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DRAFT
REMEDIAL INVESTIGATION REPORT

River Park Center – Chicken Island
Brownfield Cleanup Program Site #C360083
City of Yonkers, Westchester County, New York

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AST	Aboveground Storage Tank
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	below ground surface
C&D	Construction & Demolition
COC	Contaminant of Concern
CVOC	Chlorinated Volatile Organic Compound
cy	cubic yard
DER	Division of Environmental Remediation
DER-10	NYSDEC Technical Guidance for Site Investigation & Remediation
ECL	Environmental Conservation Law
ESA	Environmental Site Assessment
FWRIA	Fish and Wildlife Resources Impact Analysis
gpm	gallons per minute
HHEA	Human Health Exposure Assessment
msl	mean sea level
MW	Monitoring Well
NYSDEC	New York State Department of Environmental Conservation
PCB	Polychlorinated Biphenyls
PID	Photoionization Detector
ppm	parts per million
RA	Remedial Action
RASR	Remedial Action Selection Report
RAWP	Remedial Action Workplan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIW	Remedial Investigation Work plan
SCO	Soil Cleanup Objectives
SESI	SESI Consulting Engineers, PC
SFC	Struever Fidelco Cappelli, LLC
SVOCs	Semi-Volatile Organic Compounds
S&W	S&W Redevelopment of North America, LLC
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TOGS	Technical and Operations Guidance Series
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

This Remedial Investigation Report (RIR) presents the description, findings, and conclusions for a Remedial Investigation (RI) performed on 12.94 acres of contiguous parcels known as Chicken Island, City of Yonkers, New York. The investigation was conducted on the area bounded by New Main Street (west), Palisade Avenue and Elm Street (north), and Nepperhan Avenue (south and east). New School Street bisects the site north-to-south, connecting Palisade and Nepperhan Avenues (Figure 1). Various parcels identified in the application and Brownfield Cleanup Agreement with the exception of Lot 35 subsequently excluded via correspondence to the Department dated February 26, 2007, constitute the entire brownfield site (Site No. C360083), hereinafter referred to as "the site."

The site has a long history of industrial use that spans over 150 years, and included hat factories, leather factories, and chemical dye manufacturers. Present structures include one- and two-story buildings, and an open paved parking lot. The Saw Mill River courses through the site. The RI activities have shown that these historical site uses have resulted in negative environmental impacts to the site soils, groundwater, and the Saw Mill River sediment.

As part of the RI, 26 shallow and 7 deep groundwater monitoring wells; and five soil vapor wells were installed throughout the site. Nine soil borings were completed. During installation of the wells and drilling of the soil borings, 90 soil samples were collected from 47 locations across the site. Additionally, six surface water and sediment samples were collected from locations in the Saw Mill River. All samples were sent to a NYSDEC certified laboratory, under chain of custody and ASP protocol, and analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), Target Analyte List (TAL) metals, cyanide, pesticides and polychlorinated biphenyls (PCBs). Stream sediment samples, and samples collected from the proposed stream relocation course, were also analyzed for Total Organic Carbon (TOC).

Results of soil samples collected from 47 locations indicate that 41 of the sample locations contain a combination of VOCs, SVOCs, PCBs and/or metals, at concentrations that exceed the NYSDEC regulatory standards also known as soil cleanup objectives (SCOs). Metals concentrations above NYSDEC unrestricted use SCOs were identified in 35 of the sample locations, and concentrations above NYSDEC commercial use SCOs were identified in 13 of the sample locations. In particular, mercury was identified at 26 locations in concentrations above NYSDEC unrestricted use SCO, and in concentrations above NYSDEC commercial use SCO in 10 locations. SVOCs, pesticides, and metals were identified in the site soils with concentrations above NYSDEC commercial use SCO.

A review of the analytical results of the unfiltered shallow groundwater samples indicates that groundwater in all the shallow monitoring wells is impacted by a combination of

VOCs, SVOCs, PCBs and metals, at concentrations that exceed the NYSDEC standards. However, filtered samples analyzed for metals indicate most of the metals concentrations are reduced to non-detectable levels after filtering with the exception of naturally occurring metals. The constituent concentrations were compared to the more stringent of these two applicable standards: Division of Water Technical and Operational Guidance Series (1.1.1) and Technical and Administrative Guidance Memorandum 4046. Filtered samples do not contain concentrations of mercury above laboratory non-detect levels. Results of deep monitoring well samples contain limited petroleum and CVOC compounds above NYSDEC standards, and concentrations of metals above NYSDEC standards. Deep groundwater samples did not exhibit concentrations of mercury above laboratory non-detect levels.

Surface water was collected from six locations in the Saw Mill River. Bis (2-Ethylexyl) phthalate, aluminum, and iron were the only constituents detected with concentrations above the Ambient Water Quality Standard. Generally, the surface water samples contained similar concentrations and types of compounds on the target compound lists at each of the six stream sample locations. No trends in sample concentrations along the river course were observed.

Sediment samples were collected from six stream bed locations in the Saw Mill River. All locations contained at least three SVOC compounds with concentrations above the regulatory ecological SCOs, and four of the six samples contained pesticide compounds with concentrations above the regulatory SCOs. Metals concentrations above the "Severe Effect Level" SCOs were detected in each sediment sample location.

