks, carbon paper, and typewriter ribbon in open pits located behind their manufacturing buildings. Apparently, wastes from 55-gallon drums were dumped into the open pits. Additionally, wastes were pumped through a two-inch galvanized pipe from the Columbia plant directly into the pits. The wastes disposed of in the area included, but were not limited to, toluene, ethyl acetate, and other residues from the formulation of printing inks. In 1979, Powers Chemco, Inc. (Chemco) purchased a parcel of land including the above-referenced disposal area from Columbia for use as a parking lot. Chemco, a manufacturer of photographic equipment and supplies, was unaware that the parcel was heavily contaminated with industrial wastes.

- In 1983, Chemco discovered the subsurface contamination while excavation activities being conducted in the area. To determine the nature and extent of the contamination, Chemco hired Fred C. Hart Associates, Inc. (FCHA) to perform a site investigation. FCHA conducted the investigation between November 30, 1983 and February 3, 1984 and produced a report dated April 1984 and entitled *"Investigation and Hydrogeologic Assessment of the Former Columbia Ribbon and Carbon Company Waste Disposal Site."*

The report concluded that the site contained approximately 6,000 cubic yards of grossly contaminated soils, wastes, sludge, rags, filters, and other debris along with approximately 100 drums. Based on the conclusions of the report, Chemco presented to the NYSDEC an interim remedial plan for the removal and disposal of the buried wastes and heavily contaminated soils at the site. The NYSDEC approved the plan and entered into a voluntary Administrative Order on Consent (AOC) with Chemco on June 8, 1984 to implement the removal plan. Chemco retained Associated Chemical and Environmental Services (ACES) as the contractor to perform the removal action in accordance with the approved interim remedial plan. FCHA acted as the Project Manager and coordinator.

- Representatives of the NYSDEC and Nassau County Department of Health witnessed the work. Excavations began on June 19, 1984 and continued through August 1984. Fifteen overlapping trenches were excavated. The extent of the excavations was determined by the visual observations of heavily contaminated soils and wastes. A total of 4,645 tons of contaminated soils and debris along with 267 mostly empty drums were transported off-site under manifests to the Fondessy Enterprises Landfill in Oregon, Ohio. The average depth of the excavations was five feet, and did not extend into saturated soils. The results of the removal action were summarized in the FCHA report entitled "*Engineer's Certification Report: Removal of Drums and Contaminated Soils from the Former Columbia Ribbon and Carbon Company Site*" dated September 28, 1984.

- After reviewing additional information submitted in support of the report, the NYSDEC accepted the certification in April 1985. A second field investigation was conducted during early 1985 to more carefully assess the potential for contaminant migration from the site and to define the vertical and horizontal extent of groundwater contamination. This work was carried out under a second Order on Consent with the NYSDEC dated January 16, 1986. The November 1986 report prepared by FCHA entitled "*Supplemental Hydrologic Investigation of the Former Columbia Ribbon and Carbon Company Waste Disposal Site*" concluded that the contaminants were confined to a shallow sand and gravel unit, and were concentrated in the immediate area of the disposal site beneath the North Lot. The initial and supplemental investigations were used with information from the removal action as the basis for defining the nature and extent of the contamination at the site.

- Chemco then developed a Remedial Investigation/Feasibility Study (RI/FS) work plan to examine the alternatives for remediation of the site. The RI/FS work plan called for the installation of two additional groundwater monitoring wells; one to replace a damaged well and one for the use in a pump test to gather information on the yield and other characteristics of the sand and gravel unit. Additionally, the work plan identified a series of remedial alternatives to be evaluated in the Feasibility Study (FS). The agreement to perform the RI/FS was incorporated into a third Order on Consent signed on April 4, 1988. The work was performed over the Summer of 1988, and the third draft was submitted to the NYSDEC on February 1, 1991.

- During the development of the RI/FS report, Powers Chemco, Inc. was renamed Chemco Technologies, Inc., which was subsequently purchased and renamed Konica Imaging

U.S.A., Inc. (Konica). The ROD provided the following summary of the main characteristics of the Columbia site: 1) Area to remediate: approximately 1.4 acres; 2) Area of highest contamination: approximately 0.5 acres; 3) Average depth to groundwater: approximately 10 feet; 4) Average depth to confining unit: approximately 20 feet; 5) Approximate volume to remediate: 23,000 cubic yards; 6) Contaminated media: groundwater and saturated soil.

- The ROD indicated the need for a fourth Order on Consent to implement the selected remedial plan. The following Site-specific remediation goals were listed: 1) treatment of groundwater such that, to the extent technically feasible, the concentrations of contaminants was reduced to within promulgated standards, 2) ensure that the remedial activities do not increase the potential for the migration of contaminated groundwater by damaging the naturally occurring confining units, and 3) treat soil to prevent the recontamination of groundwater by the leaching of chemicals out of the soil mass.

On April 14, 1993 an Order on Consent between the NYSDEC and Konica was signed. The purpose of this Order on Consent was to design and implement the remedial plan mandated by the ROD. The proposed remedial action plan of installation of a groundwater pump and treat system, and an air sparge/soil vapor extraction (AS/SVE) system, was approved by the NYSDEC in a March 2, 1993 letter to Konica. A letter from the NYSDEC to Konica dated September 21, 1994 approved Performance Analysis and Design Modification Plan (PADM), and indicated that the construction of the site's remedial system was at or near completion.

In November 1994, the ground water pump and treat system started. In January 1995, the SVE system commenced operation. Also, the Final Engineering Certification Report and the Operation and Maintenance (O&M) Plan was accepted by the NYSDEC in May of 1995. The site was reclassified to a Class 4 Site under the New York State Superfund Program. The system continued to operate until a temporary shutdown was requested by Konica in accordance with the PADMP. Post-shutdown groundwater sampling indicated the 5 micrograms per liter µg/L) remedial goal was not achieved; therefore, the system was restarted in February of 1997. The SVE system was restarted in June 1997. The system continued to operate until November 1999. The SVE system ceased operation in September 1999. In November 1999 the system entered the second period of temporary shutdown in accordance with the PADMP. At the time of the shutdown, the treatment system influent was 1,700 µg/L (toluene). In 2000, the treatment system remained dormant and post shutdown monitoring was initiated.

ERM collected samples from six wells within the North Lot remediation area (VRW-202, AIW-705, AIW-707, VRW-207, AIW-712, and AIW-714) on September 24, 2003. The results from this sampling revealed VOC concentrations above the New York State Class GA Groundwater Quality Standards in all six wells.

In a letter from the NYSDEC to ERM dated December 8, 2003 regarding the results of the September 2003 sampling round, the NYSDEC recommended that ERM resample these six wells during the next sampling round. In addition to VOCs, the NYSDEC stated that all groundwater samples collected in the next sampling round also be analyzed for a complete list of TCL metals, specifically lead and arsenic, as requested in the ROD.

A third quarterly sampling event conducted as part of the post-remediation groundwater monitoring program was conducted during the week of December 15 - 19, 2003. Groundwater samples were collected from seven perimeter-monitoring wells (MW-1, MW-4, MW-5, MW-6, MW-8, MW-11, and MW-12) and were analyzed for the target VOCs. Results of the December 2003 sampling event indicated that VOCs were not detected in any of the sampled wells. As requested by the NYSDEC, all six of these wells were also sampled and analyzed for a full list of TAL metals. The results of this sampling revealed arsenic concentrations above the Groundwater Quality Standard of 25 ppb in MW-8. ERM also collected additional samples from the six wells within the North Lot remediation area (VRW-202, AIW-705, AIW-707, VRW-207, AIW-712, and AIW-714). These samples were analyzed for a full list of TAL metals. The results from this sampling revealed arsenic and lead concentrations above the Groundwater Quality Standard at two wells (VRW-202 and AIW-707). In addition, the sample from VRW-202 had a copper concentration above the Groundwater Quality Standard, and the sample from AIW-707 had an antimony concentration above the Groundwater Quality Standard. ERM stated that these exceedances for metal would be addressed by future deed restrictions and institutional controls.

During the December 2003 sampling round, VOCs had been detected in the in the groundwater at the North Lot remediation area as high as 34,000 µg/L. To address the impacted groundwater at the site, the NYSDEC recommended that Konica submit a remedial option plan to the NYSDEC.

The final fourth quarter sampling event conducted as part of the post-remediation groundwater monitoring program was conducted during the week of March 24, 2004. The groundwater samples were collected from seven perimeter monitoring wells (MW-1, MW-4, MW-5, MW-6, MW-8, MW-11, and MW-12) and were analyzed for the target VOCs. This sampling revealed VOC and metals concentrations above the Groundwater Quality Standards.

In December 2004, nine soil borings (SB-01 through SB-09) were installed down to the water table, and one soil sample was collected for VOC analysis at each location. The purpose of these borings was to verify that no source material remained in the unsaturated zone. The locations were selected in conjunction with the NYSDEC, and included the vicinity of the highest groundwater VOC concentrations, and locations where stained soil and/or non-aqueous phased liquid (NAPL) had been detected prior to the original remedial activities. There was no evidence of impacts at any of the locations samples. Therefore, soil samples were collected from one-foot above the water table. Only one VOC was detected above its recommended Soil Cleanup Objective (RSCO) **–** Acetone at a concentration of 204 mg/kg at SB-04, which was slightly above the RSCO of 200 mg/kg. Based on the results, it was concluded that soil in the unsaturated zone was not contributing to the elevated VOC level in groundwater.

In January and April 2005, soil vapor samples were collected from seven locations (SG-01 through SG-07). Samples SG-01 through SG-05 were collected from perimeter locations; and Samples SG-6 and SG-07 were collected from within the North Lot remediation area. The VOCs detected in groundwater were present in the soil vapor samples, and the levels decreased significantly from the remediation area to the perimeter locations. The soil gas samples collected from within the remediation area at SG-06 and SG-07 revealed chlorinated VOCs (predominantly PCE, TCE, and vinyl chloride) were detected at concentrations between 6 and 120 parts per billion (ppb).

ERM performed a soil vapor intrusion investigation that consisted of ambient and indoor air, and sub-slab soil vapor from seven residences located on the north side of The Place. The sampling was conducted between March 23 and April 3, 2007. Eighteen indoor air and ambient air samples were collected. Two indoor air samples were collected from each of the seven residential properties consisting of one basement sample and one first floor sample. Four ambient air samples were collected concurrently from locations upwind of the residences. The indoor air sampling results showed all 18 samples with low concentrations of toluene in basement indoor air ranging from 2.03 micrograms per cubic meter (µg/cubic meter) at 40-The Place to 37.9 µg/cubic meter at 44-The Place; and first floor indoor air ranging from 2.72 µg/cubic meter at 45 Dickson Street to 37.9 µg/cubic meter at 44-The Place. The benzene, toluene, ethylbenzene and xylene (BTEX) concentrations in basement indoor air ranged from 4.21 µg/cubic meter at 40-The Place to 73.19 µg/cubic meter at 44-The Place. The BTEX concentrations in the first floor indoor air ranged from 6.34 µg/cubic meter at 40-The Place to 68.16 µg/cubic meter at 44-The Place. The results from the four ambient air samples collected indicated that there were no outdoor contributing factors to these indoor air quality concerns. Background ambient air samples indicated that there was an approximate two to three fold decrease in concentrations of the contaminants of concern found outside the homes versus inside. All seven sub-slab soil vapor samples contained low concentrations of toluene ranging from 1.1 µg/cubic meter at 45 Dickson Street to 8.8 µg/cubic meter at 38-The Place. Sub-slab BTEX concentrations ranged from 2.21 µg/cubic meter at 45 The Place to 18.97 µg/cubic meter at 38-The Place. When sub-slab vapor results and indoor and ambient air sampling results were correlated for all seven properties, none appear to be negatively impacted by subsurface vapors. All seven properties exhibited higher concentrations of the contaminants of concern in indoor air than in sub-slab vapor. Furthermore, three of the properties exhibited higher concentrations of the contaminants of concern on the first floor as opposed to those found in the basements or beneath the floor slab. Based on the results of this investigation, ERM concluded that soil vapor intrusion was not occurring at the seven residential properties investigated.

Konica Minolta contracted with URS to conduct a limited site investigation to further delineate the source area beneath the North Lot both horizontally and vertically. This work was completed in December 2008 and final report was completed on March 24, 2009[1]. Groundwater results from existing wells MW-01, MW-04, MW-05, MW-08, and MW-12 indicate that the extent of groundwater impacts did not extend out to these monitoring wells. The area in the vicinity of the vertical profile borings VP-01, VP-08, and VP-09 on the northern portion of the site was impacted

[1] "Limited Subsurface Investigation Results – Phase 1", URS, March 24, 2009.

above applicable standards, which was generally consistent with the ERM 2006 delineation of the plume footprint.

A geophysical survey indicated that there were no unusual subsurface features that would indicate buried drums or underground storage tanks or any structural objects as the source of contamination.

BTEX concentrations at location VP-01 decreased significantly with depth and the location appears to have been delineated in the vertical direction. The highest concentrations were reported near the top of the water table from approximately 9 to 15 feet bgs. VP-08 and VP-09 both demonstrated lower total BTEX concentrations than VP-01 near the top of the water table and appear to be outside the most impacted portion of the BTEX plume. However, samples collected from VP-08 and VP-09 had total BTEX concentrations of 202,034 µg/l and 238,006 µg/l, respectively, in the deepest sample collected from each boring (20 to 24 ft bgs).

In a letter dated December 23, 2009, the NYSDEC notified Konica Minolta of NYS registry classification change from Class 4 to a Class 2.

3.0 SUMMARY OF REMEDIAL INVESTIGATION

3.1 March 2011 Investigation

In March of 2011, Roux Associates performed a soil and groundwater investigation to further delineate remaining VOC impacts in the North Lot. Eighteen soil borings were completed between March 4 and March 18, 2011 by Roux Associates using a track-mounted Geoprobe™ direct-push sampler (R-SB-1 through R-SB-18). A total of 66 soil samples were sent to the laboratory to be analyzed.

Volatile organic compounds were detected at concentrations above the NYSDEC Part 375 Protection of Groundwater Cleanup Objectives in 20 out of 66 soil samples.

Six VOCs were detected in soil at concentrations above the soil cleanup objectives, as summarized below and also shown on Plate 1.

VOC	NYSDEC Part 375 Protection of Groundwater Objectives (µg/kg)	Range of Concentrations above NYSDEC Part 375 Protection of Groundwater Objectives (µg/kg)	Number of Borings with Detections above NYSDEC Part 375 Protection of Groundwater Objectives	Location of Maximum Concentration
2-Butanone (MEK)	120	430 – 170,000	3	R-SB-17 (11-12 ft bls)
Ethylbenzene	1,000	3,000 – 65,000	6	R-SB-10 (13-14 ft bls)
Toluene	700	790 – 1,500,000	11	R-SB-10 (13-14 ft bls)
Xylenes (Total)	1,600	4,800 – 350,000	9	R-SB-10 (13-14 ft bls)

ft bls – feet below land surface

In general, the most significantly impacted soil boring locations were SB-5 (10 to 15 ft bls), SB-10 (13-14 ft bls), SB-15 (9 to 15 ft bls), SB-16 (7 to 14 ft bls) and SB-17 (6 to 12 ft bls).

Soil Borings SB-16 and SB-17 are located within the interior portion of the area previously delineated by ERM[2] beneath the North Lot as having the highest concentrations of VOCs in groundwater. Soil borings SB-5 and SB-10 are located along the perimeter of the area delineated by ERM. Soil Boring SB-5 (11-12 ft bls) contained the highest detections of ethylbenzene, toluene and xylenes observed during the March 2011 Investigation.

Sixteen groundwater screening samples were collected use low-flow procedures from nine soil boring locations (R-SB-1, R-SB-3, R-SB-4, R-SB-8, R-SB-9, R-SB-10, R-SB-14, R-SB-15, and R-SB-16). Fine-grained zones below the water table that could contain pockets of sorbed residual VOCs were targeted by sampling a more permeable zone either immediately above or below the fine-grained interval.

Plate 2 summarizes detections of constituents of concern in groundwater present at concentrations above NYSDEC Ambient Water-Quality Standards and Guidance Values (AWQS). The following VOCs of concern (i.e., detected at concentrations greater than one part per million) were detected in groundwater screening samples beneath the North Lot at concentrations above the AWQS:

- Ethylbenzene
- Toluene
- Xylenes (total)

No heavy metals (i.e., arsenic, chromium, lead, mercury, and zinc) were detected in filtered groundwater screening samples at concentrations above AWQS.

The VOCs detected most frequently (i.e., at greater than five locations) are summarized below.

VOCs	NYS AWQS (µg/L)	Range in Concentration above NYS AWQS (µg/L)	Number of Locations with Detections above NYS AWQS	Location of Maximum Concentration
Benzene	1	1.5 – 36	5	R-SB-3 (14-15 ft bls)

[2] "Area targeted for groundwater remediation" as shown on Figure 33 of the Historical Remediation and Data Review Report.

VOCs	NYS AWQS (µg/L)	Range in Concentration above NYS AWQS (µg/L)	Number of Locations with Detections above NYS AWQS	Location of Maximum Concentration
Ethylbenzene	5	5.6 – 4,700	6	R-SB-15 (9-14 ft bls)
Isopropylbenzene	5	9.1 – 110	5	R-SB-15 (9-14 ft bls)
Toluene	5	10 – 320,000	8	R-SB-16 (15-20 ft bls)
Xylenes (total)	5	12 – 22,000	6	R-SB-15 (9-14 ft bls)

µg/L – micrograms per liter
NYS AWQS – New York State Ambient Water Quality Standards and Guidance Values

The most significantly impacted groundwater occurred in three general locations beneath the North Lot:

1. at the water table (6 to 7 ft bls) and below the water table (9 to 10 and 14 to 15 ft bls) in the vicinity of locations R-SB-3 and R-SB-4;
2. just below the water table (8 to 9 ft bls) and at depth (12 to 15 ft bls) in the vicinity of location R-SB-10; and
3. at the water table (6 to 7 ft bls) and at depth (9 to 14 and 15 to 20 ft bls) in the vicinity of locations R-SB-15 and R-SB-16.

Groundwater sampling locations R-SB-3, R-SB-4, and R-SB-10 are located along the perimeter of the area previously delineated by ERM[3] beneath the North Lot as having the highest concentrations of VOCs in groundwater. Location R-SB-15 is located along the northern perimeter of the property as defined by the fence line. Location R-SB-16 is within the area previously delineated by ERM as having the highest concentrations of VOCs in groundwater beneath the North Lot.

3.2 May 2011 Investigation

In May of 2011, Liberty Environmental, Inc. (Liberty) performed a soil and groundwater investigation to delineate remaining VOC impacts in the North Lot and to determine if any offsite impacts exist north of the North Lot fence line. Thirteen soil borings were advanced and soil and

[3] “Area targeted for groundwater remediation” as shown on Figure 33 of the Historical Remediation and Data Review Report.

groundwater grab samples were collected. Results indicated that VOC impacts remained in both soil and groundwater in the northern and eastern portions of the North Lot. Offsite soil borings advanced immediately north of the fence line showed VOC impacts exceeding NYSDEC protection of groundwater soil cleanup objectives; however, soil borings advanced adjacent to The Place indicated no VOC impacts.

3.3 October Through November 2012 Remedial Investigation Amendment

To refine the delineation of potential residual material contributing to the elevated concentrations of VOCs in groundwater, and to confirm results of the investigation performed in March 2011 and by Liberty, 20 soil borings were advanced from October 24 to November 9, 2012 in the North Lot area (Plate 1). Four (4) additional soil borings were advanced on November 29, 2012.

At two soil sampling locations (SB-108 and SB-109 shown on Plate 3), groundwater screening samples were collected. The groundwater samples were collected from approximately two feet below the top of the water table. Groundwater screening samples were collected following completion of the soil borings using a temporary well screen consisting of 1-inch diameter slotted PVC screen placed in a borehole completed with the rotary sonic drilling rig to the desired depth. A new well screen was used for collection of each groundwater screening sample.

Prior to groundwater sampling, groundwater levels in the wells to be sampled were recorded. On November 2, 2012, four monitoring wells (MW-01, MW-06, MW-08, and MW-12) were sampled using low-flow sampling procedures. Newly installed wells MW-101 and MW-102 were sampled on December 4, 2012 and January 3, 2013, respectively.

3.3.1 Water-Level Elevations

The presence of a shallow, perched water-table zone was noted beneath most of the North Lot area during previous investigations. With the exception of existing Well MW-3R and new Well MW-101, all wells at the Site are screened in the perched zone.

The depth to water in the perched zone ranged from 6.13 to 14 feet. A review of water-level data indicated that there is an approximate 17-foot head difference between water levels in the perched zone, and the deeper, presumably more regional saturated zone in the Upper Glacial Aquifer. The water level data were used to create a perched-zone water-level map (Plate 4). A review of Plate 4 indicated that the inferred direction of groundwater flow in the perched zone ranges from southeast to south to southwest.

The following wells represent downgradient monitoring locations based on Plate 4:

- MW-01 – in the perched zone downgradient of the northern portion of the source area;
- MW-08 – in the perched zone downgradient of the eastern portion of the source area;
- MW-06 – in the perched zone downgradient of the western portion of the source area; and
- MW-101 – in the deeper flow zone, downgradient of the central portion of the source area.

As will be discussed below, there were no detection of VOCs in groundwater at any of the downgradient monitoring locations.

3.3.2 VOCs in Soil

Volatile organic compounds were detected at concentrations above the NYSDEC Part 375 Protection of Groundwater Cleanup Objectives in six (6) out of 58 soil samples.

Three (3) VOCs were detected in soil at concentrations above the soil cleanup objectives, as summarized below and also shown on Plate 1.

VOC	NYSDEC Part 375 Protection of Groundwater Objectives (µg/kg)	Range of Concentrations above NYSDEC Part 375 Protection of Groundwater Objectives (µg/kg)	Number of Borings with Detections above NYSDEC Part 375 Protection of Groundwater Objectives	Location of Maximum Concentration
Ethylbenzene	1,000	1,400 – 2,800	2	MW-102 (12.5 to 13.5 ft bls)
Toluene	700	3,000 – 26,000	5	R-SB-106 (17.5 to 20 ft bls)
Xylenes (Total)	1,600	10,000 – 23,000	2	MW-102 (12.5 to 13.5 ft bls)

ft bls – feet below land surface

A summary of the soil boring rationale and the sampling results is provided in the table below.

Designation	Depth (ft bls)	Rationale	Results
R-SB-100	0 – 27	Confirmation of previous results obtained at L-SB-19 and L-SB-20 by Liberty	18,000 µg/kg toluene (22-24.5 ft bls). Delineation completed as follows: Vertical – R-SB-100 (25-27 ft bls): No exceedances[3] Horizontal – R-SB-121 (22-25 ft bls): No exceedances[3]
MW-102	0 - 25	Soil boring prior to installation of Monitoring Well MW-102	2,800 µg/kg ethylbenzene and 3,000 µg/kg xylenes (12.5-13.5 ft bls). Delineation completed as follows: Vertical – MW-102 (24-25 ft bls): No exceedances[4] Horizontal – R-SB-102 (10-12.5 and 15-16.5 ft bls): No exceedances[4] Horizontal – R-SB-104 (12-14 ft bls): No exceedances[4] Horizontal – L-SB-30 (16 ft bls): No exceedances[4]
R-SB-102	0 – 25	Confirmation of previous results obtained at L-SB-30 by Liberty	No exceedances[4]
R-SB-103	0 – 20	Confirmation of previous results obtained at L-SB-29 by Liberty	No exceedances[4]
R-SB-104	0 – 25	Confirmation of previous results obtained at L-SB-25 by Liberty	No exceedances[4]
R-SB-105	0 – 25	Delineation of perimeter of impacted area	1,400 µg/kg ethylbenzene and 10,000 µg/kg xylenes (2-5 ft bls) and 3,800 µg/kg toluene (20-24 ft bls). Delineation completed as follows: Vertical – R-SB-105 (24-25 ft bls): No exceedances[4] Horizontal – R-SB-119 (0-5 and 23-25 ft bls): No exceedances[4]
R-SB-106	0 – 25	Delineation of perimeter of impacted area; to obtain deep soil samples for vertical delineation of impacted soil below 15 feet depth in previous boring R-SB-5	26,000 µg/kg toluene (17.5-20 ft bls). Delineation completed as follows: Vertical – R-SB-106 (21.5-25 ft bls): No exceedances[4] Horizontal – R-SB-122 (17-19.5 ft bls): No exceedances[4]

[4] Compared to NYSDEC Sub-Part 375-6 Soil Cleanup Objectives for the Protection of Groundwater

Designation	Depth (ft bls)	Rationale	Results
R-SB-107	0 – 25	Delineation of perimeter of impacted area	No exceedances[4]
R-SB-108	0 – 25	Delineation of perimeter of impacted area/groundwater screening sample	No exceedances[4]
R-SB-109	0 – 25	Delineation of perimeter of impacted area/groundwater screening sample	No exceedances[4]
R-SB-110	20 – 28	To obtain deep soil samples for vertical delineation of impacted soil below 19 feet depth in previous boring R-SB-1 (requested by NYSDEC)	No exceedances[4] (23-24 ft bls)
R-SB-111	20 – 35	To obtain deep soil samples for vertical delineation of impacted soil below 20 feet depth in previous boring R-SB-3 (requested by NYSDEC)	No exceedances[4] (28-30 and 33.5-35 ft bls)
R-SB-112	0 – 26	Resolve discrepancy in results between R-SB-2 and L-SB-25 (requested by NYSDEC)	No exceedances[4] (in agreement with R-SB-2 results)
R-SB-113	20 – 30	To obtain deep soil samples for vertical delineation of impacted soil below 19 feet depth in previous boring R-SB-13 (requested by NYSDEC)	No exceedances[4] (28-30 ft bls)
R-SB-114	20 – 30	To obtain deep soil samples for vertical delineation of impacted soil below 20 feet depth in previous boring R-SB-14 (requested by NYSDEC)	No exceedances[4] (27-30 ft bls)
R-SB-115	15 – 27.5	To obtain deep soil samples for vertical delineation of impacted soil below 15 feet depth in previous boring R-SB-15 (requested by NYSDEC)	No exceedances[4] (24-25 and 26.5-27.5 ft bls)
R-SB-116	20 – 35	To confirm previous results for VOCs in the clay and obtain deep soil samples for vertical delineation of impacted soil below 25 feet depth in previous boring R-SB-16 (requested by NYSDEC)	No exceedances[4] (27-28 and 30-32 ft bls)
R-SB-117	0 – 25	Confirmation of previous results obtained at L-SB-24 by Liberty (requested by NYSDEC)	No exceedances[4]
R-SB-118	0 – 6	Delineation of offsite area (requested by NYSDEC); Boring ended at refusal at 6 ft bls due to concrete in two attempted locations	Not completed (refusal at 6 ft bls)
R-SB-119	0 – 25	Delineation of results obtained at R-SB-105	No exceedances[4]
R-SB-120	0 – 25	Delineation of results obtained at R-SB-105 and field observations at R-	No exceedances[4]

Designation	Depth (ft bls)	Rationale	Results
		SB-119	
R-SB-121	0 – 25	Delineation of results obtained at R-SB-100	No exceedances[4]
R-SB-122	0 – 25	Delineation of results obtained at R-SB-106	No exceedances[4]

3.3.3 VOCs and SVOCs in Groundwater

The only detections of VOCs and SVOCs above NYS AWQS are summarized below.

Compound	NYS AWQS (µg/L)	Concentration above NYS AWQS (µg/L)	Number of Locations with Detections above NYS AWQS	Location of Maximum Concentration
Ethylbenzene	5	310	1	MW-102 (screened 9-19 ft bls)
Xylenes (total)	5	2200	1	MW-102 (screened 9-19 ft bls)
Naphthalene	10	210	2	R-SB-109 (obtained with Geoprobe 10 ft bls)
Benzene	1	4.9	1	R-SB-109 (obtained with Geoprobe 10 ft bls)

µg/L – micrograms per liter
NYS AWQS – New York State Ambient Water Quality Standards and Guidance Values

The observations of benzene and naphthalene in the Geoprobe groundwater screening sample from R-SB-109 may have been the result of excess turbidity (i.e., fine suspended solids) in the unfiltered sample. As noted below, the suspended solids did impact the metals in groundwater results from R-SB-108 and R-SB-109, which were both obtained with the Geoprobe, and not from developed wells.

MW-102 is in an area just offsite to the north of the North Lot area where offsite discharge of waste occurred based on previous investigations and an aerial photo[5] of the historical extent of waste discharged by Powers Chemco.

Constituents of concern were not detected in groundwater above NYS AWQS in monitoring wells MW-01, MW-06, MW-08, MW-09, and MW-101 and the groundwater screening sample collected from R-SB-108.

3.3.4 Metals in Groundwater

No heavy metals (i.e., arsenic, chromium, lead, mercury, and zinc) were detected in groundwater samples collected from monitoring wells at concentrations above AWQS. Several of these metals were detected in unfiltered groundwater screening samples collected from soil borings R-SB-108 and R-SB-109. These compounds were not detected in exceedance of soil cleanup objectives in soil samples, and are attributable to relatively high turbidity in the groundwater screening samples during collection. The presence of suspended solids in the groundwater screening samples was confirmed by the observation of high concentrations of aluminum[6].

Previous groundwater sample results from the Pre-Design Investigation conducted in March 2011 indicated that the residual pockets of VOCs below the water table are resulting in continued impacts to groundwater beneath the North Lot area. A review of the groundwater sample and groundwater screening sample analytical results collected during this Remedial Investigation Amendment in November 2012 indicated that the groundwater source area is limited to the

---

5 Figure II-I, "Investigation and Hydrogeologic Assessment of the Former Columbia Ribbon and Carbon Waste Disposal Site", Fred C. Hart Associates, Inc., April 1984.

6 Aluminum is a structural element in clay minerals. Therefore its presence in water samples is usually an indicator of the presence of suspended fine solids.

perimeter shown in blue on Plate 3 in the North Lot. The results from Monitoring Well MW-102 indicate that there is a localized area of impacted groundwater in the perched zone immediately north of the Site beneath the grassed shoulder south of The Place. There is no indication from other data obtained during the RI that impacted groundwater has migrated further north than the immediate vicinity of MW-102.

A review of data from wells downgradient of the source area in the perched zone (MW-06 and MW-08) and in the deeper flow zone (MW-101) indicated that there is no downgradient migration of VOCs in groundwater from the source area.

Plate 4 presents a summary of the depths at which soil samples did not contain exceedances of the NYSDEC Sub-Part 375-6 Soil Cleanup Objectives for the Protection of Groundwater (i.e., the vertical extent of impacted soil and groundwater). Plate 4 also contains a conceptual extent of proposed excavation of the source material for VOCs in groundwater beneath the North Lot.

4.0 IDENTIFICATION AND STANDARDS, CRITERIA AND GUIDELINES AND DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

This section presents the remedial goals, standards, criteria, and guidance (SCGs), and remedial action objectives (RAOs) that apply to soil and groundwater at the Site. The identification of the remedial goals, SCGs, and RAOs for the Site was performed in accordance with 40 CFR 300 - National Contingency Plan (NCP) (USEPA, 1994), 6 NYCRR Part 375-Environmental Remediation Programs (NYSDEC, 2006), and NYSDEC's DER-10 guidance document (NYSDEC, 2010).

The remedial goals, which are common for all registered inactive hazardous waste sites, as provided in 6 NYCRR Part 375 and the NYSDEC DER-10 guidance document (NYSDEC, 2010), are:

- Restoration to pre-disposal conditions, to the extent feasible and authorized by law; and
- Elimination or mitigation of all significant threats to public health and the environment presented by the contaminants caused by site-related activities through the proper application of scientific and engineering principles.

The remedial goals serve to establish the foundation for developing RAOs specific to Site soil and groundwater. RAOs are operable unit-specific objectives for the protection of public health and the environment and are expressed with regard to the concentration of chemicals of concern (COCs) and comparison to chemical specific SCGs.

4.1 Standards, Criteria and Guidelines

SCGs are promulgated requirements and non-promulgated guidance that govern activities that may affect the environment. Specifically, the standards and criteria are cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations that are generally applicable, consistently applied, and officially promulgated under federal or state law. Guidance includes non-promulgated criteria that are not legal requirements; however, they should be considered based on professional judgment when applicable (NYSDEC, 2010).

The three general SCG categories specified in TAGM #4030 and United States Environmental Protection Agency (USEPA) guidance documents are: location-specific SCGs; action-specific SCGs; and chemical-specific SCGs. Location-specific SCGs are restrictions placed on the concentration of COCs or performance of remedial activities solely because they are in specific locations such as floodplains, wetlands, historic places, or sensitive ecosystems. The area to be addressed in the North Lot area is not located in the aforementioned locations. Therefore, no applicable location-specific SCGs were identified.

The following sections provide a discussion of the current applicable chemical and action specific SCGs.

4.1.1 Chemical Specific SCGs

The current applicable chemical specific SCGs are cited in the NYSDEC's CP-51 Soil Cleanup Guidance Document (NYSDEC 2010a), NYSDEC Sub-Part 375 Soil Cleanup Objectives for the Protection of Groundwater for the COCs in soil and the NYSDEC's Technical and Operational Guidance Series 1.1.1 Ambient Water-Quality Standards and Guidance Values (AWQGVs) and Groundwater Effluent Limitations (NYSDEC 1998) and subsequent addendums (NYSDEC 1999, 2000 and 2004) for the COCs in groundwater. The respective SCGs for key COCs present within the limits of the North Lot that exceed their respective chemical specific SCGs are summarized below:

Key SCGs for soil:

- 2-Butanone (MEK) – 120 µg/kg
- Ethylbenzene – 1,000 µg/kg
- Toluene – 700 µg/kg
- Xylenes – 260 µg/kg

Key SCGs for groundwater

- Benzene – 1 µg/L
- Ethylbenzene – 5 µg/L
- Napthalene – 10 µg/L

- Toluene – 5 µg/L
- Xylenes – 5 µg/L

4.1.2 Action-Specific SCGs

Action-specific SCGs are those that pertain to the implementation of a remediation technology. Those applicable for the Site are listed below in the following table.

Citation	**Title**	**Regulatory Agency**
General		
DER-10	Technical Guidance for Site Investigation and Remediation	NYSDEC
6 NYCRR Part 375	Environmental Remediation Programs	NYSDEC
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response	US Department of Labor, OSHA
29 CFR 1926	Safety and Health Regulations for Construction	US Department of Labor, OSHA
TAGM HWR-4031	Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	NYSDEC
Not Applicable	Analytical Services Protocol	NYSDEC
6 NYCRR Part 608	Use and Protection of Waters	NYSDEC
6 NYCRR Part 621	Uniform Procedures Regulations	NYSDEC
6 NYCRR Parts 750-757	State Pollutant Discharge Elimination System	NYSDEC

Citation	Title	Regulatory Agency
DER-31	Green Remediation	NYSDEC
Not Applicable	New York State Stormwater Management Design Manual	NYSDEC
Section 404	Clean Water Act	USACE
Groundwater		
6 NYCRR Part 700-705	Surface Water and Ground Water Classification Standards	NYSDEC
TOGS 1.1.1	Ambient Water Quality Standards and Guidance Values	NYSDEC
Air		
Air Guide No. 1	Guidelines for the Control of Toxic Ambient Air Contaminants	NYSDEC
6 NYCRR 200 - 202	NYSDEC regulations for “Prevention and Control of Air Contamination”	NYSDEC
Solid Waste		
6 NYCRR 360	Solid Waste Management Facilities	NYSDEC
6 NYCRR 364	Waste Transporters	NYSDEC

4.2 Development of Remedial Action Objectives

RAOs are specific goals for protecting human health and the environment. They are typically developed considering the requirements of applicable SCGs, the toxic or carcinogenic potential of the COCs, the exposure pathways, and the environmental impacts. As part of the FS process, RAOs were used in the screening of technologies and in the development and detailed evaluation of the selected remedial alternatives. Based on the results of the RI, and the nature and extent of contamination, the following RAOs have been established for the Site:

- Prevent or reduce the potential human exposure by ingestion, direct contact, and/or inhalation (via volatilization and airborne vapor) of soil that exceeds the applicable chemical specific SCGs;
- Prevent or reduce the potential for the leaching of COCs from soil to groundwater;
- Prevent off-site migration of primary COCs in groundwater; and
- Reduce the level of on-Site contamination due to the presence of primary COCs to the extent practicable.

4.3 General Response Actions

General Response Actions (GRAs) are broad categories of remedial actions capable of addressing the contamination at the Site. GRAs describe, in general terms, the site-specific measures that can be performed to achieve the RAOs established for the Site. GRAs identified for the impacted soil and groundwater at the Site include:

- No action;
- Containment;
- *In Situ/Ex Situ* Treatment and No Disposal;
- Extraction, *Ex Situ* Treatment and Disposal; and
- Source Removal and Disposal.

A summary description of each type of GRA is presented below:

<u>No Action</u> – The no action response measure provides a baseline assessment for comparison with other response measures consisting of greater levels of response. When a response measure may cause a greater environmental or health danger than a no action response, the no action response measure may be considered as an appropriate remedial measure for a Site. The no action response is evaluated and carried through the FS as required by 40 CFR Part 300.430[e][iii]. The no action response may consist of no action whatsoever on the Site, or some limited measure, such as periodic monitoring or access restrictions to the Site or specific area of the Site. Natural

degradation, dispersion, adsorption, dilution and volatilization are the only processes that would take place, and will occur regardless of intervention.