An environmental analysis, consistent with the NYSDEC Fish and Wildlife Resources Impact Analysis (FWRIA) Part 1, was completed as part of the RI. The report characterized the site with particular attention to the river, and fish and wildlife habitats at the site. Ecological exposure pathways were identified in the report. The report concluded that potential adverse effects and ecological risks to fish and wildlife resources will be unlikely from migration of constituents of potential ecological concern.

A Human Health Exposure Assessment (HHEA) was also completed to evaluate whether the site poses a potential hazard to the surrounding population. The report concluded that a low risk to human health exists at the site based on benzene in groundwater in certain locations if left unmitigated without appropriate engineering controls. The report also indicated that asbestos and lead based paint, which were not included in the scope of this RI, must be evaluated in the existing buildings prior to demolition.

1.0 INTRODUCTION

1.1 General

This document presents the results of a Remedial Investigation (RI) completed for multiple contiguous parcels located in the City of Yonkers, New York, which have been combined under the New York State Brownfield Cleanup Program (BCP) into a single BCP site (Site No. C360083).

This RI Report (RIR) has been prepared in accordance with the Brownfield Cleanup Agreement (BCA) between the volunteer/developer Struever Fidelco Cappelli, LLC, (SFC), who has secured the parcels under option agreements and site access agreements. The Brownfield Site RI was completed in accordance with the NYSDEC draft BCP Guidance and Technical Guidance for Site Investigation and Remediation (DER-10), to provide a systematic assessment of environmental conditions on the property. The objective of the RI is to define the nature and extent of contamination on-site, identify contaminant source areas, and produce data of sufficient quantity and quality to complete an on-site exposure assessment and a qualitative off-site exposure assessment.

The RIR supports the development of an acceptable Remedial Action Work Plan (RAWP), which is a remedy for the site that is protective of public health and the environment, taking into account the current, intended, and reasonably anticipated future use of the site. This RIR has been conducted according to the contents and intent of the Remedial Investigation Work Plan for Downtown Yonkers River Park Center Project (RIWP) submitted to the NYSDEC by S&W Redevelopment in January 2007, and subsequently approved by NYSDEC in February 2007.

1.2 Site Description

The BCP site consists of approximately 12.95 acres, within a wedge-shaped area bounded by New Main Street (west), Palisade Avenue and Elm Street (north), and Nepperhan Avenue (south and east). New School Street bisects the site north-to-south, connecting Palisade and Nepperhan Avenues (Sheet RI-1) with the exception of Lot 35, the Church owned parcels consolidated into one lot.

One- and two-story buildings, occupied by various retail businesses, restaurants, and offices, line New Main Street and Palisade Avenue, west of School Street. Behind these buildings, toward the interior of the site, is a paved parking lot. There are several commercial/industrial buildings east of School Street, which include an automotive body and repair shops, a gasoline service station, and a café. A single lane bridge connects John Street to a construction equipment/vehicle storage yard. The City's Engine No.1 Fire Department Headquarters is located on the corner of New School Street and John Street. The Saw Mill River travels through the site in a northeast to southwest direction to a culvert under School Street and the adjacent parking lot. The River emerges from

the culvert on the west side of the parking lot, bends in a northwestern direction for approximately 200 feet and then again enters a concrete culvert. The River does not re-emerge from the culvert within the site's boundaries.

1.3 Site History

Based on a review of previous Phase I investigations, site development dates back to the mid 1850s. From 1889 until the present, the perimeter properties have been occupied by one and two story wood framed and brick retail/commercial type buildings. Historic industrial use within the site boundary includes several hat factories, leather factories, and chemical dye manufacturers. At one time the existing parking lot was occupied by larger industrial facilities including hat factories, a brewery, and a contractor's yard. Other smaller buildings within the interior of the site consisted of garages, carpenter shops, auto businesses, wagon sheds, and a laundry business. Most of these structures were demolished sometime between 1942 and the late 1950's.

Until the RI work was performed, there was little current, quantitative information for the site relative to the presence of contamination. However, due to the site history, areas of contamination were anticipated. For example, mercury contamination was anticipated and has been found associated with the historic hat factory operations. Aside from this general history of industrial use, previous Phase I Environmental Site Assessments (ESA) performed by Advanced Cleanup Technologies, Inc. and S&W Redevelopment of North America, LLC, indicate historic petroleum spills may have impacted the site. At least two very limited Phase II type investigations were performed at the site prior to the implementation of the RI. The results of those are summarized in Section 1.5.

Historic petroleum spills were identified at 127-129 New Main Street as well as spills at adjacent properties on Palisade Avenue. The Yonkers Fire Station located at 5-7 New School Street also has a history of petroleum spills. In addition to spill data, visual evidence of USTs (fill and vent pipes) was identified during the Phase I site inspections mentioned above.

Typical maintenance programs, such as rodent control and weed control, may have caused pesticide/herbicide impacts.

1.4 Proposed Redevelopment

The site will be redeveloped into a mixed use retail, residential, office, and baseball stadium complex. SFC leads this redevelopment effort, which has been officially named the "Downtown Yonkers River Center Project". The completed project will include a 6,500-seat minor league baseball park with adjacent retail space. Parking will be accommodated on and off site (Sheet RI-6).