Containment – This type of remedial action will significantly reduce the mobility and volume of the contaminated wastes. Containment measures provide isolation of the impacted media, thereby minimizing the potential for direct exposure to, or migration of, COCs. Containment technologies for soil usually consist of impermeable or low permeability caps, which may be constructed as a surface feature. Containment technologies for groundwater could consist of groundwater extraction systems or subsurface barriers. Vapor by-products from several treatment processes may also require treatment.

In situ/Ex situ Treatment and No Disposal – *In situ/ Ex situ* treatment methods included under this GRA destroy or convert contaminants in soil or groundwater to less toxic compounds and do not require off-site disposal of treated soil or groundwater. For groundwater, proposed treatment methods (i.e., chemical oxidation) considered herein would be performed *in situ*.

Possible *in-situ/ex-situ* treatment methods, where applicable, for soil include soil vapor extraction (SVE) with air sparging (AS), electric resistance heating (ERH), chemical stabilization or thermal desorption. Vapor by-products may require treatment.

Extraction, *Ex situ* Treatment and Disposal – Removal of subsurface contamination in groundwater or soil would consist of the removal of media containing COCs, with concentrations exceeding specified remedial goals, from their existing place via excavation, pumping, SVE or other extraction techniques followed by treatment and discharge/ disposal of the treated media.

Ex-situ treatment methods separate, destroy, or convert contaminants from the following sources:

- extracted groundwater;
- excavated soil;
- extracted soil vapor; or
- vapor by-products from groundwater or soil treatments systems.

Possible *ex situ* groundwater treatment methods include the following: air stripping, liquid phase carbon adsorption, ultraviolet oxidation, biological treatment, thermal desorption, filtration, ion exchange and chemical precipitation. Considered *ex situ* treatment methods for soil include soil washing, thermal desorption or SVE. Possible *ex situ* vapor treatment methods include vapor-phase granular activated carbon adsorption and catalytic oxidation.

Methods for disposal of treated groundwater include discharge to sanitary sewers, storm drains, surface waters, publicly owned treatment works (POTWs) or re-injection/ recharge into the groundwater. Disposal of excavated soil and recovered groundwater, where applicable, consists of off-Site disposal at an appropriately designed and permitted facility. Off-Site disposal requires proper analyses to classify the material as hazardous or non-hazardous, and transport to the appropriate properly permitted facility. The methods for disposal of treated air emissions would be discharge to the atmosphere.

<u>Source Removal and Disposal</u> – Based on the RI, the source of contamination in soil and groundwater within the impacted areas in the North Lot would be removed by traditional excavation and dewatering techniques. Methods for disposal of treated groundwater include discharge to sanitary sewers, storm drains, surface waters, POTWs or re-injection/ recharge into the groundwater. Disposal of excavated soil and recovered groundwater, where applicable, consists of off-Site disposal at an appropriately designed and permitted facility. Off-Site disposal requires proper analyses to classify the material as hazardous or non-hazardous, and transport to the appropriate properly permitted facility.

Section 5.0 evaluates various technologies that were considered to be potentially viable for each GRA described above.

5.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section develops the GRAs discussed in the previous section into potential remedial technologies by identifying, evaluating, and screening applicable remedial technologies that may be employed in the North Lot area to achieve the RAOs. The remedial technologies to be evaluated in this section have been chosen based on their potential applicability in addressing the soil and groundwater impacts in the North Lot area. The technology screening process will consider whether technologies and process options can by themselves or in combination address the residual contamination in the North Lot area and meet the RAOs. During the screening of the technologies, the demonstrated ability of the technology to prevent potential impacts to human health and the environment and proven reliability of the technology under similar site conditions is evaluated.

The technology types and associated process options in this section have been identified based on the previous remedial actions conducted in the North Lot area, experience with similar types of environmental conditions, and engineering judgment. The selected remedial technologies will be evaluated on the basis of:

- Effectiveness – The effectiveness criterion evaluates the extent to which the technology meets the established RAO and considers the short-term effectiveness, long-term effectiveness, and potential impacts to human health and the environment. Short-term effectiveness refers to the effects during construction and/or implementation of the technology. Long-term effectiveness refers to the period after the remedial action is in place.

- Implementability – The implementability criterion focuses on both technical and administrative feasibility of constructing and operating a remedial action. Institutional aspects of the remedial technologies with factors such as institutional constraints, time schedules, and the availability of services, equipment, and trained personnel, compliance with applicable rules and regulations being considered as part of the evaluation.

- Relative Cost - The cost criterion evaluates the relative value of low, medium or high. The relative costs include capital cost, and operation and maintenance (O&M) costs. The capital costs include those costs for equipment, buildings, construction, land and site development, and purchased services such as transportation and disposal. The O&M costs include operating labor, maintenance costs, and purchased services such as electrical and natural gas.

Based on the previous remedial actions and the current condition of the Site (i.e., asphalt parking lot), technologies that may be appropriate were selected. The technologies that have been identified to be potentially applicable for addressing the soil and groundwater in the North Lot area include:

- No Action

Soil

- Capping (Soil, geomembrane, and asphalt caps)
- Excavation and Off-Site Disposal
- Soil Vapor Extraction and Air Sparging
- Chemical Stabilization
- Electric Resistance Heating
- Thermal Desorption
- Soil Washing

Groundwater

- Groundwater Extraction and Treatment (long-term pump and treat and short-term dewatering)
- *In Situ* Chemical Oxidation
- Containment/ Treatment Barrier

The following sections provide a brief description of the above technologies and present an evaluation of the technology's effectiveness, implementability and cost. A summary of this screening effort is presented in Table 1. After screening, the remaining technologies will be assembled, where applicable, and developed into various remedial alternatives to address soil and groundwater contamination present at the North Lot area.

5.1 No Action

The no action option, the inclusion of which is required by the NCP, provides a baseline against which other options may be compared. Under no action, no additional cleanup would be undertaken, and the Site would be left as it now exists. No action consists of leaving impacted soil and groundwater in place.

5.2 Soil Remediation Technologies

Soil general response actions have been developed that may be taken, singly or in combination, to satisfy the soil RAOs for the North Lot area.

5.2.1 Capping Options

Capping involves the placement of an engineered cover over contaminated soil. Capping prevents the direct contact with the contaminated soil and minimizes contaminant migration through air or run-off pathways. This technology prevents migration of contaminants by physically isolating them from driving forces, such as precipitation percolation, and stormwater run-off. In addition, capping will minimize and in some cases prevent soil vapor migration from the VOCs in the soil. Capping will not remove or degrade the VOCs in the soil and groundwater. Capping can be completed relatively quickly using readily available materials with standard construction equipment.

5.2.1.1 Soil Cap

A typical soil cap is constructed by regrading the Site and then spreading and compacting a 24-inch thick barrier/protective layer of soil and a 6-inch thick topsoil layer on the regraded area. The topsoil layer would support vegetation over the soil cover and provide drainage to minimize surface-water infiltration.

The cost of the installation and maintenance of a soil cap is expected to be lower than the other cap construction process options. Installation of the soil cap would not have any negative impacts to human health and environment and could be installed in a relatively fast timeframe. A soil cap would not prevent infiltrating precipitation from leaching contaminants from the underlying soil and into groundwater and would only provide some control of soil vapors that would migrate through the subsurface from impacted soil and groundwater. However, as the North Lot is a former asphalt parking lot, a soil cap cannot be readily incorporated.

5.2.1.2 Asphalt Cap

A typical asphalt cap is constructed by regrading the Site and then spreading and compacting a 6-inch base course and a 4-inch thick asphalt pavement layer. A gas venting layer may be required based on the potential for the build-up of soil vapor. This cap provides a high level of protection against both infiltration and direct human contact with the underlying soil and groundwater and controls vapors from volatile contaminants present in soil and groundwater.

The installation of an asphalt cap would be implemented relatively easy as the North Lot area is a former asphalt parking lot and construction is not expected to have negative impacts on human health or the environment. From an implementation standpoint, it is anticipated that the asphalt parking lot would only require minor restoration to remove and replace cracked or deteriorated pavement. The low permeability aspects of an asphalt cap would decrease infiltration of surface water and precipitation from entering the impacted soil. The cost, including maintenance, and remedial timeframe associated with the installation of and asphalt cap is typically moderate in comparison to other cap construction process options. Given the fact that there already is an existing asphalt parking lot in place, the cost for constructing this cap should be relatively low in comparison to the other cap options proposed.

5.2.1.3 Geomembrane Cap

A typical geomembrane cap is constructed by regrading the Site and then installing a 40-mil high density synthetic membrane overlain with a 24-inch thick protective layer of soil and a 6-inch thick topsoil layer. A gas venting layer may be required based on the potential for the build-up of soil vapor. The topsoil layer would support vegetation over the soil cover and provide drainage to minimize surface-water infiltration. This cap provides a high level of protection against both infiltration and direct human contact with the underlying soil and groundwater as compared to the other cap construction process options and also controls vapors from volatile contaminants present in soil and groundwater. However, as the North Lot is a former asphalt parking lot, a geomembrane cap cannot be readily incorporated.

5.2.1.4 Capping Summary Evaluation

In summary, although capping is a viable technology that would serve to prevent human and animal contact with the impacted soil and groundwater, it will not address the COCs in soil that are an ongoing source to groundwater and soil vapor. The caps will also restrict future land use. Therefore, capping will be not retained for further evaluation.

5.2.2 Excavation/ Dewatering and Off-Site Disposal

This technology consists of the excavation of impacted soil using readily available mechanical excavation equipment. The soil would be temporarily stockpiled onsite or directly loaded into trucks to be transported to an offsite disposal facility.

Waste characterization sampling would be collected from soil stockpiles to confirm the waste classification for disposal. The analysis would be determined by the disposal facility and may include VOCs, SVOCs, Toxicity Characteristic Leaching Procedure (TCLP) for VOCs, SVOCs, and metals and Resource Conservation and Recovery Act (RCRA) characteristics analysis. TCLP and the characteristic analysis would determine the classification of the VOC impacted soil in the North Lot with the higher detected concentrations.

Excavation is a viable remedial option because excavation permanently eliminates continuing sources to groundwater through source removal. Excavation with on-site treatment and/or off-site transportation and disposal provides the most permanent solution to remove VOC contaminated soil and sources to groundwater. Dewatering and treatment/disposal during excavation will also remove contaminated groundwater. For the purpose of this FS, dewatering is being considered a groundwater extraction and treatment technology and is further discussed in Section 5.3.1.

One disadvantage associated with excavation is the potential to expand the excavation based upon post-excavation end-point sample results or subsurface findings encountered during excavation. The volume of groundwater resulting from the dewatering operation can vary based on the depth of excavation, recharge rate and duration, thereby impacting the cost and logistics for this option. In addition, the potential to generate odors and the respective requirements for odor control measures is increased when excavation is conducted. The groundwater quality will improve by removing the soil source found in soil by excavation and existing groundwater impacts by dewatering.

During excavation activities, this technology may present dermal contact, inhalation, and ingestion exposure risks to workers and the nearby residences associated with the physical removal of the impacted soil. However, with the proper engineering controls and health and safety monitoring, this risk will be reduced. Although this technology is not sustainable and the respective costs are typically high, this technology offers complete remediation of the soil and may be combined with other technologies to address any residual impacted groundwater. This technology would fulfill the RAOs for the soil and, to a large extent, the groundwater and is retained for further evaluation.

5.2.3 Soil Vapor Extraction and Air Sparging

SVE is typically an *in-situ* treatment technology that can be performed *ex situ* and is designed to remove and treat VOCs from the soil in the unsaturated zone. A vacuum is applied to impacted soil to extract VOC vapors. The vapors are extracted from the soil and conveyed through a piping network to a treatment system, where they are treated prior to discharge. Air sparging is a remediation technique that uses the injection of pressurized air into the subsurface at depths below the water table. Air injected into the zone of impacted groundwater causes high vapor pressure chemicals to volatilize, effectively “stripping” the volatile chemicals from impacted groundwater. Injected air also causes volatilization of chemicals from saturated and unsaturated soils. The vapors migrate upward toward the unsaturated zone, where they are captured by an SVE system.

As was discussed in Section 2.2, the previous remedial action at the Site consisted of an SVE system. The SVE system was implemented unsuccessfully due to the heterogeneity of the Site soil and will not be retained for further evaluation as an *in situ* or *ex situ* technology option. As air sparging is contingent upon the ability to capture any sparged vapor with SVE, it will also not be retained for further evaluation.

5.2.4 Chemical Stabilization

Chemical stabilization processes alter the chemical structure of the contaminants to produce a less hazardous residue than the original waste. Typically, *in situ* stabilization involves the direct injection of reagents and additives into the subsurface using specialized machinery and injection augers and rotary-type mixers for blending, but can also be performed *ex situ*, where applicable. This process has the potential to reduce the mobility of inorganic contaminants and has been used on hazardous waste sites with varying degrees of success. The COCs in the soil in the North Lot area are predominantly VOCs, therefore, this process will not be retained for further evaluation because of the inapplicability of treating the VOCs of concern utilizing this technology option.

5.2.5 Electric Resistance Heating (ERH)

ERH is an *in situ* treatment technology that utilizes controlled electrical current and powerful vacuum pumps to vaporize and then extract contaminants. ERH uses electrodes that are installed like wells to direct the flow of electrical current through the subsurface soil. The flow of electrical current through the subsurface heats the soil and groundwater directly and uniformly.

ERH increases subsurface temperatures to the boiling point of water. By doing so, ERH speeds the removal of contaminants by two primary mechanisms: increased volatilization and steam stripping. As subsurface temperatures begin to climb, contaminant vapor pressure and the corresponding rate of contaminant extraction increases. However, it is the ability to produce steam *in situ* that represents an advantage of ERH. Through preferential heating, ERH creates steam from within silt and clay stringers and lenses. The physical action of steam escaping these tight soil lenses drives contaminants out of those portions of the soil matrix that tend to lock in contamination via low permeability or capillary forces. Released steam then acts as a carrier gas, which is removed through vapor recovery wells.

At the surface, a condenser separates the mixture of soil vapors, steam, and contaminant liquids, which is extracted from the subsurface, into condensate and contaminant laden vapor. If these waste streams require pre-treatment before discharge, standard air abatement and water treatment technologies are used.

The cost and remedial timeframes associated with ERH is expected to be high in relation to other technologies. ERH has the potential to liberate sorbed VOCs and does not include hydraulic control, therefore, it has the potential to result in uncontrolled off-site migration of impacted groundwater. However, this technology has been proven capable of remediating VOCs from both the unsaturated and saturated zones as well as groundwater, regardless of permeability or heterogeneity. For this reason, ERH will be retained for further evaluation.

5.2.6 Thermal Desorption

Thermal desorption removes contaminants by processes that may include boiling, evaporation, oxidation and steam distillation. Specifically, heating elements transfer heat to the soil by thermal conduction. Some contaminants are destroyed in the area of soil near the heat source. The remaining contaminants are extracted by the vacuum system and treated prior to release.

As an *in situ* treatment technology, thermal desorption is primarily effective for VOCs in unsaturated soils only. As a significant amount of the soil contamination is in the saturated zone, this will limit the effectiveness of this technology and is the reason why the *in situ* option wasn't evaluated herein. As an *ex situ* technology, it would require excavation, dewatering (to minimize water content of saturated soils) and significant soil handling and mixing (to ensure uniform thermal treatment). The excavated soil would be placed in rotary kiln incinerators. The incinerators treat organic contaminants in the soil by subjecting them to high temperatures (maximum of 950 degrees Fahrenheit). This temperature causes the volatilization and combustion of the organic COCs present at the Site. Soil and fuel are fed into the rotary kiln and passed through the combustion zone as the kiln slowly rotates. The retention times vary but may vary from several minutes to an hour or more. The soil would be treated to the project-specific soil cleanup objectives (SCOs) and used as backfill eliminating the need for off-site disposal.

The costs and remedial timeframes associated with thermal desorption could potentially be high in relation to other technologies; however, *ex situ* thermal desorption is a sustainable, effective treatment option that can be used in combination with excavation and will be evaluated further.

5.2.7 Soil Washing

Soil washing is an *ex situ* treatment technology that treats excavated soil by mixing the soil with a wash solution (i.e., water) to form a slurry. Through physical separation processes, the washed sand is then separated from the slurry mixture containing the fine materials and associated contaminants. The mixture of silt and water must then be treated by other processes or disposed off-site.

The cost associated with soil washing is expected to be high in relation to other technologies due to the silty clay soil present at the Site. In addition, the direct cost of soil washing is not a cost for complete treatment as additional technologies such as excavation and off-site waste disposal would be necessary to comply with Site-specific RAOs. There are potential health and safety risks to Site workers associated with excavation and handling of waste through odor and dust. However, with proper engineering controls and health and safety monitoring, these risks will be minimized. Also, this remedial technology would require a comparatively long time for remediation. Based on the factors discussed above, soil washing will not be evaluated further.

5.3 Groundwater Remediation Technologies

The following sections present remedial technologies and process options applicable to the contaminated groundwater at the Site.

5.3.1 Groundwater Extraction and Treatment

Groundwater extraction and treatment is a technology that captures and prevents off-site migration of groundwater and removes contaminants prior to discharge to surface water, groundwater, or POTW. The groundwater is extracted through the use of interceptor trenches or vertical extraction wells via pumping. It is typically a technology that is employed for multiple years before Site-specific SCGs can be achieved.

As was discussed in Section 2.2, the previous remedial action at the Site consisted of a groundwater extraction and treatment system. The groundwater extraction and treatment system was implemented unsuccessfully due to the heterogeneity of the Site soil and therefore construction and long term operation of a groundwater extraction and treatment system will not be retained for further evaluation. However, the short-term option of dewatering, treatment (as required) and disposal of all dewatering wastewater encountered during potential excavation of impacted soils will be retained for further evaluation as the most impacted water within the limits of the North Lot would be addressed through implementation of the respective retained soil remediation technology.

5.3.2 *In Situ* Chemical Oxidation

In situ chemical oxidation (ISCO) is a proven and effective groundwater treatment method to address dissolved phase VOC contamination. ISCO destroys organic contaminants in the groundwater by utilizing blends of catalysts, and oxidizers and oxidizing the VOCs. However, to be effective the chemical oxidant needs to be in contact with the contaminants. The heterogeneity of the Site silty clay layers, would limit the effectiveness of chemical oxidation by limiting the distribution of the injected oxidant to ensure adequate treatment coverage.