All development at ground level will be commercial, retail, parking garages, and loading docks. Residential development will be restricted to upper levels of the proposed buildings.

The development will also include a partial relocation the Saw Mill River. Redevelopment will include day-lighting the southeastern portion of the river that is currently flowing through the culvert under the City of Yonkers parking area.

1.5 Previous Investigations

All of the tax parcels included in the site have been the subject of either an area-wide Phase I ESA, or individual Phase I ESAs. Summaries of these assessments are listed below:

- Phase I ESAs were performed on much of the site by Advanced Cleanup Technologies, Inc. and S&W Redevelopment of North America, LLC (August 2006 and July 2007). These Phase I ESAs indicated that a variety of potential contaminants were likely to be present across the site. In addition, several past petroleum spills were identified across the site, and visual evidence of USTs (fill and vent pipes) were identified during Phase I site inspections. These reports were provided to NYSDEC as an appendix to SFC's BCP application for the site.

- The United States Environmental Protection Agency (USEPA) facilitate use of their mobile lab unit to enable the City of Yonkers through a consulting firm PS&S to conduct preliminary soil sampling and analyses on portions of the site in Novermber 2005. During this investigation, eight soil samples were collected and analyzed for metals concentrations. All samples contained concentrations of metals above NYSDEC unrestricted use criteria, and three samples contained concentrations of metals above NYSDEC Commercial Use Criteria. The analytical results for this investigation are included as Appendix A. Samples were also taken to evaluate for VOC contamination, but due to the limited nature of the drilling rig used for these borings and the fact that refusal was hit continuously, the VOC data did not prove to be useful.

- A report completed for Milio Management on their own site, titled "Limited Subsurface Environmental Investigation Report" by Warren and Panzer Engineers, P. C., November 2004, presents the results of soil samples collected from two borings at 78 Elm Street and three borings at 90-92 Elm Street. The soil samples were analyzed for VOCs and Priority Pollutant Metals (PP Metals). The report indicates that "VOCs were not detected at concentrations exceeding regulatory guidance from any of the borings investigated." However, similar to the EPA investigation, due to the shallow nature of this investigation, the results in this report were very limited in scope. Additionally, the report states, "[s]oil samples from all locations contained metal concentrations above the NYSDEC TAGM 4046 guidance or the TAGM Eastern United States Soil Typical Background concentration range" (WPE, 2004).

  Warren & Panzer's recommendations included:

- Soil should be monitored for the likelihood of encountering higher concentrations of VOCs during future earthwork activities;
- All surfaces of the lot be either capped with new structure foundation, concrete slabs, or asphalt; and
- Areas left open should be backfilled with a minimum of two feet of certified clean fill.

A copy of the report is included as Appendix B.

1.6 Site Setting

1.6.1 Topography

The Site generally slopes towards the west, with a steep gradient from the intersection of Elm Street and Nepperhan Avenue on the east side of the site, becoming more gentle west of the Saw Mill River. The upper elevation at the site is approximately 112 feet mean sea level (msl); however, the majority of the site is between approximate elevations of 75 feet and 52 feet msl (USGS, 1998).

1.6.2 Surface Water and Drainage

The Saw Mill River is a tributary of the Hudson River that flows through the City of Yonkers. It flows south from marshlands upstream of the City, paralleling the Saw Mill River Parkway for much of its length. The Saw Mill River empties into the Hudson River at Dock Street in Yonkers after traveling underground for approximately 2,000 feet starting from the western portion of the site.

Approximately 1,200 feet of the Saw Mill River flows through the BCP site. Of this stretch, approximately 480 feet of the upstream segment, east of School Street, is open. West of School street, approximately 200 feet is open. The remaining lengths are either bridged or contained in culverts.

Potential sources of pollution to the river's surface water and sediment include:

- Runoff from current residential and commercial development on-Site;
- Roadways and nearby highways;
- Sewage overflows from the Saw Mill River Pump Station of Mount Kisco; and
- Numerous untreated discharges from residential, commercial and industrial facilities in the watershed.

Based on site topography, the BCP site may contribute limited contamination to the Saw Mill River on a more localized scale, however, results from surface water samples collected throughout the river contain approximately equal concentrations SVOCs and metals above NYSDEC guidance levels. This suggests that contamination from the site

is not migrating to/or impacting the Saw Mill River, and the slight water quality criteria exceedances exist as background conditions.

1.6.3 Geology

The site is located within the Highlands Province (Hudson Highlands region). A review of the regional bedrock geology (USGS Map 1-514-A - Engineering Geology of the Northeast Corridor Washington D.C., to Boston, Massachusetts: Bedrock Geology) in the vicinity of the site indicates that, the site overlies two lithologic units:

- Gneiss: biotite-quartz-feldspar gneiss with associated migmatite, granulite, amphibolites, and granitic rocks
- Marble, crystalline limestone, and dolomite

A review of the Soil Survey of Putnam and Westchester Counties, New York, dated September 1994, prepared by United States Department of Agriculture, Soil Conservation Service, reveals that surficial soils in the vicinity of the site are classified as follows:

> Uf – Urban land: "...at least 60 percent if the land surface is covered with buildings or other structures. The areas include parking lots, shopping centers...slopes range from 0 to 8 percent. Included in the mapping are small areas of soil that have not been appreciably altered...The undisturbed soils are in areas between buildings or other structures..."

During the RI activities completed by SESI, borings were extended to depths ranging from eight to 51 feet below ground surface (bgs). A significant amount of cobbles, boulders and rubble was encountered in to the completion depth of the borings. Drilling to facilitate monitoring well installation was extremely difficult even with a relatively large air powered rotary drill rig.

A review of the SESI boring logs and the Preliminary Geotechnical Report, dated January 30, 2007, prepared by McLaren Engineering Group of West Nyack, NY, reveals the following site stratigraphy (from the top to the bottom):

- Fill: surficial fill extending to a maximum depths of about 5' - 28' bgs, was encountered throughout the site and was predominantly, gray to brown sand with a little gravel, a little silt with fragments of brick/wood/concrete.

- Glacial Till: encountered below the fill and extending to a maximum depth of about 85' bgs, consisting of gray to brown sand, with a little gravel, a little silt with cobbles and boulders.

- Bedrock: generally present beneath the glacial till, bedrock was encountered at depths ranging from 3' to 85' bgs.

1.6.4 Hydrogeology

During the monitoring well sampling event between September 14 and 18, 2007, groundwater was encountered at depths ranging from 0.3 ft below ground surface (bgs) at MW-10 to 19 ft bgs at MW-14. The direction of groundwater flow, on-site, varied from westerly to northwesterly. The Saw Mill River is the outcropping of the groundwater table at the ground surface. The groundwater hydraulic gradient ranges from 10% on the eastern side (steeply sloped side of the site) to generally approximately 3% across the remainder of the site. Groundwater elevation contours are presented on sheet RI-2.

During well sampling, slow recharge was noted in several wells; in particular was MW-17, which required over 12 hours to recharge enough volume to allow collection of a sample. Rising head tests were performed in three shallow groundwater wells during the September sampling event. Hydraulic conductivity was determined based on data collected during those tests, and found to be approximately $1.18 * 10^{-4}$ cm/sec.

A second round of well sampling was performed in December 2007. Additionally, seven deep groundwater wells were installed. Groundwater elevations collected during the second sampling event as well as groundwater elevations collected from the deep wells indicate similar groundwater flow direction and hydraulic gradients.

2.0 REMEDIAL INVESTIGATION (RI) ACTIVITIES

This RI has been conducted in general accordance with the Remedial Investigation Work Plan for Downtown Yonkers River Park Center Project (RIWP) submitted to the NYSDEC by S&W Redevelopment, January 2007, and subsequently approved by NYSDEC in February 2007. The RI was also completed in accordance with NYSDEC's draft Brownfield Cleanup Program Guidance and Technical Guidance for Site Investigation and Remediation (DER-10).

The RIWP included sections describing the scope of investigations for the site soil and groundwater, soil vapor, and the Saw Mill River surface water and sediment. A Human Health Exposure Assessment; a Fish and Wildlife Impact Analysis and Quality Control for analytical samples generally followed in the investigation.

The main objectives of the RI were to:

- Identify if soil and groundwater contamination exist at the site;
- Identify the extent of soil and groundwater contamination at the site;

- Determine groundwater flow direction, groundwater hydraulic gradient, and assess the possibility of off-site impacts from possible groundwater contamination;
- Determine if the Saw Mill River has been impacted from site contaminants;
- Determine if contaminants are impacting soil vapor, and whether soil vapor poses a health or safety threats;
- Obtain information required to evaluate potential remedial alternatives and determine appropriate remedial actions.

Draft results of the initial investigation were presented to the NYSDEC in November 2007. After reviewing the initial investigation results, NYSDEC requested that additional soil and groundwater samples be collected and analyzed. The NYSDEC requested:

- A second round of groundwater samples to be collected from the shallow groundwater wells already installed at the site,
- Collect filtered and unfiltered samples from the wells, and analyze the samples for TAL metals,
- Install seven (7) deep groundwater wells across the site, with the well screens placed just above the bedrock elevation. Analyze samples collected from these wells for TCL VOCs, SVOC, Pesticides, PCBs, and TAL metals.
- Collect soil samples for analysis at nine (9) additional boring locations. Six of the boring locations were placed in the path of the proposed Saw Mill River relocation course.

2.1 Soil Investigation

Forty (40) soil samples were initially collected from split spoon sampling devices retrieved from soil borings during the installation of groundwater monitoring wells. Based on the results of the initial samples and as per guidance provided by the NYSDEC, fifty (50) additional soil samples were collected from seven (7) deep groundwater monitoring wells and nine (9) soil borings. Sheet RI-3 depicts the locations of the groundwater monitoring wells and soil borings. The boring logs are included as Appendices G1 and G2.

The initial soil samples selected for analyses were selected based on field screening observations, including visual observations, a determination of odor, and screening with a photoionization detector (PID). The additional samples depths were mainly predetermined based on the initial analytical results and the proposed grades for the proposed River Park Center development. Also, where possible during deep well installations, samples were collected from the soil interval immediately above the bedrock elevation. Sample collection intervals were also biased towards field screening observations. Boring results indicate that the majority of subsurface material is comprised primarily of boulders, cobbles, and interstitial soil (glacial till). A significant amount of historic fill and rubble is present in the upper 10 to 12 feet of the site. In many

instances the sample recovery devices contained very small sample amounts, so sample intervals were sometimes increased beyond two feet to five feet.