ISCO is an effective remedial option since it does not require any treatment system infrastructure or long-term O&M. The costs are moderate but multiple injections would be necessary due to the silty clay soil located in the North Lot area. However, this technology is a viable groundwater treatment technology, following excavation and backfilling with clean, uniform sand and will be retained for further evaluation. The import of clean sandy backfill would improve the ability to inject the chemical oxidant and address the residual groundwater contamination that may be remaining after excavation activities. As such, ISCO should not be applied as a “stand alone” technology due to the heterogeneity of the soil at the Site.

5.3.3 Containment/Treatment Barrier

Vertical barriers are physical barriers which impede the horizontal flow of contaminated groundwater. The vertical barrier considered for this Site is a slurry wall. The slurry wall would be used around the perimeter of the North Lot area to prevent the migration of contaminated groundwater. Typically slurry wall construction involves soil/cement bentonite mixtures. The construction of a slurry wall involves the excavation of a vertical trench and the injection of slurry into the excavated trench. Vertical barriers can be constructed by conventional construction methods at a moderate capital cost in relation to other groundwater technologies. However, it would be necessary to augment the vertical barrier with groundwater extraction to prevent the buildup of hydrostatic pressure on the upgradient or interior sides of the barrier. As groundwater extraction and treatment was not retained for further evaluation and would have to be part of a vertical barrier system; a vertical barrier will not be retained for further evaluation.

5.4 Retained Technologies

Based on the screening of remedial technologies, provided below is a summary of the technologies that are retained for further consideration, either as remedial alternatives in and of themselves, or in combination with other technologies to form alternatives. Certain technologies (i.e., ISCO) could be part of a source removal alternative that addresses any residual groundwater contamination that may be present after the performance of any proposed remedial alternative. These technologies have been determined to be applicable to address the nature and extent of contamination at the Site and have been retained for further evaluation in Section 6.0 and are summarized as follows:

- Excavation and Off-Site Disposal;
- Thermal Desorption;
- Short-term Groundwater Extraction and Treatment (Dewatering);
- ISCO; and
- ERH.

The no-action option, the inclusion of which is required by the NCP, provides a baseline against which other technology options may be compared and will be retained for further evaluation as well.

6.0 DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

The description and evaluation of remedial alternatives provides a detailed analysis of remedial alternatives. The remedial alternatives were developed by combining technologies retained in the technology screening process described in Section 5.0. The area impacted by historical disposal of industrial wastes is approximately 1.4 acres and located in the northwest section of the Site (the North Lot) and serves as an employee parking area. The area of concern is one-third (1/3) of an acre within the north-northeast portion of the North Lot. The remedial alternatives for the area of concern include:

Remedial Alternative 1:	No Action;
Remedial Alternative 2:	Soil Excavation/Offsite Disposal, Dewatering and *In Situ* Chemical Oxidation;
Remedial Alternative 3:	Soil Excavation, Dewatering, *Ex Situ* Thermal Desorption and *In Situ* Chemical Oxidation; and
Remedial Alternative 4:	ERH.

Each of the above alternatives will be evaluated based on seven specific criteria. The results of this assessment will be used to comparatively evaluate the alternatives to determine which is most appropriate for implementation. The seven criteria are provided in NYSDEC TAGM 4030 (NYSDEC, 1990), the NCP (40 CFR Part 300.430), Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988b), and DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010). The seven evaluation criteria are the following:

- Overall protection of public health and the environment
- Compliance with SCGs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume
- Short-term effectiveness
- Implementability
- Cost

Overall protection of public health and the environment and compliance with SCGs are termed threshold criteria, whereas the remedial alternative must meet these requirements in order to be eligible for selection. The remaining five criteria are termed primary balancing criteria and are used as the primary basis of comparison in selecting the recommended remedial alternative.

The following sections provide a description of the remedial alternatives that were developed to address the VOC impacted soil and groundwater in the North Lot area and evaluate the alternatives based on the above seven evaluation criteria.

6.1 Remedial Alternative 1: No Further Action

In accordance with the NCP and the DER-10, a no action alternative is evaluated to provide a baseline for comparison of potential risks posed if no remedial action were performed. For this remedial alternative, all soil located in the North Lot areas would remain in place and the impacted groundwater would not be treated.

6.1.1 Overall Protection of Human Health and the Environment

Remedial Alternative 1 would not be protective to human health and the environment and, in turn, does not meet this minimum threshold criteria. The presence of soil with concentrations exceeding the soil cleanup levels would continue to be a source for the existing impacted groundwater. The asphalt pavement covering the soil currently provides protection to humans and the environment. However, under this alternative, maintenance of pavement in this areas is not required, resulting in a long term potential for exposure.

6.1.2 Compliance with SCGs

Since no remedial actions would be conducted under this alternative, this alternative would not comply with the applicable chemical and action-specific SCGs and, in turn, does not meet this minimum threshold criteria. Specifically, this remedial alternative would not:

- Satisfy the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to public health and the environment;
- Satisfy the 6 NYCRR Part 375 goal to restore the North Lot to pre-disposal/pre-release conditions, to the extent feasible and authorized by law; and

- Address SCGs for soil and groundwater.

6.1.3 Long-Term Effectiveness and Permanence

This evaluation criterion is based on the amount of residual risk of contamination that remains after the remedial action alternative is implemented. Alternative 1 provides neither long-term effectiveness nor permanence since the quality of the soil and groundwater exceeding cleanup levels would remain the same.

6.1.4 Reduction of Toxicity, Mobility, or Volume

This alternative would not be effective in reducing the toxicity, mobility, or volume of impacted soil and groundwater. This alternative would not provide a means to ensure that the mobility of the VOCs in soil would be prevented. The natural attenuation of COCs in groundwater would not be a reliable means of reducing the toxicity, mobility, or volume of VOCs in the subsurface.

6.1.5 Short-Term Effectiveness

Since there are no actions proposed for this alternative, there is no associated construction and implementation period, and therefore no associated short-term impacts to human health and the environment.

6.1.6 Implementability

Implementability concerns posed by this alternative do not exist since there would not be any actions performed. Therefore, this alternative would be readily implementable.

6.1.7 Cost

Since there are no remedial actions for this alternative, there is no capital cost associated with Remedial Alternative 1.

6.2 Remedial Alternative 2: Soil Excavation/Offsite Disposal, Dewatering and *In Situ* Chemical Oxidation

Remedial Alternative 2 consists of the removal of soil and groundwater impacted with VOCs at concentrations above SCGs by excavation/ dewatering and subsequent offsite disposal. As part of this alternative, ISCO would address any remaining impacted groundwater, if required, based on the results of post-remediation groundwater monitoring. Development of this alternative satisfies the remediation goal of evaluating the technical feasibility of remediation to predisposal conditions. Remediation to predisposal conditions would entail excavation of all soil containing VOCs greater than the SCGs, removal of all groundwater containing VOCS greater than SCGs to the extent practical followed by ISCO to address any residual impacted groundwater.

Based on the delineation of the soil during the recent RI, the approximate areal extent of the area of concern in the North Lot area is 0.3 acres. The RI soil data has shown that the first five feet of soil has no impacts above the SCOs, with the exception of a small area in the immediate vicinity of SB-105. The extent of VOC-impacted soil is limited to approximately 5 to 20 ft bls. Therefore, this alternative would result in the removal of approximately 13,000 cubic yards of soil. The results of the recent RI indicate that there is a localized area of impacted groundwater (depth to groundwater is approximately 7 ft bls) in the perched zone in the area of the proposed excavation that will be removed, treated and disposed off-site as part of concurrent dewatering operations. Residual impacted groundwater, if present after remedy implementation, will be treated following excavation and backfill with ISCO.

A part of the delineated area is located between the northern property line and “The Place”. Due to the proposed depth of excavation, a support of excavation (SOE) will be installed along the portion of the impacted area border that adjoins “The Place”. Based on the results of the RI, there is a clay layer at approximately 25 ft bls that has prevented the downward migration of VOCs. Therefore, the proposed SOE will consist of a modular shoring system (i.e., ICON™ System). Along the perimeter of the proposed excavation area within the property boundary, there are active utilities located in close proximity to the impacted offsite area between the chain-link fence and “The Place” that include an overhead electrical line and underground high pressure natural gas line. The offsite soil sampling results indicated that the impacted soils extend to approximately 15 feet from the overhead utility line and 25 feet from the natural gas line. Any residual soil impacts that may be left in offsite soil between the northern perimeter of the excavation and “The Place” will be addressed by ISCO. The ISCO treatment will be focused along the sidewalls and bottom of the off-site portion of the excavated area, and will facilitate treatment of the un-excavated zone immediately south of "The Place". The spacing of the injection points and oxidant volume may be adjusted, as necessary, to properly introduce the oxidant solution to the subsurface.

The interior limits of the excavation perimeter will be protected using sloping and benching of the excavation in lieu of sidewall support structures. Sloping of the excavation perimeter will be based on industry standards and OSHA requirements for the applicable soil type present at the Site.

Due to the shallow depth of groundwater, dewatering will be necessary during excavation activities. The dewatering activities will require the installation of slotted PVC pipe or sumps. Trash pumps will be used to pump the groundwater from the slotted pipe or sumps to aboveground frac tanks. The groundwater will be pumped through the appropriate treatment units (i.e., liquid phase carbon units) prior to discharge to the Publicly-Owned Treatment Works (POTW).

The first five feet of soil will be excavated and staged for re-use as backfill. Following removal of the first five feet, the remaining soil will be excavated and staged for off-site disposal. Waste characterization samples will be submitted for analysis based on disposal facility requirements, which is likely to include TCLP VOCs, TCLP SVOCs, TCLP metals, and RCRA characteristics.

An average density of 1.6 tons per cubic yard was assumed for the excavated soil. Based on this density assumption, it is estimated that approximately 21,000 tons of soil will be excavated, of which 5,000 tons (i.e., the upper 5 feet) will be re-used as backfill.

A CAMP would be developed in accordance with the NYSDOH Generic Community Air Monitoring Plan contained in Appendix 1A of the DER-10 (NYSDEC, 2010). The air monitoring program would include real-time continuous particulate monitoring using particulate monitoring devices. VOCs and odors will be monitored and mitigated as necessary using foam or other odor-suppressant means.

Dust would be controlled by spraying a water mist over the work area if perimeter action levels established in the CAMP are exceeded. This would be generated by connecting a misting device to a hose, which would be connected to any potable water source. The degree to which these measures are used would depend on particulate levels in ambient air at the perimeter of the Site as determined through implementation of the CAMP.

A soil monitoring plan will be followed for the analytical testing of excavated soil prior to off-site disposal. Following backfilling of the on-site staged soil and clean imported backfill, post-remedy groundwater monitoring will be performed to determine the need for ISCO to treat any remaining impacted groundwater. In addition, ISCO will be performed in the unexcavated area between the northern property line and “The Place”.

As a potential cost savings measure, a system of injection points and piping will be installed during backfilling activities, in anticipation that ISCO would be required to treat any remaining impacted groundwater. If required, a chemical oxidant (i.e., RegenOx™) will be injected of sufficient quantity to treat the VOCs remaining in the groundwater. Following the first injection event, groundwater monitoring will be performed to determine the effectiveness of the injections. The groundwater monitoring data will be used to determine the need for additional injections.

6.2.1 Overall Protection of Human Health and the Environment

This alternative would meet each of the RAOs for providing protection to human health and the environment by removing COCs in soil and groundwater above their respective SCGs. Site restoration would be accomplished using backfill from on-site staged clean soil and imported certified clean backfill. Institutional and engineering controls would not be required to provide future protection to humans and the environment.

Future risk of exposure for on-site construction workers to VOC impacted soil is removed entirely by implementing this remedial action alternative. Protection of the environment is also provided through removal of VOC impacted soil that could serve as a continuing source of future impacts groundwater.

6.2.2 Compliance with SCGs

This remedial action alternative would comply with the applicable chemical and key action-specific SCGs for the media of concern.

Specifically, Remedial Alternative 2 would comply with the following key SCGs:

- Satisfy the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to public health and the environment;
- Satisfy the 6 NYCRR Part 375 goal to restore the North Lot to pre-disposal/pre-release conditions, to the extent feasible and authorized by law; and
- Address SCGs for soil and groundwater.

6.2.3 Long Term Effectiveness and Permanence

Remedial Alternative 2 provides long-term effectiveness through the permanent removal and treatment of VOC impacted soil and groundwater from the North Lot and the treatment of residual groundwater impacts, if required, with ISCO.

6.2.4 Reduction of Toxicity, Mobility, or Volume

Soil excavation would effectively reduce the toxicity, mobility, and volume of soil with concentrations exceeding the SCGs at the Site. All soil exhibiting concentrations in excess of SCGs would be removed from the Site or treated on-site, thereby reducing mobility, toxicity and the volume of contaminated soil and groundwater at the Site. The source to groundwater by soil excavation and existing groundwater impacts by dewatering will also be removed.

6.2.5 Short-Term Effectiveness

This alternative requires excavation, and therefore poses the greatest short-term impacts for remedial workers, and the residential community. Remedial workers would be in direct contact with soil during excavation activities. Exposure would be reduced through the use of mechanical equipment for soil excavation and site preparation, to the extent practicable. Engineering controls, including proper personal protective equipment (PPE), will reduce the short-term impacts to workers while conducting this work. Air monitoring and dust controls would be implemented as needed to ensure that the surrounding residential properties are not exposed to site-related contaminants from construction activities.

Additional potential short-term risks to the community would be posed from transportation of approximately 500 truckloads of soil to offsite disposal facilities. Potential exposure could result from releases from haul vehicles along the transportation route. To minimize these risks, haul vehicle loads would also be secured via tarping prior to exiting the Site to guard against release of waste in route to the disposal facility..

6.2.6 Implementability

Implementation of soil excavation in the North Lot area is feasible to perform within a reasonable timeframe. In addition, ISCO can be performed in a reasonable timeframe.

6.2.7 Cost

The estimated capital cost to implement Remedial Alternative 2 is $5,084,000. This capital cost consists of soil excavation, dewatering, off-site disposal and transportation, and replacement of approximately 10,000 cubic yards of soil followed by ISCO injections and monitoring. The annual operation and maintenance costs would consist of groundwater monitoring.

6.3 Remedial Alternative 3: Excavation, Dewatering and On-Site Thermal Desorption and ISCO

The components of Remedial Alternative 3 are similar to those for Remedial Alternative 2, except that the excavated soil above the SCGs will be treated on-site using thermal desorption, which will allow for the re-use of the treated excavated soil above the Site SCGs.

Prior to excavation, the on-site thermal desorption equipment will be mobilized to the Site. The appropriate utilities will be provided and consist of potable water, electricity and a fuel source (i.e., natural gas). Once the equipment is set-up, the excavation and dewatering activities will take place following the same procedures as described for Remedial Alternative 2. The excavated impacted soil will then be screened to remove large objects (greater than 2 inches in diameter). The screened soil is then introduced to the rotary kiln incinerator for treatment. The anticipated throughput is approximately 30 tons per hour. After treatment, the soils are rehydrated for dust control reasons, and stockpiled on-site. The vapor stream generated during the treatment process will be treated with a thermal oxidizer. A soil monitoring plan will be followed for the analytical testing of excavated soil being treated by thermal desorption as part of routine monitoring of the thermal treatment process. In the event that analytical testing of the soil indicates that the treated material is above the SCOs, the soil would be stockpiled and re-treated.

Following successful treatment of the impacted soil and removal and disposal of impacted groundwater, the excavation will be backfilled with the on-site staged soil. The treated soil may require additional hydration to meet specified backfilling and compaction requirements. Groundwater monitoring will be performed to determine the need for ISCO.

As a potential cost measure, a system of injection points and piping will be installed during backfilling of the excavated area, in anticipation that ISCO would be required to treat any remaining impacted groundwater. A chemical oxidant (i.e., RegenOx™) will be injected of sufficient quantity to treat the VOCs remaining in the groundwater. Following the first injection event, groundwater monitoring will be performed to determine the effectiveness of the injections. The groundwater monitoring data will be used to determine the need for additional injections. It is important to note that the effectiveness of ISCO would be limited given the heterogeneous nature of site soils being excavated and returned to the excavation.

6.3.1 Overall Protection of Human Health and the Environment

This alternative would meet each of the RAOs for providing protection to human health and the environment by removal and *ex situ* treatment of COCs in soil and groundwater above their respective SCGs. Protection is afforded by treating all soil with VOC concentrations present in the source area to levels below their respective SCGs. Site restoration would be accomplished using backfill from on-site staged clean soil and treated soil to below Site SCGs. Institutional controls would not be required to provide future protection to humans and the environment.

Future risk of exposure for on-site construction workers to VOC impacted soil is removed by implementing this remedial action alternative. Protection of the environment is provided through successful treatment of VOC impacted soil that could potentially impact groundwater. However, residual impacts to Site groundwater would be a potential concern as thermal treatment of excavated material used as backfill would not remove all COCs.

6.3.2 Compliance with SCGs

This remedial action alternative would comply with the applicable chemical and action-specific SCGs for the media of concern.

Specifically, Remedial Alternative 3 would comply with the following key SCGs:

- Satisfy the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to public health and the environment;
- Satisfy the 6 NYCRR Part 375 goal to restore the North Lot to pre-disposal/pre-release condition, to the extent feasible and authorized by law s; and
- Address SCGs for soil and groundwater.

It is anticipated that groundwater contamination would be removed by dewatering efforts performed during ongoing excavation activities; however, a potential post-remediation source of groundwater risk would remain as residual COCs would still be present in treated soil returned to the excavated portions of the North Lot.

6.3.3 Long Term Effectiveness and Permanence

Remedial Alternative 3 provides long-term effectiveness through the removal and treatment of impacted soil from the North Lot area. ISCO would be implemented, if warranted based on post-remedy monitoring, to address any residual impacted groundwater remaining after the backfilling the excavation. However, the effectiveness of ISCO would potentially be limited based on the heterogeneous nature of the Site soils that would be returned to the excavated portions of the North Lot.

6.3.4 Reduction of Toxicity, Mobility, or Volume

The on-site thermal treatment would effectively reduce the overall toxicity, mobility, and volume of soil with concentrations exceeding the SCOs. Dewatering associated with excavation will significantly reduce COC concentrations in groundwater exceeding Site-specific SCGs. However, there is a potential future leaching component due to the treated soils being returned to the excavated portions of the North Lot as thermal treatment does not fully treat all COCs of concern.

6.3.5 Short-Term Effectiveness

This alternative poses moderate short-term risks for remedial workers and residential community. Remedial workers would be in direct contact with soil during excavation activities and the on-site thermal treatment process. Exposure would be reduced through the use of mechanical equipment for soil excavation and site preparation, and off-gas treatment for the thermal treatment to the extent practicable. Engineering controls, including proper PPE, requirements can reduce the short-term risks to workers while conducting this work.