Soil sampling consisted of split spoon sampling following ASTM D-1586/Split Barrel Sampling using a standard 2-foot long, 2-inch outside diameter, split-spoon sampler with a 140-pound hammer or collection via continuous drill cutting stream from a Sonic Drill rig.

The soil samples were analyzed for Target Compound List (TLC) Volatile Organic Compounds (VOCs), TLC Semi-Volatile Organic Compounds, Target Analyte List (TAL) metals and cyanide, pesticides and PCBs. Soil samples collected from the proposed Saw Mill River relocation course were also analyzed for Total Organic Carbon (TOC). Field Blanks were collected each day sampling was conducted.

2.2 Groundwater Investigation

Twenty-Six (26) shallow groundwater monitoring wells were installed between August 14 and September 5, 2007. Based on the analytical results of samples collected from these wells, seven (7) additional deep groundwater monitoring wells were installed between November 17 and December 4, 2007. Sheet RI-2 depicts the locations of groundwater monitoring wells.

As stated in Progress Report #001 (SESI, July 2007) and discussed with the NYSDEC, SESI proposed to modify some monitoring well locations that were approved in the RIWP. Also, as stated in Progress Report #002 (SESI, September 2007), five groundwater monitoring wells were eliminated from the RI because existing utilities and in-use buildings prohibited access. Several monitoring well locations had to be modified based on accessibility, existing utility clearance, and worker safety issues. The actual groundwater monitoring well locations are depicted on Sheet RI-2.

The groundwater monitoring wells were installed around the site boundary and within its interior by Summit Drilling of Bound Brook, NJ and Aquifer Drilling and Testing of New Hyde Park, NY.

Since previous field investigations had revealed an extensive boulder field underlying much of the site, drilling for installation of the initial monitoring wells was completed by air rotary methods. The additional wells were installed by drilling with a combination of air-rotary, mud-rotary, and sonic drilling methods. The monitoring wells consisted of 2-inch or 4-inch diameter PVC pipe, with a sand filter pack, bentonite seal, and a bolt-down protective cover cemented in place at ground surface. Shallow groundwater wells contain a #10 (0.10") slotted well screen section, approximately 10 to 15 feet long, installed from the bottom of the well to above the surface of the water table. The remaining length of the well is solid PVC pipe to the terminus just below ground surface. Deep groundwater wells are constructed in the same manner; however, the length of screen was 10 feet, the entire length of screen was placed below the groundwater, and,

the well screen depth was installed as close to the depth of the soil/bedrock contact as was possible. Monitoring Well construction details are presented on Sheet RI-2D. Following well completion, each monitoring well was developed to reduce suspended sediments (i.e. turbidity) by removing a minimum of three volumes of water. Groundwater samples were collected from each shallow groundwater monitoring well a minimum of one week following installation; groundwater samples were collected from the deep groundwater wells following a minimum 24 hour period. Two rounds of groundwater samples were collected from the shallow groundwater monitoring wells and one round of groundwater samples was collected from the deep groundwater monitoring wells.

Groundwater sampling included collection of the following information prior to, during, and after sample collection: pH, specific conductivity, temperature, dissolved oxygen concentration and depth to water. Three well volumes were purged prior to sample collection. During the first round of sampling, despite purging the wells, high turbidity was noted in several of the groundwater samples collected. High turbidity may cause elevated metals concentrations in the samples. The data was recorded onto Monitoring Well Field Sheets, which are included as Appendix H. To determine if metal concentrations were a result of high turbidity, the second round of shallow well sampling included collecting filtered and unfiltered samples. The deep monitoring well sampling included monitoring water turbidity, and, if elevated turbidity was noted, low flow purge techniques were implemented.

The first round of shallow and the deep groundwater samples were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-Volatile Organic Compounds, Target Analyte List (TAL) metals and cyanide, pesticides and PCBs. Field Blanks were included each day sampling was conducted. The second round of shallow groundwater samples, including both the filtered and unfiltered samples, were analyzed for TAL metal only.

2.3 Soil Vapor Investigation

Nine (9) soil vapor collection wells were proposed as part of the RI. Similar to the difficulties encountered during installation of the groundwater monitoring wells, four of the proposed soil vapor wells could not be installed, and one of the wells had to be relocated. Likewise, these deviations from the RIWP were documented in the aforementioned progress reports and approved by the NYSDEC.

Summit Drilling of Bound Brook, NJ was contracted to install the soil vapor wells. Air-rotary drilling techniques were utilized to drill the holes for the vapor wells. Installation included advancing a 6-inch hole to a depth that maintained a minimum two-foot clearance above the estimated groundwater elevation. Well construction consisted of 4-inch diameter PVC pipe, the bottom two feet of which is slotted to permit vapor collection. The annular space of the slotted portion was filled with number 10 quartz sand from the bottom of the pipe to approximately 1-foot above the slotted section. A

bentonite seal was installed in the annular space on top of the sand, and the remaining annular space was cement grouted. A flush mounted bolt-down protective cover was cemented in place at the ground surface. Sheet RI-5 depicts the soil vapor collection locations.