Potential short-term risks to the residential community would be posed from the transportation of approximately 10,000 cubic yards of soil on-site to staging areas and thermal treatment system. However, this risk is lower comparing the truck traffic impacts to the residential community associated with the alternative that incorporates off-site disposal. Potential exposure could result from off-gas from the thermal treatment process, which may require treatment to mitigate

6.3.6 Implementability

Experienced remedial contractors are readily available to implement the excavation as well as thermal desorption activities associated with this alternative. The respective mechanical equipment is also readily available for soil excavation. However, the availability of portable thermal treatment units may be limited; therefore, careful planning during the bidding stage is required to meet any regulatory requirements for timely completion of the proposed remedial action. On a related note, permitting associated with regulatory approval of this proposed remedy can take a significant amount of time and should also be considered with regards to timely completion of the remedial action. Once mobilized to the Site, the on-site management of the thermal treatment system would require moderate effort due to the anticipated volume of soil to be treated.

The silt and clay lenses present at the site could potentially result in poor treatment performance because the fined-grained material tends to agglomerate and cake and thereby inhibit heat and mass transfer required for optimum treatment performance. Moreover, a review of the RI results indicated that a high proportion of contaminant mass may be adsorbed into the fine-grain portion of the impacted soil at the Site. Because of the presence of the clay lenses at the Site, many contractors require bench scale/pilot testing on the proposed Site soils to definitively confirm the applicability of the technology for the Site. This requirement would further adversely impact project schedule.

6.3.7 Cost

The estimated capital cost to implement Remedial Alternative 3 is $5,009,300. This capital cost consists of soil excavation and treatment and backfill of 10,000 cubic yards of soil and ISCO. The annual operation and maintenance costs would consist of groundwater monitoring.

6.4 Remedial Alternative 4: Electrical Resistance Heating

Remedial Alternative 4 is a remedial option that relies on a network of high voltage electricity conduits leading to subsurface electrodes, combined with an above grade vapor extraction, recovery and treatment system. The estimated number of electrodes to treat the area is 80. The electrodes would consist of approximately 4-foot wide sheeting piling sections spaced approximately 15 feet apart. A power control unit (PCU) capable of 2000 kilowatts will be used to generate the electricity needed. In addition to the electrodes, approximately 80 co-located vapor recovery wells will also be installed to capture the steam and vapor during the heating process. Temperature monitoring points will be used to monitor the subsurface temperature. The aboveground treatment system consists of a heat exchanger, vapor recovery blower with knockout tank. The off-gas from the blower will be used using a catalytic oxidizer. The recovered condensate will be treated using liquid phase carbon units prior to off-disposal or discharge to the POTW.

6.4.1 Overall Protection of Human Health and the Environment

This alternative would meet the RAOs for providing protection to human health and the environment. Protection is afforded by treating both the soil and groundwater during the ERH process. However, this technology has the potential to liberate sorbed contaminants and requires hydraulic and vacuum controls to prevent uncontrolled off-site migration of dissolved and vapor phase contaminants. For the Site, hydraulic control requirements may not be completely effective given the heterogeneous nature of soils at the Site, which is a major drawback for utilizing this technology at the Site as there is a potential for existing groundwater contamination to migrate uncontrollably off-site. In addition, recovery of the steam and vapor may not be completely effective due to the silty clay lenses potentially preventing capture by the vapor recovery wells.

6.4.2 Compliance with SCGs

This remedial action alternative would comply with the applicable chemical and action-specific SCGs for the media of concern.

Specifically, Remedial Alternative 4 would comply with the following key SCGs:

- Satisfy the 6 NYCRR Part 375 goal to eliminate or mitigate all significant threats to public health and the environment;
- Satisfy the 6 NYCRR Part 375 goal to restore the North Lot to pre-disposal/pre-release conditions; and
- Address SCGs for soil and groundwater.

6.4.3 Long Term Effectiveness and Permanence

Remedial Alternative 4 provides long-term effectiveness through the *in situ* treatment of impacted soil and groundwater.

6.4.4 Reduction of Toxicity, Mobility, or Volume

The treatment of both the impacted soil and groundwater would effectively reduce the overall toxicity, mobility, and volume of impacted soil and groundwater exceeding the cleanup levels. However, there is a potential for existing contamination to mobilize to the dissolved phase with ineffective hydraulic control and, in turn, increase toxicity, mobility and volume of groundwater contamination off-site.

From a sustainability perspective, landfill space is preserved if treated soil remains at the Site as opposed to the alternative option of excavation and off-site disposal as non-hazardous and hazardous waste.

6.4.5 Short-Term Effectiveness

This alternative poses moderate short-term effects for remedial workers and the residential community. Remedial workers would be in indirect contact with soil during the installation of the electrodes and SVE wells. Exposure would be reduced through the use of engineering controls including proper PPE requirements can reduce the short-term effects to workers while conducting this work.

6.4.6 Implementability

Experienced remedial contractors are readily available to implement the remedial activities associated with this alternative; however, ERH is generally not considered easily implemented as there is some specialty construction required for utilizing this treatment option.

6.4.7 Cost

The estimated capital cost to implement Remedial Alternative 4 is $4,082,760.

6.5 Comparison of Remedial Alternatives

The NCP and the NYSDEC regulation and guidance on the selection of remedial alternatives for inactive hazardous waste disposal sites require that the seven evaluation criteria be used to individually evaluate the remedial action alternatives and also evaluate comparatively to identify advantages and disadvantages of each alternative relative one another (NYSDEC, 1990 and NYSDEC, 2010).

The NCP and the NYSDEC guidance also require that alternatives be evaluated based on community acceptance. In accordance with NYSDEC guidance, alternatives are evaluated for community acceptance after the public comment period and are not discussed herein.

6.5.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment and compliance with SCGs are threshold criteria. Therefore, the remedial action alternatives must adequately protect the human health and the environment and successfully comply with SCGs to be considered for selection as a recommended alternative. The protection of human health and the environment can be measured by the alternative's ability to satisfy the RAOs.

Remedial Alternative 1 – The "No Action" alternative would not reduce or control the potential for exposure to impacted soil and groundwater and would not satisfy the RAOs. Therefore, this alternative would not offer a sufficient level of protection to human health and the environment.

Remedial Alternatives 2, 3 and 4 would provide adequate protection to human health and the environment by reducing and controlling risks through: soil excavation; on-site treatment and/or off-site disposal; backfilling with clean fill; and, Site restoration. However, Alternative 2 is more protective than the other alternatives because of the following:

- Implementation of Remedial Alternative 4 presents the potential for uncontrolled off-site migration of impacted groundwater; and
- Implementation of Remedial Alternative 3 presents the potential for incomplete groundwater remediation as there would still be residual COCs in treated soil returned to the excavation that could potentially serve as an ongoing source of contamination to groundwater. Also, ISCO would be used to address any residual contamination in groundwater, but its effectiveness would be limited given the heterogeneous nature of site soils being excavated and returned to the excavation.

6.5.2 Compliance with SCGs

Compliance with SCGs, also a threshold criterion, determines whether an alternative satisfies regulatory requirements.

Remedial Alternative 1 would not satisfy the applicable chemical and action specific SCGs. Of these SCGs, Remedial Alternative 1 would not address the key remedial goals provided in 6 NYCRR Part 375 to: eliminate or mitigate all significant risk to public health and the environment; and restore the site to pre-disposal/pre-release conditions, to the extent feasible and authorized by law.

Through employing the same excavation and dewatering remedial technologies, Remedial Alternatives 2 and 3 would equally meet the applicable chemical and action-specific SCGs. However, under Alternative 3 the potential exists for a residual and persistent source of residual impacts to groundwater, because not all COCs are addressed through treatment and there is some level of uncertainty that all fine-grained material would be uniformly and thoroughly treated. In general, both alternatives still satisfy the goal of eliminating or mitigating significant threats to human health and the environment. Remedial Alternative 4 would also meet the proposed chemical specific SCGs; however, there is a concern that some impacted groundwater would remain untreated with the potential for uncontrolled offsite migration while ERH is being implemented.

6.5.3 Long-Term Effectiveness and Permanence

Long-term effectiveness refers to the effectiveness of the alternative to provide protection to human health and the environment and is measured by the magnitude of residual risk remaining after the remedial action is completed and by the adequacy and reliability of controls.

Remedial Alternative 1 provides neither long-term effectiveness nor permanence since the volume of soil exceeding the SCOs would remain the same.

Remedial Alternatives 2 provide the highest level of long term effectiveness and permanence through the removal of all VOC impacted soil and groundwater and the treatment of any residual impacted groundwater through ISCO. For Alternative 3, the potential exists to have a residual, yet persistent source of residual impacts to groundwater by returning treated soil back to the excavation. This is due to the fact that not all COCs are addressed through treatment and there is some level of uncertainty that all fine-grained material would be thoroughly treated. Remedial Alternative 4 may not be considered a permanent solution due to the potential uncontrolled off-site migration of impacted groundwater and vapor as ERH is implemented.

6.5.4 Reduction of Toxicity, Mobility, or Volume

This criterion evaluates the anticipated performance of the remedial action alternative in terms of the treatment used to reduce the toxicity, mobility, or volume, the type and quantity of residuals remaining after treatment, and the degree to which the treatment is irreversible. Specifically, this criterion evaluates the remedial alternative’s ability to reduce the toxicity, mobility, or volume of the VOCs in soil and groundwater.

Remedial Alternative 1 would not reduce the toxicity, mobility, or volume of COC-impacted soil and groundwater since the volume of soil exceeding the SCOs would remain the same.

Alternatives 2 removes all soil above the SCOs (with follow-up *in situ* groundwater treatment, if applicable) and provides the highest level of reduction of toxicity, mobility, and volume of VOCs from the Site. Dewatering associated with excavation will significantly reduce COC concentrations in groundwater exceeding Site-specific SCGs. ISCO can address any residual COCs above Site-specific SCGs that may persist upon completion of all excavation and backfilling activities.

Similarly, Alternatives 3 and 4 reduces all COCs in soil and groundwater to levels below their respective SCGs. However, for Alternative 3 there is a potential leaching concern with regards to the treated soils being returned to the excavated portions of the North Lot as thermal treatment does not fully treat all COCs of concern. Similarly, the potential for uncontrolled off-site migration of impacted groundwater and vapor is greater for Remedial Alternative 4 during implementation of ERH.

Overall, the residual toxicity and potential for mobility is more greatly reduced by Remedial Alternative 2, followed by Remedial Alternatives 3 and 4.

6.5.5 Short-Term Effectiveness

Short-term effectiveness refers to the potential effects and related risks associated with the implementation of the remedial action alternative. Potential short-term effects would occur during construction and operation of the remedy. Since Remedial Alternative 1 does not include any remedial actions, it would not have any short-term impacts.

Potential short-term impacts from the implementation of Remedial Alternatives 2 and 3 include:

- Direct contact with impacted soil;
- Air emissions during excavation and on-site thermal treatment;
- Off-site transportation risks (Remedial Alternative 2 only); and
- Remedial contractor and onsite worker safety.

The quantities of excavated soil associated with Remedial Alternatives 2 and 3 represent manageable, medium scale excavations and would pose comparable short-term impacts to remedial workers and the residential community. Remedial Alternative 2 poses the highest level of short term impacts due to the volume of soil to be transported off-site for disposal including construction traffic, noise, odors and particulates during the remedial action. These alternatives require heavy equipment for earth moving during remedial action and will have an increased potential for work-related accidents. The use of a site-specific HASP will minimize the risk of any on or off-site accidents. Air monitoring will be performed during the excavations. Proper dust control measures will be required to minimize particulate emissions.

The short term impacts for Remedial Alternative 4 would occur during the installation of the ERH electrodes and piping and operation of the system. The use of a site-specific HASP will minimize the risk to remedial works and the residential community. Air monitoring will be performed during the electrode and SVE well installation.

6.5.6 Implementability

The implementability criterion evaluates the feasibility of an alternative based on the ability to construct and operate the technology, reliability of the technology, ease of undertaking additional remedial actions, if necessary, ability to monitor effectiveness, the administrative feasibility, and the availability of services and materials.

Remedial Alternative 1 can be implemented with relative ease. No active construction or remedial actions would be performed. This alternative would not provide any reliability in reducing exposure risks.

Remedial Alternatives 2 and 3 would be technically feasible to implement. The mechanical equipment required to perform the work would consist of standard excavation and remedial equipment. Remedial contractors are also readily available to perform this work. However, there are some concerns with regards to timely and effective implementation of Alternative 3 that are listed below:

- availability of portable thermal units may be limited; therefore, careful planning during the bidding stage is required to meet any regulatory requirements for timely completion of the proposed remedial action;

- the clay lenses present at the site could potentially result in poor treatment performance and thereby affecting successful implementation of this option;
- many contractors require bench scale/pilot testing on the proposed Site soils to definitively confirm the applicability of the technology for the Site; and
- permitting associated with regulatory approval of thermal desorption can sometimes take a significant amount of time and should be considered with regards to remediation timeframes that may be imposed by the governing regulatory agency.

Although technically feasible, Remedial Alternative 4 would require long-term operation and maintenance of the ERH system for approximately 6 to 8 months.

6.5.7 Cost

The following is a summary of the estimated costs for each of the remedial action alternatives. The detailed cost estimates are provided in Appendix A.

	Direct Costs	Indirect Costs	Total Cost
Remedial Alternative 1	$0	$0	$0
Remedial Alternative 2	$4,809,000	$275,000	$5,084,000
Remedial Alternative 3	$4,734,300	$275,000	$5,009,300
Remedial Alternative 4	$3,737,760	$345,000	$4,082,760

With the exception of Alternative 1 (no action) only Remedial Alternative 4 has a clear cost advantage. However, given the other modifying criteria, this cost advantage could be offset by addressing the potential issue of uncontrolled migration of impacted groundwater and soil vapors during ERH treatment. For all intents and purposes, the costs to implement Alternatives 2 and 3 are the same.

7.0 RECOMMENDED REMEDIAL ACTION ALTERNATIVE

The recommended remedial action alternative for the North Lot area is Remedial Alternative 2: Soil Excavation/Offsite Disposal, Dewatering and In Situ Chemical Oxidation. If properly implemented, Remedial Alternative 2 would best comply with the applicable chemical and action-specific SCGs compared to the other alternatives that were considered. Each of the remedial tasks associated with Remedial Alternative 2 would provide long-term effectiveness and permanence. Soil and groundwater with concentrations in excess of the proposed SCGs for VOCs would be removed and disposed off-site. Any residual soil and groundwater impacts, if observed, would be addressed by ISCO. Until it has been demonstrated that remediation of soil and groundwater is complete, institutional controls in the form of a deed restriction will be implemented for the Site. In addition, engineering controls (e.g., vapor barrier, subsurface venting system, capping) would be implemented, as required, in the event that the Site is disturbed prior to demonstrating remediation of soil and groundwater have been completed. These controls would be documented in a comprehensive Site Management Plan that would be issued for the Site following the completion of the proposed remedial action described under Remedial Alternative 2. The Site Management Plan will include a Soil Management Plan.

Remedial Alternative 2 poses some potential short-term impacts to onsite workers, remedial contractors and the residential community. However, these are readily managed through the appropriate protective measures and engineering controls. Alternative 2 is administratively feasible, with a reasonable level of effort in obtaining permits. Remedial Alternative 2 is most protective to human health and the environment at a cost that is comparable to the other considered alternatives.

Lastly, Alternative 2 provides the most likely scenario under which the complete remediation of the Site can be accomplished within the shortest timeframe, and with the least uncertainty about the outcome of the remedial effort. Given the long history of investigation and only partly-successful remedial efforts at the Site, these factors give Remedial Alternative 2 a distinct advantage over all other alternatives.

8.0 REFERENCES

NYSDEC, 1990. NYSDEC Technical and Administrative Guidance Memorandum TAGM #4030: Selection of Remedial Actions at Inactive Hazardous Waste Sites, May 15, 1990.

NYSDEC, 1994. NYSDEC Technical and Administrative Guidance Memorandum TAGM #4046: Selection of Remedial Actions at Inactive Hazardous Waste Sites, January 24, 1994.

NYSDEC, 2006. 6 NYCRR Part 375 Environmental Remediation Programs, Subparts 375-1 to 375-4 & 375-6, Effective December 14, 2008.

NYSDEC, 2007. DER-15: Presumptive/Proven Remedial Technologies, February 27, 2007.

NYSDEC, 2010. DER-10 Technical Guidance for Site Investigation and Remediation, May, 2010.

NYSDEC, 2010a. Final Commissioner Policy, CP-51 Soil Cleanup Guidance, October 21, 2010.

Roux Associates, 2013. Remedial Investigation Amendment Summary Report, Konica Minolta Holdings, USA, Glen Cove, New York, January 27, 2013.

USEPA, 1988a. CERCLA Compliance with Other Laws Manual: Interim Final, August 1988.

USEPA, 1988b. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final, EPA 540/G-89 004, October 1988.

USEPA, 1994. National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR 300 – Final Rule, March 8, 1990.

USEPA, 2000. A Guide to Developing and Documenting Cost Estimates During Feasibility Study, EPA 540-R-00-002, July 2000.

TABLES

Table 1. Individual Evaluation of Remedial Technologies, Konica Minolta Holding, USA, Glen Cove, New York

General Response Action	Remedial Technology	Description	Effectiveness		Implementability	Cost	Retained
			Advantages	Disadvantages			
No Action	None	No action and perform groundwater monitoring only.	1. No disturbance of the Site.	1. No additional treatment will take place at Site. 2. Does not achieve the RAOs for soil and groundwater.	1. Readily implementable.	1. Minimal cost.	Retained for alternative development.
<u>SOIL REMEDIATION</u>							
Containment	Soil Cap	Provides soil barrier to prevent contact with the contaminated soil.	1. Minimizes potential for human and animal contact with the contaminated soil.	1. Does not remove or degrade contamination within the soil, which will be a continuing source of groundwater contamination. 2. Susceptible to erosion cracking and easily removed. 3. Restrictions on future land use. 4. Soil cap is the least effective of the three capping options. 5. Does not prevent infiltrating precipitation from leaching contaminants from underlying soil and into groundwater. 6. Does not prevent migration of impacted soil vapor.	1. Widely used, proven and commercially available technology. 2. More easily implemented than other cap construction process options. 3. Conventional construction. 4. Not practical because the North Lot is already covered by asphalt pavement. Therefore, a soil cap cannot be readily incorporated.	1. Low capital cost. 2. Moderate maintenance cost. 3. Overall lower capital and maintenance costs than other cap construction process options.	Not Retained
Containment	Asphalt Cap	Provides asphalt barrier to prevent contact with the contaminated soil.	1. Reduces the rate of groundwater infiltration and further dissolution of contaminants from soil into groundwater. 2. Minimizes potential for direct exposure to contaminated soil. 3. Reduces but does not eliminate migration of vapors from volatile contaminants present in the soil and groundwater. 4. More effective than soil cap design.	1. Does not remove or degrade contamination within the soil, which will be a continuing source of groundwater contamination. 2. Susceptible to weathering and cracking. Future repair and replacement will be required. 3. Restrictions on future land use. 4. Less effective than geomembrane cap design.	1. Widely used, proven and commercially available technology. 2. Easily implemented, as the North Lot is currently an asphalt parking lot. 3. The asphalt parking lot would require repaving to replace cracked and/or deteriorating asphalt pavement.	1. Overall lower capital and maintenance costs than geomembrane cap and higher than soil cap.	Not Retained
Containment	Geomembrane Cap	Provides low permeability barrier to prevent contact with the contaminated soil.	1. Provides highest level of protection against groundwater infiltration and further dissolution of contaminants from soil into groundwater. 2. Minimizes potential for direct exposure to contaminated soil. 3. Significantly reduces, but does not eliminate migration of vapors from volatile contaminants present in the soil and groundwater. 4. Minimizes potential for human and animal contact with the contaminated soil. 5. Most effective of three capping options.	1. Does not remove or degrade contamination within the soil, which will be a continuing source of groundwater contamination. 2. Susceptible to erosion and cracking. 3. Restrictions on future land use.	1. Widely used, proven and commercially available technology. 2. Easily implemented. In comparison to other cap construction process options provides highest level of difficulty to implement. 3. Some conventional and specialty construction. 4. It does not make practical sense to remove and replace the existing asphalt pavement in the North Lot with a geomembrane cap since an effective cap already exists.	1. High capital cost. 2. Moderate Maintenance cost. 3. Overall higher capital and maintenance costs than other cap construction process options.	Not Retained

Table 1. Individual Evaluation of Remedial Technologies, Konica Minolta Holding, USA, Glen Cove, New York

General Response Action	Remedial Technology	Description	Effectiveness		Implementability	Cost	Retained
			Advantages	Disadvantages			
Source Removal and Disposal	Excavation and Off-site Disposal	Physical removal of contaminated media.	1. Effective for VOCs, SVOCs and metals in the unsaturated and saturated soils. 2. Completely removes contamination. 3. Relatively short remedial construction period expected. 4. Will improve groundwater quality by removing the soil source.	1. A percentage of the material removed is considered hazardous waste; therefore, disposal costs are relatively high. 2. The excavated soil may require soil amendments to reduce the moisture content of the soil prior to off-site disposal and treatment. 3. Dewatering may be necessary. Extracted water may require treatment and discharge to local storm sewer and/or off-site disposal. 4. Odors and dust generated during excavation would need to be controlled. 5. Truck traffic through residential communities would be required. 6. Large amounts of backfill would need to be imported to fill the excavation. 7. Not considered a sustainable (i.e., “green”) remedial option to the NYSDEC.	1. Widely used, proven and commercially available option. 2. Easily implemented. 3. Due to depth of excavation, sloping, shoring will be needed. 4. Conventional construction.	1. High capital cost. 2. No maintenance cost.	Retained
Extraction, *Ex-situ* Treatment and Disposal	Soil Washing	Includes excavating contaminated soil, contacting the soil with a wash solution and treating the solution. Wash solutions may include surfactants or mild solvents.	1. Effective for chlorinated and non-chlorinated VOCs, SVOCs and metals in unsaturated and saturated soils. 2. Completely removes contamination. 3. Will improve groundwater quality by reducing the soil source.	1. Ex-situ technology with excavation. Odor control and air permits will be required. 2. Any residual materials, including fine soil particles and treatment solutions, may have to be disposed of as hazardous waste. 3. Involves treatment of hazardous soil on-site. 4. Requires treatment of the wash solution. 5. Less effective on fine-grained soils such as silt and clay, which are known to be present in the saturated zones at the site.	1. Not widely used technology. Commercial availability is limited. 2. Not easily implemented. 3. Special construction and permitting required. 4. Remedial construction activities would take longer than other technologies. 5. Typically requires significant time to address permitting requirements.	1. High capital cost. 2. No maintenance cost.	Not Retained
In-situ/ Ex-Situ Treatment and No Disposal	Soil Vapor Extraction (SVE) with Air Sparging (AS)	Soil gas extraction coupled with injection of air enhances volatilization of contaminants sorbed to soil particles. Contaminants in the extracted soil vapor are destroyed by off-gas treatment.	**In-Situ/ Ex-Situ** 1. Effective for chlorinated and non-chlorinated VOCs in Unsaturated soils only. 2. Contaminants destroyed. **In-Situ** 1. Minimal disturbance of soil required if heterogeneous soil conditions exist. **Ex-Situ** 1. Can address chlorinated and non-chlorinated VOCs in a controlled manner by creating homogeneous soil conditions which would limit potential for short circuiting.	**In-Situ/ Ex-Situ** SVE/AS was previously implemented at Site with limited effectiveness. Does not address metals or SVOCs. **In-Situ** Heterogeneous soil conditions (i.e., alternating fine and coarse-grained layers) resulted in remediation of primarily coarser-grained sand layers, with fine-grained silt and clay layers retaining high concentrations of VOC contamination after treatment. **Ex-Situ** Requires additional handling of soil (excavation, staging, mixing, etc.). Soil will require excessive amounts of shredding to homogenize silt and clay material, which has the bulk of the mass of VOC contamination.	**In-Situ/ Ex-Situ** 1. Previously implemented unsuccessfully at the Site and would require installation of new SVE/AS wells, and trenching. 2. Conventional construction. 3. Existing blowers and equipment may need to be replaced. 4. Ex-situ treatment would require construction of aboveground treatment cells with perforated piping.	**In-Situ/ Ex-Situ** 1. Moderate capital cost. 2. Moderate maintenance cost.	*In-Situ* Option Not Retained/Ex-Situ Option Not Retained

Table 1. Individual Evaluation of Remedial Technologies, Konica Minolta Holding, USA, Glen Cove, New York

General Response Action	Remedial Technology	Description	Effectiveness		Implementability	Cost	Retained
			Advantages	Disadvantages			
In-situ/ Ex-Situ Treatment	Chemical Stabilization	Chemical reactions are induced between a stabilizing agent and contaminants to reduce their mobility.	**In-Situ/ Ex-Situ** 1. Will immobilize contaminants and prevent dissolution of metals into groundwater. 2. Effective for metals and some SVOCs in unsaturated and saturated soils.	**In-Situ/ Ex-Situ** 1. Pilot testing would be required. 2. Does not address VOCs and dissolved phase metals. 3. Potential for volume increase of the treated soil due to the addition of stabilizing agent. **In-Situ** 1. Uncontrolled emissions of VOCs to the air will occur during implementation. 2. Heterogeneous soil may produce uneven treatment. **Ex-Situ** 1. Requires significant additional handling of soil (excavation, staging, mixing, etc.) to create required homogenous soil mixture prior to treatment. 2. Extended duration of treatment may be required due to high levels of VOCs.	**In-Situ/ Ex-Situ** 1. Widely used, proven and commercially available technology. 2. Not easily implemented. 3. Construction of a tent to control emissions would likely be required. 4. Conventional Construction.	**In-Situ/ Ex-Situ** 1. Moderate capital cost. 2. Moderate maintenance cost.	Ex-Situ Option Not Retained/ In-Situ Option Not Retained
In-situ Treatment	Electric Resistance Heating (ERH])	Electrodes direct flow of electrical current through the subsurface, heating the soil to remove contaminants. Processes include boiling, evaporation, and steam distillation.	1. Effective for chlorinated and non-chlorinated VOCs in in unsaturated and saturated soils. 2. ERH speeds the removal of contaminants by two primary mechanisms: increased volatilization and steam stripping. 3. The technology has been proven capable of remediating both the unsaturated and saturated zones. Not limited by subsurface heterogeneity.	1. Does not address metals. 2. Off-gas and condensate treatment would be required. 3. Requires significant infrastructure to operate the system due to need for electrical infrastructure and associated capital and utility costs. 4. It has the potential to liberate sorbed contaminants which requires hydraulic and vacuum controls to prevent uncontrolled off-site migration of dissolved and vapor phase contaminants. 5. Hydraulic control requirements may not be completely effective in the heterogeneous soils at the Site.	1. Commercial availability is limited. 2. Not easily implemented. 3. Specialty construction required. 4. Remedial operation activities would take longer than other technologies.	1. High capital cost. 2. High maintenance cost.	Retained
Ex-Situ Treatment	Thermal Desorption	Heating elements transfer heat to the excavated soil by thermal conduction. Contaminants are removed by processes including boiling, evaporation, oxidation and steam distillation.	1. Effective for chlorinated and non-chlorinated VOCs in in soils. 2. On-site treatment of soil for reuse eliminates need for imported backfill. 3. Treatment of potentially hazardous soil to allow for off-site disposal as non-hazardous.	1. Off-gas and condensate treatment would be required. 2. Requires additional handling of soil (excavation, staging, etc.). 3. Extended duration of treatment may be required due to high levels of VOCs. 4. The tendency of dry, clayey soils to agglomerate can slow treatment processes and lower the efficiency of the thermal desorption process. 5. Pilot testing is sometimes required for atypical soil conditions.	1. Commercial availability is limited. 2. Not easily implemented; require temporary installation of treatment equipment and additional soil staging areas. 3. Special construction required. 4. Remedial construction activities would take longer than other technologies. 5. Typically requires significant time to address permitting requirements. 6. On-site treatment area requirements are typically 0.5 acres or greater to address stockpiling needs of treated and untreated materials and process equipment.	1. Moderate to high capital costs. 2. No maintenance cost.	Retained

Table 1. Individual Evaluation of Remedial Technologies, Konica Minolta Holding, USA, Glen Cove, New York

General Response Action	Remedial Technology	Description	Effectiveness: Advantages	Effectiveness: Disadvantages	Implementability	Cost	Retained
GROUNDWATER REMEDIATION							
Extraction with *Ex-Situ* Treatment	Extraction	Installation of recovery wells to extract contaminated groundwater for aboveground treatment.	1. Primarily effective for VOC contaminants. 2. Prevents off-site migration.	1. Ineffective for SVOCs and inorganic contaminants. 2. Ineffective for saturated soil with high concentrations of adsorbed contaminants. 3. High potential for inorganic or biological fouling of the equipment. 4. If air stripping technology is used to treat the extracted groundwater, off-gases will require treatment based on mass emission rate. 5. Previous operation of a pump and treat system at the Site was not effective due to the heterogeneity of the soil. 6. System would have to be operated for prolonged duration.	1. Widely used and commercially available technology. 2. Installation of new recovery wells and trenching would easily be implemented. 3. Existing treatment system may not work and may require new equipment.	1. Moderate capital cost. 2. Moderate maintenance cost.	Not Retained
Containment	Vertical barrier	Vertical barrier consisting of low hydraulic conductivity cutoff walls using slurry walls, sheet piles or synthetic membranes.	1. May be capable of controlling contaminants migrating off the Site.	1. No treatment of the groundwater will be performed. 2. Often requires hydraulic gradient control via pumping to maintain barrier effectiveness.	1. Widely used, proven and commercially available technology. 2. Easily implemented. 3. Conventional construction.	1. High capital cost. 2. Moderate maintenance cost.	Not Retained
In-situ Treatment	Chemical Oxidation	Chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.	1. Effective for chlorinated and non-chlorinated VOCs. 2. Can be used as a "polishing step" to treat any residual impacted groundwater, following excavation and backfilling. The use of a chemical oxidant will be contingent on post-excavation groundwater monitoring data.	1. Does not address certain SVOCs or metals contamination. 2. Effectiveness is dependent on contact time and uniform distribution of chemical in subsurface. Low permeability, heterogeneous soils will inhibit uniform distribution capability. 3. Not a stand alone technology, as it may not be able to treat fine grained silt and clay due to inability to inject chemical into low permeability layers.	1. Vendor contractor and proprietary chemicals are readily available. 2. Installation of injection points following excavation would improve effectiveness in distribution of chemical in subsurface, if needed as a polishing step.	1. Moderate capital cost. 2. No maintenance Cost.	Retained (as a polishing step)

FIGURES

QUADRANGLE LOCATION

N

0 2000'

SOURCE:
USGS; 1968, Sea Cliff, N.Y.
7.5 Minute Topographic Quadrangle

Title:

SITE LOCATION MAP

71 CHARLES STREET
GLEN COVE, NEW YORK

POWERS CHEMCO SITE NO. 1-30-028
FEASIBILITY STUDY

Prepared for:

KONICA MINOLTA HOLDINGS USA, INC.

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: G.N.	Date: 26MAR13	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr.: G.N.	Project No.: 2020.0001Y000	
File: 2020.0001Y127.01.CDR		

\2020Y\0001Y127\2020.0001Y127.01.CDR

LEGEND

Approximate extent of 1.4 acre site boundary

NYSDEC-defined area of known impacts to soil and groundwater (revised based on RI amendment results)

N

0 100'

Title:

SITE PLAN

71 CHARLES STREET
GLEN COVE, NEW YORK

POWERS CHEMCO SITE NO. 1-30-028
FEASIBILITY STUDY

Prepared for:

KONICA MINOLTA HOLDINGS USA, INC.

ROUX ROUX ASSOCIATES, INC. *Environmental Consulting & Management*	Compiled by: G.N.	Date: 26MAR13	FIGURE
	Prepared by: B.H.C.	Scale: AS SHOWN	2
	Project Mgr.: G.N.	Project No.: 2020.0001Y000	
	File: 2020.0001Y127.01.CDR		

\2020Y0001\Y127\2020.0001Y127.01.CDR

APPENDICES

Table A1. Cost Estimate for Remedial Alternative 2, Konica Minolta Holding, USA, Glen Cove, New York.

Description	Quantity	Units	Unit Cost ($)	Total Cost ($)	Descriptions
Excavation with Off-Site Disposal and ISCO					
Mobilization/demobilization	1	LS	$75,000	$75,000	Mobilization of equipment.
Site preparation activities	1	LS	$100,000	$100,000	Set-up of temporary facilities, odor and dust control, stormwater erosion controls.
Removal and disposal of asphalt paving	18000	SF	$5	$90,000	Removal and disposal of existing asphalt pavement (assumes 6-inch thick).
Ground freezewall (support of excavation)	3000	SF	$30	$90,000	Ground freezing to support excavation along property line.
Excavation of first 5 feet (0-5 ft bls)	3350	CY	$35	$117,250	Excavation and staging of first 5 feet for re-use as backfill.
Excavation from 5 to 20 ft bls	10050	CY	$40	$402,000	Excavation and staging for off-site disposal.
Soil handling/staging	1	LS	$100,000	$100,000	Asssumes providing drying reagent to wet soil prior to off-site disposal.
Dewatering	1	LS	$60,000	$60,000	Assumes using sump pump(s) and on-site frac tank(s) for 8 weeks.
Disposal of non-hazardous groundwater	620000	GAL	$0.65	$403,000	Includes transportation of groundwater for disposal.
Post-excavation soil sampling	1	LS	$30,000	$30,000	
Backfill (Import of clean fill)	10050	CY	$45	$452,250	
Backfill (Stockpiled overburden soil)	3350	CY	$35	$117,250	Assumes 25% of excavated material will be used as backfill.
Placement of imported 3/4" crushed stone	350	CY	$145	$50,750	Assume 6-inch thick.
Waste characterization sampling	1	LS	$50,000	$50,000	
Transportation and Disposal (Non-Hazardous)	14000	TON	$80	$1,120,000	Assumes 65% excavated material is non-hazardous, 1.6 tons/cubic yard.
Transportation and Disposal (Low Hazardous)	1000	TON	$225	$225,000	Assumes 5% of excavated material is low hazardous, 1.6 tons/cubic yard.
Transportation and Disposal (High Hazardous)	1000	TON	$325	$325,000	Assumes 5% of excavated material is high hazardous, 1.6 tons/cubic yard.
Restoration	1	LS	$50,000	$50,000	Pavement restoration.
In Situ Chemical Oxidation "Polish"	1	LS	$150,000	$150,000	Includes equipment and mixing tanks to inject chemical oxidant, and post-treatment groundwater samples.
Subtotal				**$4,007,500**	
Contingency 20%				**$801,500**	
Total				**$4,809,000**	
Engineering				$85,000	Includes preparation of FS, RAWP, public participation activities, bid support.
CAMP				$60,000	Community air monitoring during excavation activities (3 months).
Construction Management				$70,000	Includes oversight of excavation activities (4 months).
Project Management				$40,000	
Final Engineering Report				$20,000	
Subtotal Indirect Costs				**$275,000**	

GRAND TOTAL REMEDIAL ALTERNATIVE 2	**$5,084,000**

Table A2. Cost Estimate for Remedial Alternative 3, Konica Minolta Holding, USA, Glen Cove, New York.

Description	Quantity	Units	Unit Cost ($)	Total Cost ($)	Descriptions
Excavation with On-Site Thermal Desorption					
Mobilization/demobilization	1	LS	$125,000	$125,000	Includes mobilization of equipment and on-site thermal treatment unit.
Site preparation activities	1	LS	$125,000	$125,000	Set-up of temporary facilities, odor and dust control, stormwater erosion controls , and set-up of utilities for on-site thermal treatment unit.
Removal and disposal of asphalt paving	18000	SF	$5	$90,000	Removal and disposal of existing asphalt pavement (assumes 6-inch thick).
Ground freezewall (support of excavation)	3000	SF	$30	$90,000	Ground freezing to support excavation along property line.
Excavation of first 5 feet (0-5 ft bls)	3350	CY	$35	$117,250	Excavation and staging of first 5 feet for re-use as backfill.
Excavation from 5 to 20 ft bls	10050	CY	$35	$351,750	Excavation and staging for on-site thermal treatment.
Soil handling/staging	1	LS	$100,000	$100,000	Soil handling for on-site thermal treatment unit.
On-Site Thermal Desorption	16080	TON	$100	$1,608,000	Includes on-site thermal unit (rotary kiln incineratior), thermal oxidizer and peripheral equipment.
Dewatering	1	LS	$60,000	$60,000	Assumes using sump pump(s) and on-site frac tank(s) for 8 weeks.
Disposal of non-hazardous groundwater	620000	GAL	$0.65	$403,000	Includes transportation of groundwater for disposal.
Post-excavation soil sampling	1	LS	$30,000	$30,000	
Performance soil sampling	1	LS	$25,000	$25,000	Includes sampling and analysis of treated soil to confirm on-site thermal treatment unit is achieving the soil clean-up objectives.
Backfill (stockpiled overburden soil)	3350	CY	$35	$117,250	Includes backfilling and compacting overburden soil.
Backfill (treated soil)	10050	CY	$45	$452,250	Includes backfilling and compacting treated soil.
Placement of imported 3/4" crushed stone	350	CY	$145	$50,750	Assume 6-inch thick.
Restoration	1	LS	$50,000	$50,000	Pavement restoration.
In Situ Chemical Oxidation "Polish"	1	LS	$150,000	$150,000	Includes equipment and mixing tanks to inject chemical oxidant, and post-treatment groundwater samples.
Subtotal				**$3,945,250**	
Contingency 20%				**$789,050**	
Total				**$4,734,300**	
Engineering				$85,000	Includes preparation of FS, RAWP, public participation activities, bid support.
CAMP				$60,000	Community air monitoring during excavation activities (3 months).
Construction Management				$70,000	Includes oversight of excavation activities (4 months).
Project Management				$40,000	
Final Engineering Report				$20,000	
Subtotal Indirect Costs				**$275,000**	

GRAND TOTAL REMEDIAL ALTERNATIVE 3	**$5,009,300**

Table A3. Cost Estimate for Remedial Alternative 4, Konica Minolta Holding, USA, Glen Cove, New York.