Soil vapor samples were collected from the five constructed soil vapor collection wells. The soil vapor survey was conducted in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (February 2005). Soil vapor samples were collected in the vadose zone from shallow well points. A plastic tube was inserted into each vapor well and the top sealed to prevent ambient air infiltration. The soil vapor sampling effort also included the use of an inert helium tracer gas to verify that the soil vapor samples are not diluted by ambient air. The atmosphere around the sampling tube was enriched with the tracer gas, and the soil vapor sample was collected in the presence of the enriched tracer atmosphere. The soil vapor sampling program used a 1 microgram per cubic meter detection limit for VOCs, by USEPA method TO-15.

2.4 Surface Water and Sediment Investigation

Seven (7) surface water and stream sediment locations were proposed in the RIWP submitted by S&W. One location, SED/SW-7, was located approximately 400 feet from the entrance to the culvert and could not be accessed, therefore, it was not sampled. DEC was made aware of the inability to access this sample location in the July 2007 Progress Report. Sheet RI-4 shows the surface water and stream sediment sample locations.

In August 2007, where access permitted, surface water samples were collected directly into the sample bottles, and sediment samples were collected from the upper 6-inches of the stream bed using a disposable trowel. Surface water sample locations SED/SW-4, SED/SW-5, and SED/SW-6 were collected using disposable bailers, and sediment sample locations SED/SW-4, SED/SW-5, and SED/SW-6 were collected using a hand held auger with extension rods due to access restrictions. Any rocks and/or vegetative material present in the sediment samples were discarded. The water and sediment samples were analyzed for TCL VOCs, SVOCs, PCBs, pesticides, TOC, and TAL metals.

In November 2007, six borings SB-1 thru SB-6 were advanced, at locations along the planned relocated Saw Mill River alignment, to depths ranging from 0 feet to 32 feet below the ground surface. The borings were advanced to evaluate the soil/sediment quality along the length of the planned alignment. Soil samples were collected from each boring location at multiple depths. The samples were subsequently analyzed for VOCs, SVOCs, PCBs, pesticides, metals and TOC.

The surface water results were compared to "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" which are part of the New York State Division of Water Quality Technical and Operational Guidance Series (1.1.1). The river's sediment results were compared to the criteria listed in NYSDEC "Technical Guidance for Screening Contaminated Sediments - January 1999".

3.0 REMEDIAL INVESTIGATION RESULTS

3.1 Soil

Table 2A and 2B present analytical results for the 90 soil samples that were collected during the RI. The samples were submitted to Accutest Laboratories Inc., or Hampton Clarke/Veritech, NYS Department of Health certified labs, for analysis. The ASP protocol laboratory data packages and related Data Usability Summary Reports (DUSR) are included as Appendices E and F respectively. The DUSR for the additional samples collected in November and December will be submitted as an addendum to the RIR.

For purposes of evaluating the remedial alternatives associated with the proposed site redevelopment, the analytical results of the soil samples were compared to the NYSDEC soils Unrestricted Use and Commercial Use SCOs. Sheet RI-3 shows the locations of all exceedances above the Unrestricted Use Criteria and the Commercial Use Criteria. The following table summarizes the results of the soil investigation by sample, and a detailed description of these results is provided below.

Parameter	# Samples Collected	# Samples Analyzed	# Exceedances of Unrestricted Use Criteria	# Exceedances of Commercial Use Criteria
VOCs	90	90	7	0
SVOCs	90	80	17	11
PCBs	90	82	9	2
Pesticides	90	82	12	0
Metals	90	82	82	16

The following table summarized the results of the soil investigation by location:

Parameter	# of Sample Locations	# Exceedances of Unrestricted Use Criteria	# Exceedances of Commercial Use Criteria
VOCs	47	4	0
SVOCs	39	14	9
PCBs	40	3	2
Pesticides	40	9	0
Metals	40	35	13
Mercury	40	26	10

VOCs - Acetone was detected in six soil samples at concentrations slightly above NYSDEC unrestricted use criteria and methylene chloride was detected in two locations, SV-9 and MW-38, above NYSDEC unrestricted use criteria. VOCs were not detected at concentrations above the Unrestricted Use Criteria in any other soil samples collected at the site. VOCs were not detected at concentrations above the Commercial Criteria in the soil samples.

SVOCs - Of the 90 samples collected, 10 samples were not analyzed for SVOCs because of insufficient soil volume. Of the 80 samples analyzed for SVOCs, 17 samples contained concentrations exceeding NYSDEC Unrestricted Use Criteria. Eleven of these 17 samples contained concentrations exceeding the Commercial Use Criteria.

The SVOCs detected at concentrations above the SCOs were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, Chrysene and indeno(1,2,3-cd)pyrene. Dibenzo(a,h)anthracene was detected at concentrations slightly above the Unrestricted Use SCOs in two locations.

PCBs and Pesticides - Of the 40 samples collected, eight samples were not analyzed for Pesticides and nine were not analyzed for PCBs because of insufficient soil volume. Of the 81 samples analyzed for PCBs, nine samples contained concentrations exceeding NYSDEC Unrestricted Use SCOs and two samples contained concentrations exceeding NYSDEC Commercial Use SCOs for PCBs. Of the 82 samples analyzed for Pesticides, 12 samples contained concentrations exceeding NYSDEC Unrestricted Use SCOs for Pesticides. It should be noted that rodent control measures may have caused pesticide impacts.

The Pesticides detected at concentrations above the Unrestricted Use SCOs were 4,4'-DDT, 4,4'-DDD, 4,4'-DDE, and Dieldrin. PCB concentrations above NYSDEC commercial use criteria included Aroclor in SB-2, (15'-17'), and in MW-36 (0'-2').

Pesticides were not detected at concentrations above the Commercial Use SCOs in soil samples collected from any location.

Metals - Of the 90 samples collected, eight samples were not analyzed for Metals because of insufficient soil volume. A summary of the metal concentrations is presented below:

Metal	Number of Samples Analyzed	Number above Unrestricted Use SCO	Number above Commercial Use SCO
Arsenic	82	2	0
Chromium	82	81	0
Copper	82	27	1
Lead	82	30	1
Manganese	82	2	0
Mercury	82	43	14
Nickel	82	12	0
Silver	82	5	0
Zinc	82	16	0

3.2 Shallow Groundwater

Analytical results of groundwater samples collected from the shallow groundwater monitoring wells are depicted on Table 3 and Table 4; and on Sheet RI-2A and Sheet RI-2B. The extent of the impacts associated with the different contamination categories are depicted on Sheet RI-2D. The laboratory data packages and related Data Usability Summary Reports are included as Appendices E and F respectively. The DUSR for the additional samples collected in November and December will be submitted as an addendum to the RIR.

A review of the analytical results of the unfiltered samples indicates that groundwater in all the sampled monitoring wells is impacted by a combination of VOCs, SVOCs, PCBs and metals, at concentrations that exceed the NYSDEC standards. However, filtered samples analyzed for metals indicate most of the metals concentrations are reduced to non-detectable levels after filtering with the exception of naturally occurring metals. The constituent concentrations were compared to the more stringent of these two applicable standards: Division of Water Technical and Operational Guidance Series (1.1.1) and Technical and Administrative Guidance Memorandum 4046.

Petroleum shallow groundwater impacts, potentially associated with a gasoline station on School Street, were observed in monitoring wells MW-3, MW-4, MW-5, MW-6 and MW-8. Specifically, benzene, toluene, ethylbenzene, xylenes, MTBE, 2,4-dimethylphenol, 2-methylnaphthalene, 2-methylphenol, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene and naphthalene, which are generally associated with gasoline and diesel were detected. Maximum concentrations of the targeted analytes were detected at the location of monitoring well MW-6. A contamination plume follows the local groundwater flow in a westerly direction.

Chlorinated volatile organic compounds (CVOCs) (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, cis-1,2-dichloroethene, chloroform) were detected in groundwater, primarily along the southeastern property boundary. The CVOC concentrations are relatively low (e.g., maximum PCE concentration of 23.9 ug/L in monitoring well MW-23).

Naturally occurring metals, including arsenic, barium, beryllium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, sodium and zinc, were detected in various combinations in all the monitoring wells at concentrations that exceeded the NYSDEC standards in unfiltered samples. Filtered samples indicate concentrations that exceed NYSDEC standards for barium in 1 well; for iron in 7 wells; for magnesium in 8 wells; for manganese in 11 wells, for selenium in 1 well, and for sodium in 25 wells. The filtered results indicate that the exceedances for metals, and in particular mercury, in the unfiltered samples were due to the presence of sediment in the groundwater samples as a result of high turbidity affected during sample collection procedures.

Mercury that is associated with historic on-site operations (e.g., former hat factories, former chemical dye facilities and leather factory) was detected in unfiltered samples from 18 monitoring wells that are located throughout the property, however mercury was not detected in any of the filtered samples.

3.3 Deep Groundwater

Analytical results from 7 deep groundwater wells are presented on Table 5 and on Sheet RI-2C. The extent of the impacts is presented on Sheet RI-2C. The extent of the impacts associated with the different contamination categories are depicted on Sheet RI-2D. The laboratory data packages and related Data Usability Summary Reports are included as Appendices E and F respectively. The DUSR for the additional samples collected in November and December will be submitted as an addendum to the RIR.

Petroleum deep groundwater impacts were observed in monitoring wells MW-32 and MW-35. Specifically, benzene, MTBE, 2,4-dimethylphenol, acenaphthene, 2-methylnaphthalene, 2-methylphenol, and naphthalene, which are generally associated with gasoline and diesel were detected. Maximum concentrations of the targeted analytes were detected at the location of monitoring well MW-6 and MW-35.

Chlorinated volatile organic compounds (CVOCs) (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, cis-1,2-dichloroethene, chloroform) were detected in deep groundwater, in monitoring wells MW-35, MW-36, and MW-38. The CVOC concentrations are relatively low (e.g., maximum PCE concentration of 40 ug/L in monitoring well MW-38). Dibenzofuran was also detected in MW-35.