Description	Quantity	Units	Unit Cost ($)	Total Cost ($)	Descriptions
ERH					
Mobilization/demobilization	1	LS	$375,000	$375,000	Mobilization of electrical equipment (power control unit) and demobilization.
Site preparation activities	1	LS	$25,000	$25,000	Set-up of temporary facilities, odor and dust control, stormwater erosion controls.
Installation of electrodes	80	EA	$4,500	$360,000	Includes installation of 4-foot wide sheeting.
Installation of vapor recovery wells	80	EA	$560	$44,800	
Installation of aboveground piping and system	1	LS	$310,000	$310,000	
Operation of ERH system	1	LS	$2,000,000	$2,000,000	Includes electric usage costs for 8 months.
Subtotal				**$3,114,800**	
Contingency 20%				**$622,960**	
Subtotal Capital Costs				**$3,737,760**	
Engineering				$85,000	Includes preparation of FS, RAWP, public participation activities, bid support.
CAMP				$60,000	Community air monitoring during activities.
Construction Management				$140,000	Includes oversight of excavation activities (8 months).
Project Management				$40,000	
Final Engineering Report				$20,000	
Subtotal Indirect Costs				**$345,000**	

GRAND TOTAL REMEDIAL ALTERNATIVE 4	**$4,082,760**

PLATES

R-SB-112	10/26/12	10/26/12	10/26/12	10/26/12
Depth	4-5'	8-10'	12-14'	25-26'
VOCs	NE	NE	NE	NE

R-SB-2	3/14/11	3/14/11	3/14/11	3/14/11
Depth	1-2'	4-5'	7-8'	12-13'
VOCs	NE	NE	NE	NE

R-SB-118	10/25/12
Not Completed (Refusal at 6 Feet)	

R-SB-110	11/6/12
Depth	23-24'
VOCs	NE

R-SB-1	3/8/11	3/8/11	3/8/11	3/8/11
Depth	2-3'	7-8'	13-14'	18-19'
VOCs				
Toluene	NE	NE	NE	14000

R-SB-108	11/5/12	11/5/12	11/5/12
Depth	7.5-10'	11-12'	22-25'
VOCs	NE	NE	NE

R-SB-104	10/25/12	10/25/12	10/25/12	10/25/12
Depth	7.5-10'	12-14'	15-18'	23-25'
VOCs	NE	NE	NE	NE

R-SB-115	10/26/12	10/26/12
Depth	24-25'	26.5-27.5'
VOCs	NE	NE

MW-102	10/25/12	10/25/12	10/25/12
Depth	6.5-7.5'	12.5-13.5'	24-25'
VOCs			
Ethylbenzene	NE	2800	NE
Toluene	NE	NE	NE
Xylenes (total)	NE	23000	NE

R-SB-102	10/25/12	10/25/12	10/25/12
Depth	10-12.5'	15-16.5'	23-24'
VOCs	NE	NE	NE

R-SB-15	3/14/11	3/14/11	3/14/11	3/14/11	3/14/11
Depth	1-2'	4-5'	6-7'	9-10'	14-15'
VOCs					
Ethylbenzene	NE	NE	NE	31000	16000
Toluene	NE	NE	NE	130000	23000
Xylenes (total)	NE	NE	NE	280000	110000

R-SB-103	10/25/12	10/25/12
Depth	8-10'	18-20'
VOCs	NE	NE

R-SB-114	11/7/12	11/7/12
Depth	20-22'	27-30'
VOCs		
Toluene	6900	NE

R-SB-117	10/26/12	10/26/12	10/26/12
Depth	8-10'	13-15'	24.5-25'
VOCs	NE	NE	NE

R-SB-18	3/9/11	3/9/11
Depth	3-4'	5-6'
VOCs	NE	NE

R-SB-14	3/8/11	3/8/11	3/8/11	3/8/11
Depth	2-3'	7-8'	14-15'	19-20'
VOCs				
Toluene	NE	NE	NE	3400

R-SB-13	3/8/11	3/8/11	3/8/11	3/8/11
Depth	3-4'	7-8'	13-14'	18-19'
VOCs				
2-Butanone (MEK)	NE	NE	NE	3500
Toluene	NE	NE	NE	4700

R-SB-113	11/9/12	11/9/12
Depth	17.5-20'	28-30'
VOCs		
Toluene	3000	NE

R-SB-16	3/9/11	3/9/11	3/9/11	3/9/11
Depth	7-8'	13-14'	19-20'	24-25'
VOCs				
Ethylbenzene	2200 J	15000 J	NE	3400
Toluene	NE	830000	NE	3300
Xylenes (total)	180000	120000	NE	4800

R-SB-116	11/9/12	11/9/12
Depth	27-28'	30-32'
VOCs	NE	NE

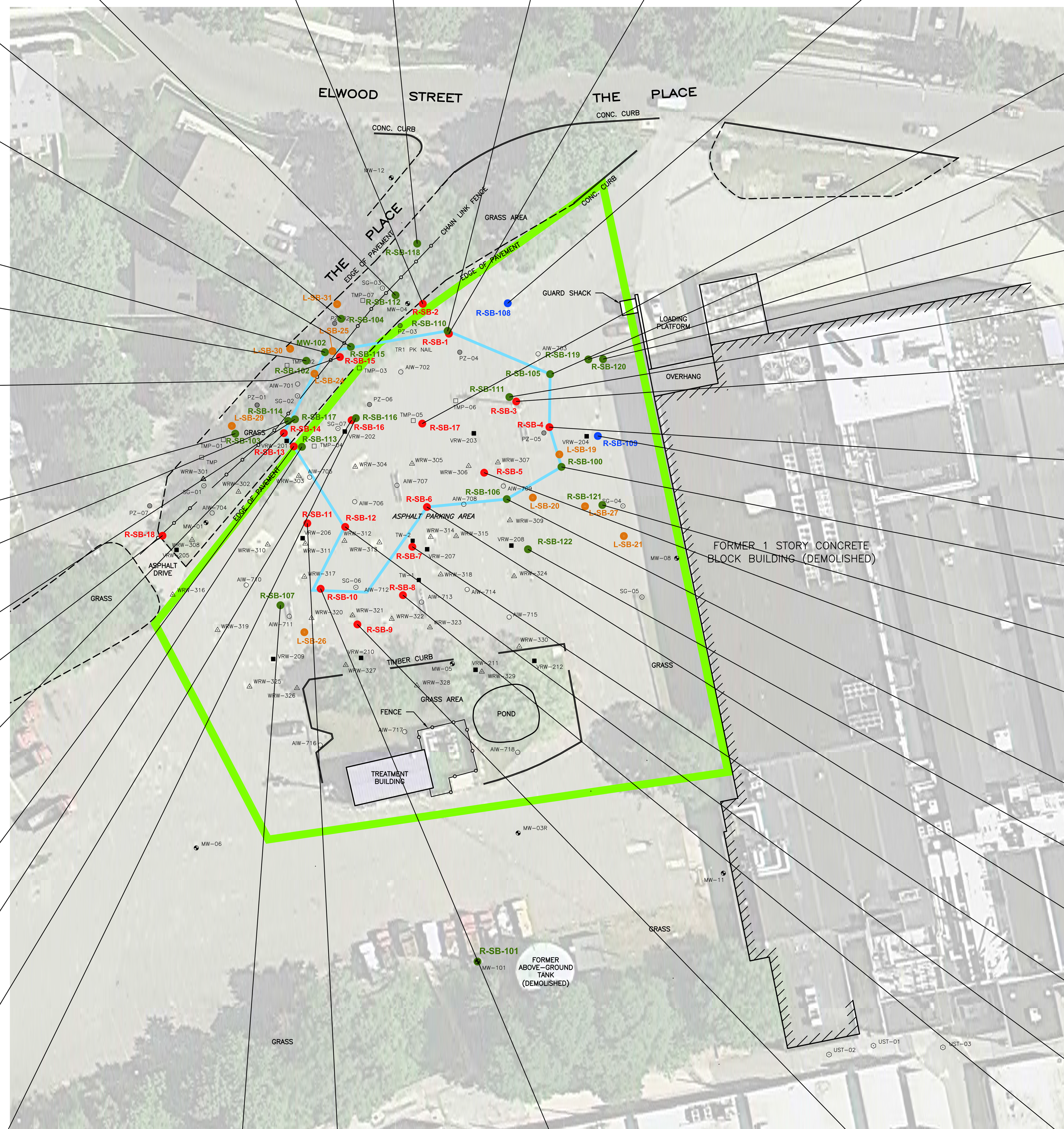
R-SB-107	11/5/12	11/5/12	11/5/12
Depth	6-9'	11-14'	24-25'
VOCs	NE	NE	NE

R-SB-11	3/8/11	3/8/11	3/8/11
Depth	8-9'	11-12'	19-20'
VOCs	NE	NE	NE

R-SB-10	3/4/11	3/4/11	3/4/11	3/4/11
Depth	3-4'	7-8'	13-14'	23-24'
VOCs				
Ethylbenzene	NE	NE	65000	NE
Toluene	NE	NE	1500000	NE
Xylenes (total)	NE	NE	350000	NE

R-SB-9	3/4/11	3/4/11	3/4/11
Depth	11-12'	15-16'	21-22'
VOCs	NE	NE	NE

R-SB-8	3/4/11	3/4/11
Depth	7-8'	9-10'
VOCs	NE	NE



R-SB-17	3/14/11	3/14/11	3/14/11
Depth	6-7'	11-12'	17-18'
VOCs			
2-Butanone (MEK)	600	170000 B	430
Ethylbenzene	3500	3000 J	NE
Toluene	NE	150000	NE
Xylenes (total)	18000	21000	NE

R-SB-105	11/5/12	11/5/12	11/5/12	11/5/12
Depth	2-5'	8-10'	20-24'	24-25'
VOCs				
Ethylbenzene	1400	NE	NE	NE
Toluene	NE	NE	3800	NE
Xylenes (total)	10000	NE	NE	NE

R-SB-119	11/29/12	11/29/12
Depth	0-5'	23-25'
VOCs	NE	NE

R-SB-120	11/29/12	11/29/12
Depth	0-4'	20-23'
VOCs	NE	NE

R-SB-111	11/6/12	11/6/12
Depth	28-30'	33.5-35'
VOCs	NE	NE

R-SB-3	3/7/11	3/7/11	3/7/11	3/7/11
Depth	2-3'	7-8'	12-13'	19-20'
VOCs				
2-Butanone (MEK)	NE	NE	NE	1600
Ethylbenzene	NE	4100	NE	NE
Toluene	NE	NE	NE	31000
Xylenes (total)	NE	31000	NE	NE

R-SB-4	3/7/11	3/7/11	3/7/11	3/7/11
Depth	3-4'	6-7'	11-12'	16-17'
VOCs				
Toluene	NE	NE	790	NE

R-SB-109	11/5/12	11/5/12	11/5/12
Depth	10-11'	17-19'	20-22'
VOCs	NE	NE	NE

R-SB-100	11/5/12	11/5/12	11/5/12	11/5/12	11/5/12
Depth	6-9'	6-9' DUP	12-15'	22-24.5'	25-27'
VOCs					
Toluene	NE	NE	NE	18000	NE

R-SB-121	11/29/12	11/29/12	11/29/12
Depth	22-23'	23-25'	23-25' DUP
VOCs	NE	NE	NE

R-SB-5	3/7/11	3/7/11	3/7/11	3/7/11	3/7/11
Depth	3-4'	7-8'	10-11'	11-12'	14-15'
VOCs					
Ethylbenzene	NE	NE	35000	9600	NE
Toluene	NE	NE	740000	230000	100000
Xylenes (total)	NE	NE	250000	68000	4800

R-SB-106	11/6/12	11/6/12
Depth	17.5-20'	21.5-25'
VOCs		
Toluene	26000	NE

R-SB-122	11/29/12
Depth	17-19.5'
VOCs	NE

R-SB-6	3/7/11	3/7/11	3/7/11
Depth	7-8'	9-10'	11-12'
VOCs	NE	NE	NE

R-SB-7	3/7/11	3/7/11	3/7/11	3/7/11
Depth	4-5'	7-8'	10-11'	14-15'
VOCs	NE	NE	NE	NE

R-SB-12	3/8/11	3/8/11	3/8/11
Depth	7-8'	11-12'	12-13'
VOCs			
Toluene	NE	1100	NE
Xylenes (total)	NE	43000	NE

LEGEND

- R-SB-1 ROUX SOIL BORING LOCATION AND DESIGNATION
- R-SB-103 PROPOSED SOIL BORING LOCATION AND DESIGNATION
- R-SB-109 PROPOSED SOIL BORING AND GROUNDWATER SCREENING SAMPLE LOCATION AND DESIGNATION
- L-SB-24 LIBERTY SOIL BORING LOCATION AND DESIGNATION
- MONITORING WELL
- PIEZOMETER
- PASSIVE AIR INJECTION WELL
- SOIL GAS SAMPLING POINT
- VAPOR RECOVERY WELL
- WATER RECOVERY WELL
- TEMPORARY SOIL AND GROUNDWATER SAMPLING POINT
- APPROXIMATE EXTENT OF 1.4 ACRE SITE BOUNDARY
- NYSDEC-DEFINED AREA OF KNOWN IMPACTS TO SOIL AND GROUNDWATER (REVISED BASED ON RI AMENDMENT RESULTS)

TYPICAL DATA BOX

SAMPLE ID → R-SB-17; SAMPLE DATE → 3/14/11; SAMPLE DEPTH (ft) → 17-18'; ANALYTES → VOCs; CONCENTRATION (ug/kg) → 430

R-SB-17	3/14/11	3/14/11	3/14/11
Depth	6-7'	11-12'	17-18'
VOCs			
2-Butanone (MEK)	600	170000 B	430
Ethylbenzene	3500	3000 J	NE
Toluene	NE	150000	NE
Xylenes (total)	18000	21000	NE

MARCH 2011 PRE-DESIGN INVESTIGATION

OCTOBER-NOVEMBER 2012 REMEDIAL INVESTIGATION AMENDMENT

Parameter	Standards* (µg/kg)
VOCs	
Ethylbenzene	1000
Toluene	700
Xylenes (total)	1600

Concentrations in µg/kg
*NYSDEC Part 375 Protection of Groundwater
µg/kg - Micrograms per kilogram
NYSDEC - New York State Department of Environmental Conservation
J - Estimated value
DUP - Duplicate Sample
VOCs - Volatile Organic Compounds
NE - No exceedances
Depth - Feet Below Land Surface

NOTES

1. THIS PROPERTY DESIGNATED SECTION 31, BLOCK "G" ON THE LAND AND TAX MAP OF THE COUNTY OF NASSAU.
2. ONLY EXCEEDANCES OF THE NYSDEC PART 375 PROTECTION OF GROUNDWATER CRITERIA ARE SHOWN.

N

40' 0 40'

Title:

SOIL SAMPLE RESULTS

POWERS CHEMCO SITE NO. 1-30-028
REMEDIAL INVESTIGATION AMENDMENT

Prepared For:
KONICA MINOLTA HOLDINGS USA, INC.
GLEN COVE, NY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: N.E.	Date: 27MAR13	PLATE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr: N.E.	Project: 2020.0001Y000	
File: 2020.0001Y127.03.DWG		

V:\CAD\PROJECTS\2020Y\0001Y\127\2020.0001Y127.03.DWG

R-SB-15/GW	3/15/11	3/18/11
Depth	6-7'	9-14'
VOCs		
Ethylbenzene	**2700**	**4700**
Toluene	**37000**	**29000**
Xylenes (total)	**21000**	**22000**

MW-12	11/2/12
Screened Interval	13-28'
VOCs	NE
SVOCs	NE

R-SB-1/GW	3/18/11
Depth	12-13'
VOCs	
Ethylbenzene	**43**
Toluene	**4000**
Xylenes (total)	**250**

R-SB-108	11/5/12
Depth	10'
VOCs	NE
SVOCs	NE

MW-102	1/3/13
Screened Interval	9-19'
VOCs	
Ethylbenzene	310
Xylenes (Total)	2200
SVOCs	
Naphthalene	120

R-SB-16/GW	3/15/11	3/18/11
Depth	6-7'	15-20'
VOCs		
Ethylbenzene	**140**	**2200**
Toluene	**1800**	**320000**
Xylenes (total)	**2900**	**19000 E**

R-SB-14/GW	3/15/11	3/18/11
Depth	6-7'	12-15'
VOCs		
Toluene	NE	**10**

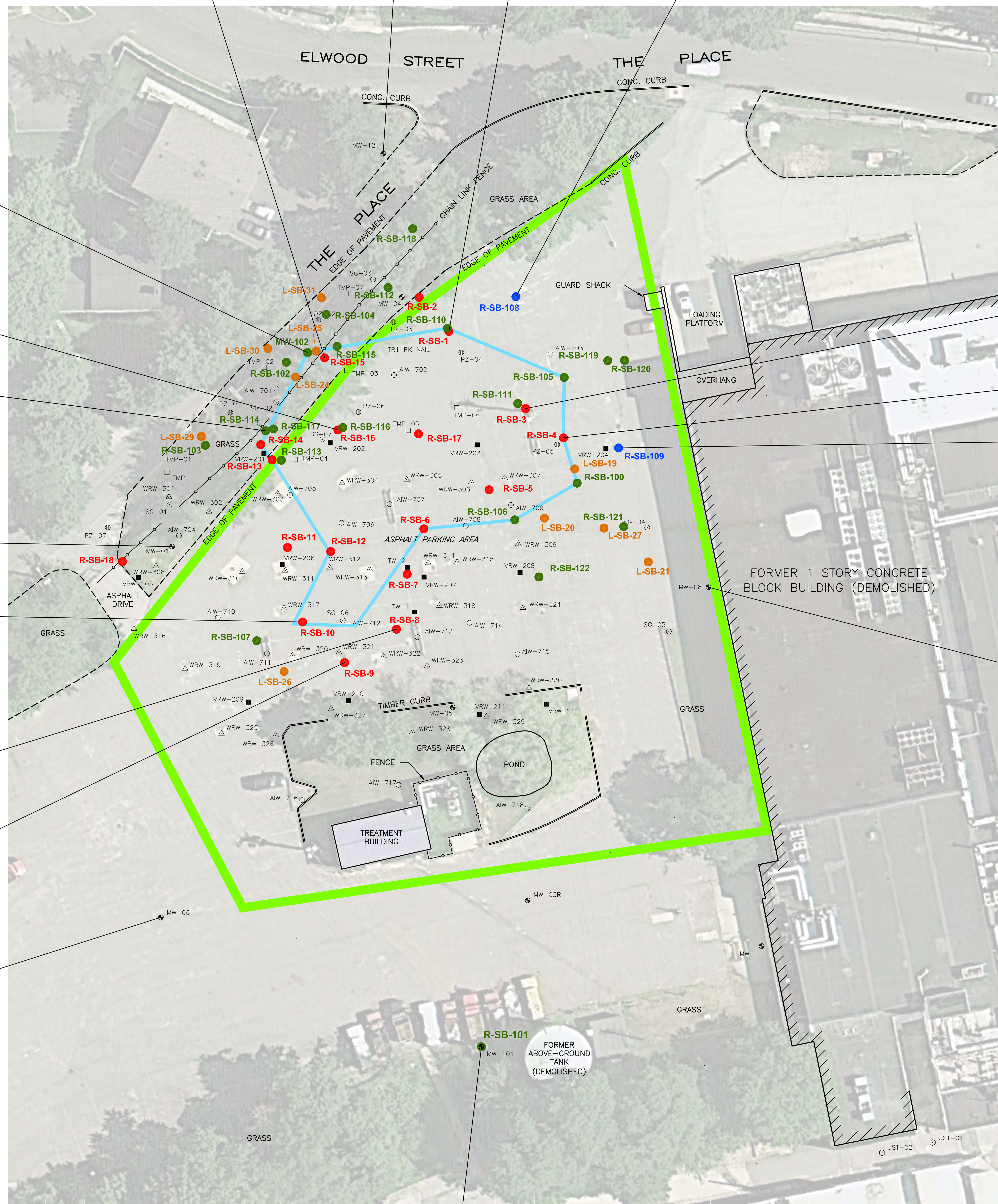
MW-01	11/2/12
Screened Interval	13-23'
VOCs	NE
SVOCs	NE

R-SB-10/GW	3/15/11	3/18/11
Depth	8-9'	12-15'
VOCs		
Ethylbenzene	**23**	**1300**
Toluene	**140**	**130000**
Xylenes (total)	**3300**	**10000 E**

R-SB-8/GW	3/15/11	3/18/11
Depth	7-8'	10-15'
VOCs		
Toluene	NE	**42**

R-SB-9/GW	3/15/11
Depth	8-9'
VOCs	NE

MW-06	11/2/12
Screened Interval	9-14'
VOCs	NE
SVOCs	NE



R-SB-3/GW	3/15/11	3/18/11
Depth	6-7'	14-15'
VOCs		
Ethylbenzene	**130**	**140**
Toluene	**440**	**34000**
Xylenes (total)	**730**	**1000**

R-SB-4/GW	3/15/11	3/18/11
Depth	6-7'	9-10'
VOCs		
Ethylbenzene	**5.6**	**190**
Toluene	**140**	**6900**
Xylenes (total)	**12**	**830**

R-SB-109	11/5/12
Depth	10'
VOCs	
Benzene	**4.9**
SVOCs	
Naphthalene	**210**

MW-08	11/2/12
Screened Interval	9-19'
VOCs	NE
SVOCs	NE

MW-101	12/4/12
Screened Interval	35-45'
VOCs	NE
SVOCs	NE

LEGEND

- R-SB-1 — ROUX SOIL BORING LOCATION AND DESIGNATION
- R-SB-103 — PROPOSED SOIL BORING LOCATION AND DESIGNATION
- R-SB-109 — PROPOSED SOIL BORING AND GROUNDWATER SCREENING SAMPLE LOCATION AND DESIGNATION
- L-SB-24 — LIBERTY SOIL BORING LOCATION AND DESIGNATION
- MONITORING WELL
- PIEZOMETER
- PASSIVE AIR INJECTION WELL
- SOIL GAS SAMPLING POINT
- VAPOR RECOVERY WELL
- WATER RECOVERY WELL
- TEMPORARY SOIL AND GROUNDWATER SAMPLING POINT
- APPROXIMATE EXTENT OF 1.4 ACRE SITE BOUNDARY
- NYSDEC–DEFINED AREA OF KNOWN IMPACTS TO SOIL AND GROUNDWATER (REVISED BASED ON RI AMENDMENT RESULTS)

TYPICAL DATA BOX

SAMPLE ID → R-SB-109; SAMPLE DATE → 11/5/12; SAMPLE DEPTH (ft) → 10'; ANALYTES; CONCENTRATION (ug/L) → 4.9

R-SB-109	11/5/12
Depth	10'
VOCs	
Benzene	**4.9**
SVOCs	
Naphthalene	**210**

MARCH 2011 PRE–DESIGN INVESTIGATION

OCTOBER–NOVEMBER 2012 REMEDIAL INVESTIGATION AMENDMENT

Parameter	Standards* (µg/L)
VOCs	
Ethylbenzene	5
Xylenes (Total)	5
Naphthalene	10
SVOCs	
Naphthalene	10

Concentrations in µg/L
*NYSDEC AWQSGVs
µg/L - Micrograms per liter
NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water Quality Standards and Guidance Values
-- - Not detected above NYSDEC AWQSGV
J - Estimated value
SVOCs - Semivolatile Organic Compounds
VOCs - Volatile Organic Compounds
NE - No exceedances

NOTES

1. THIS PROPERTY DESIGNATED SECTION 31, BLOCK "G" ON THE LAND AND TAX MAP OF THE COUNTY OF NASSAU.
2. ONLY EXCEEDANCES OF THE NYSDEC AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES ARE SHOWN.

N

40' 0 40'

Title:

GROUNDWATER SAMPLE RESULTS

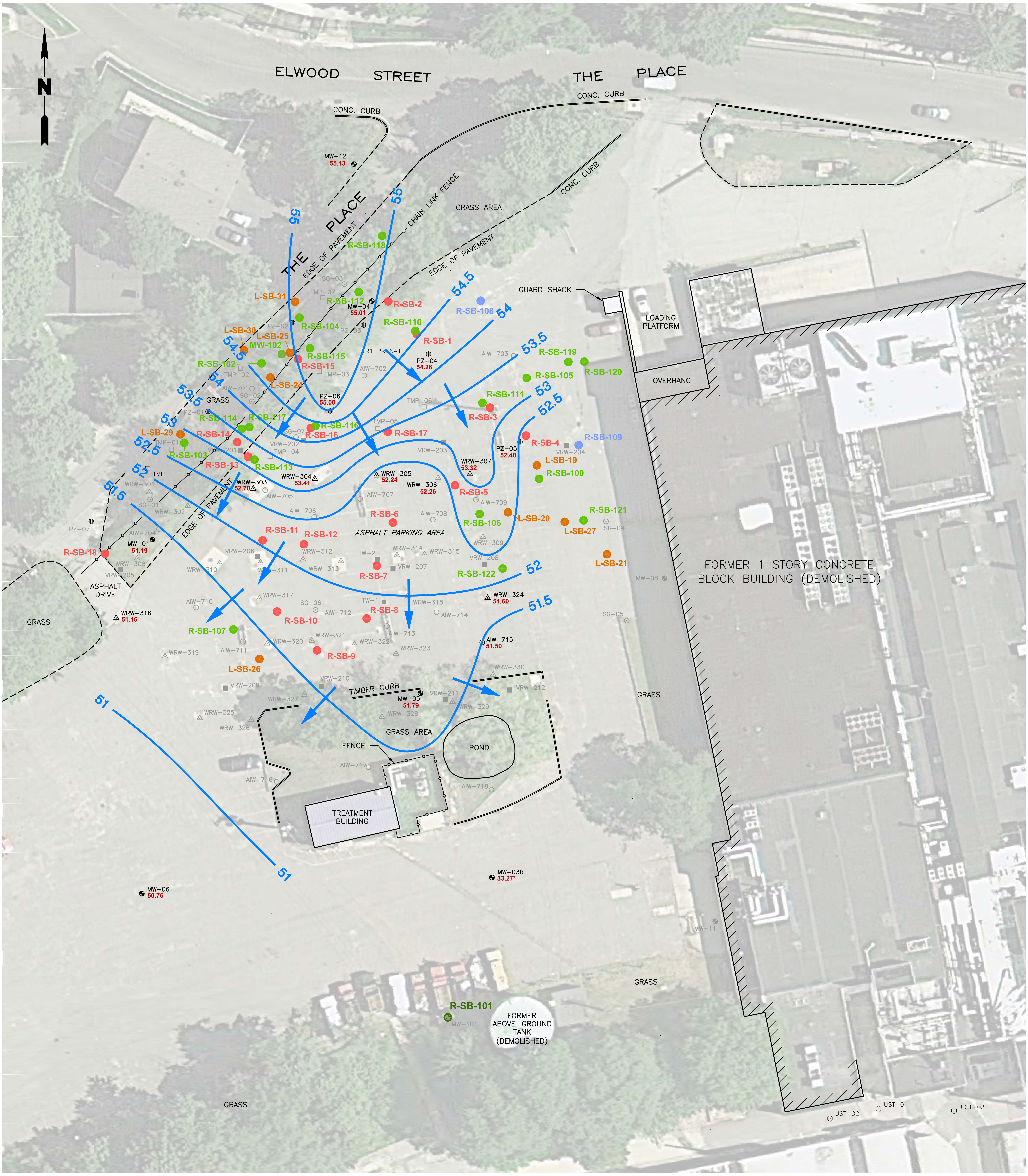
POWERS CHEMCO SITE NO. 1–30–028
REMEDIAL INVESTIGATION AMENDMENT

Prepared For:
KONICA MINOLTA HOLDINGS USA, INC.
GLEN COVE, NY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: N.E.	Date: 27MAR13	PLATE
Prepared by: B.H.C.	Scale: AS SHOWN	2
Project Mgr: N.E.	Project: 2020.0001Y000	
File: 2020.0001Y127.02.DWG		

V:\CAD\PROJECTS\2020Y\0001Y\127\2020.0001Y127.02.DWG



LEGEND

- R-SB-1 — SOIL BORING LOCATION AND DESIGNATION (REMEDIAL INVESTIGATION)
- R-SB-103 — SOIL BORING LOCATION AND DESIGNATION (REMEDIAL INVESTIGATION AMENDMENT)
- R-SB-109 — SOIL BORING AND GROUNDWATER SCREENING SAMPLE LOCATION AND DESIGNATION (REMEDIAL INVESTIGATION AMENDMENT)
- L-SB-24 — LIBERTY SOIL BORING LOCATION AND DESIGNATION
- MONITORING WELL
- PIEZOMETER
- PASSIVE AIR INJECTION WELL
- SOIL GAS SAMPLING POINT
- VAPOR RECOVERY WELL
- WATER RECOVERY WELL
- TEMPORARY SOIL AND GROUNDWATER SAMPLING POINT
- 55 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL
- INFERRED DIRECTION OF GROUNDWATER FLOW IN THE PERCHED ZONE
- 50.76 — WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL
- * — WELL NOT SCREENED IN PERCHED ZONE. NOT INCLUDED IN CONTOUR MAP PREPARATION

NOTES

1. THIS PROPERTY DESIGNATED SECTION 31, BLOCK "G" ON THE LAND AND TAX MAP OF THE COUNTY OF NASSAU.
2. ABSTRACT OF TITLE AND EASEMENTS FOR SUBJECT PARCEL AND ADJOINING PARCELS NOT PROVIDED FOR THE PREPARATION OF THIS SURVEY. ABSENCE OF EASEMENTS DOES NOT DENY THE EXISTENCE OF SAME.

Title:

WATER-LEVEL ELEVATIONS IN THE PERCHED ZONE

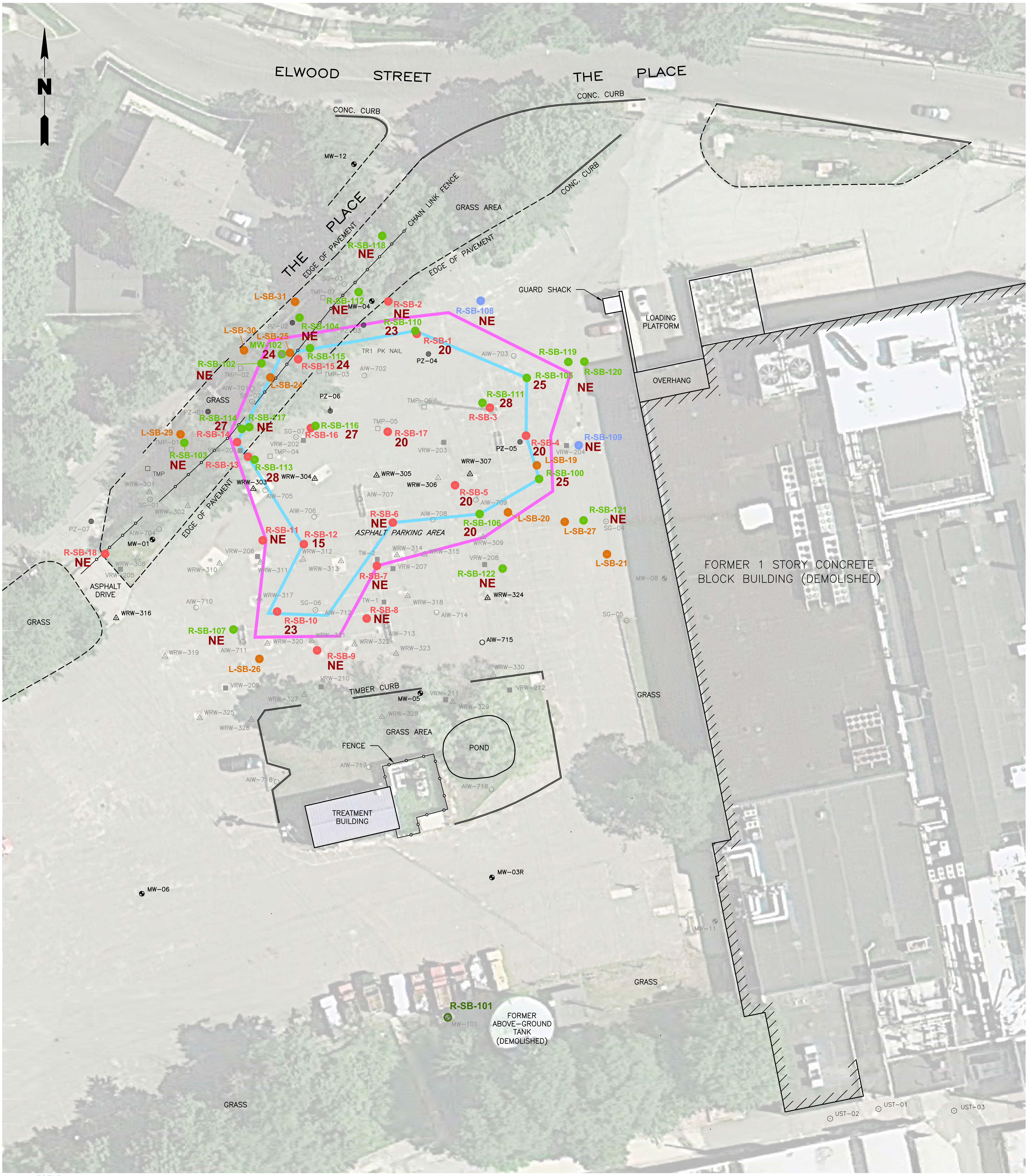
POWERS CHEMCO SITE NO. 1-30-028
REMEDIAL INVESTIGATION AMENDMENT

Prepared For:
KONICA MINOLTA HOLDINGS USA, INC.
GLEN COVE, NY

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting and Management

Compiled by: N.E.	Date: 27MAR13	PLATE
Prepared by: J.A.D.	Scale: AS SHOWN	3
Project Mgr: N.E.	Project: 2020.0001Y000	
File: 2020.0001Y127.04.DWG		

V:\CAD\PROJECTS\2020\0001Y\127\2020.0001Y127.04.DWG



LEGEND

R-SB-1 SOIL BORING LOCATION AND DESIGNATION (REMEDIAL INVESTIGATION)

R-SB-103 SOIL BORING LOCATION AND DESIGNATION (REMEDIAL INVESTIGATION AMENDMENT)

R-SB-109 SOIL BORING AND GROUNDWATER SCREENING SAMPLE LOCATION AND DESIGNATION (REMEDIAL INVESTIGATION AMENDMENT)

L-SB-24 LIBERTY SOIL BORING LOCATION AND DESIGNATION

MONITORING WELL

PIEZOMETER

PASSIVE AIR INJECTION WELL

SOIL GAS SAMPLING POINT

VAPOR RECOVERY WELL

WATER RECOVERY WELL

TEMPORARY SOIL AND GROUNDWATER SAMPLING POINT

20 APPROXIMATE DEPTH (FEET BELOW GRADE) OF TOP OF CLEAN ZONE BENEATH GROUNDWATER SOURCE AREA

NE NO EXCEEDANCES OF PART 375 IMPACT TO GROUNDWATER CRITERIA

NYSDEC-DEFINED AREA OF KNOWN IMPACTS TO SOIL AND GROUNDWATER (REVISED BASED ON RI AMENDMENT RESULTS)

CONCEPTUAL LIMIT OF EXCAVATION OF GROUNDWATER SOURCE AREA

30' 0 30'

NOTES

1. THIS PROPERTY DESIGNATED SECTION 31, BLOCK "G" ON THE LAND AND TAX MAP OF THE COUNTY OF NASSAU.
2. ABSTRACT OF TITLE AND EASEMENTS FOR SUBJECT PARCEL AND ADJOINING PARCELS NOT PROVIDED FOR THE PREPARATION OF THIS SURVEY. ABSENCE OF EASEMENTS DOES NOT DENY THE EXISTENCE OF SAME.

Title:

DEPTHS TO CLEAN ZONE AND CONCEPTUAL LIMITS OF PROPOSED EXCAVATION

POWERS CHEMCO SITE NO. 1-30-028
REMEDIAL INVESTIGATION AMENDMENT

Prepared For:
KONICA MINOLTA HOLDINGS USA, INC.
GLEN COVE, NY

ROUX ASSOCIATES, INC.
Environmental Consulting and Management

Compiled by: N.E.	Date: 27MAR13	PLATE
Prepared by: J.A.D.	Scale: AS SHOWN	4
Project Mgr: N.E.	Project: 2020.0001Y000	
File: 2020.0001Y127.04.DWG		

V:\CAD\PROJECTS\2020\0001Y\127\2020.0001Y127.04.DWG