Metals, including iron, manganese, selenium, and sodium were detected in various combinations in all the deep groundwater monitoring wells at concentrations that exceeded the NYSDEC standards.

3.4 Soil Gas

Concentrations of 25 VOCs were detected above the laboratory minimum detection limits (MDL), with each soil vapor location containing some compounds and one sample contained concentrations of PCE above guidance levels for indoor air and sub-slab even though this sample was collected outside of a building. SV-1 contains eight compounds with concentrations above MDL, SV-3 and SV-9 contain 12 compounds with concentrations above MDL, and SV-2 and SV-8 contain 14 compounds with concentrations above MDL. The laboratory data packages and related Data Usability Summary Reports are included as Appendices E and F respectively.

The State of New York Department of Health (NYSDOH) does not have any standards, criteria or guidance values for concentrations of volatile chemicals in subsurface vapors form exterior probes (DOH, October 2006). However, NYS has developed guidelines for concentrations of chemicals in indoor air and from sub slab samples. The soil vapor results were compared to the air guidelines developed by NYSDOH. Only one compound was detected above NYSDOH guidelines. Well SV-2 contained tetrachloroethene at 286 ug/m^3. The compounds detected above MDLs are indicated on Figure RI-5. A complete list of the soil vapor analytical results is presented on Table 8-Soil Vapor Results which is included in Appendix C.

3.5 Surface Water and Sediment

Surface Water

Site contamination does not appear to be impacting surface water in the Saw Mill River. One VOC, one SVOC, and seven metal compounds were detected with concentrations above the MDL. Bis (2-Ethylexyl)phthalate, aluminum, and iron were detected with concentrations above the applicable Water Quality Standard. No trends in sample concentrations were observed. Generally, the surface water samples throughout the river contain approximately equal concentrations of these same compounds. This suggests that contamination from the site is not migrating to/or impacting the Saw Mill River, and the slight water quality criteria exceedances exist as background conditions.

The compounds detected above MDLs are indicated on Sheet RI-4. A complete list of the surface water analytical results is presented on Table 9-Steam Sediment and Surface Water Results, which is included in Appendix C.

Stream Sediment

Site contamination is also having a limited impact on sediment in the Saw Mill River. The analyte concentrations in the sediment samples were normalized with respect to the total organic carbon content associated with the sample locations. A review of these

results of samples collected in August 2007, indicates that all stream sediment sample locations (SED-1 thru SED-6) contained at least three SVOC compounds (benzo(a)anthracene, benzo(a)pyrene, and bis(2-Ethylhexyl)phthalate, etc.) at concentrations that exceeded applicable sediment criteria and ecological SCOs. Four of the six samples contained various pesticides at concentrations that exceeded the applicable criteria. Metals concentrations above the "Severe Effect Level" criteria were detected in each sediment sample location. No trends in sample concentrations were observed.

Proposed Stream Relocation Course Sample Results

A review of the analytical results associated with samples collected from borings advanced along the proposed re-alignment of the Saw Mill River indicates that only one sample SB-3, collected from the depth interval of about 16'-18' below ground surface (bgs) is impacted. Aroclor-1248 was detected in this sample at a concentration of 0.7 ug/gOC, which exceeded the applicable most stringent sediment criteria of 0.0008 ug/gOC. Additionally, manganese and nickel were detected in samples SB-2 (1,600 mg/Kg at a depth of about 15'-17' bgs) and SB-6 (79 mg/kg at depth of about 28'–30' bgs) at concentrations that exceeded the applicable Severe Effects Level, respectively.

Analytical results of the surface water and stream sediment samples are depicted on Table 8 and Sheet RI-4. The extent of the impacts associated with the different contamination categories are depicted on Sheet RI-4. The ASP protocol laboratory data packages and related Data Usability Summary Reports are included as Appendices E and F respectively.

3.6 Fate and Transport

The migration and attenuation of the on-site groundwater contaminants as governed by advection, retardation and biodegradation is evaluated in the sections to follow. This evaluation targeted the petroleum impacts along the northern property boundary (in the vicinity of monitoring wells MW-3, MW-4, MW-5, MW-6 and MW-8). Additionally, the evaluation was applied to the chlorinated volatile organic compounds (CVOCs) detected in the shallow and relatively deep groundwater samples. It should be noted that delineation of the CVOC impacts in not complete. The CVOCs impacts are likely migrating onto the site from sources outside the Site. The goal of the evaluation is to estimate the extent of the institutional controls needed to address the groundwater contamination detected at the site. The institutional control will remain until the groundwater quality is restored (remedial strategy to address the groundwater impacts will likely involve removal of source areas and remediation of groundwater impacts via Monitored Natural Attenuation).

Fate and transport associated with mercury impacts has not been addressed because the mercury impacts were due to the high turbidity of the groundwater samples, an artifact of the groundwater sampling technique. CVOC impacts were encountered in both the shallow and deep groundwater onsite; however, source areas were not encountered. Shallow and deep CVOC plume maps were developed and shown on Sheet RI-2D, which

depict the fate and transport of the CVOC's. The properties immediately to the northeast of the site, currently occupied by a church, a residential structure, and parking lots, may also be impacted by these CVOC plumes.

For the petroleum impacts, the rate (advection) at which each of the targeted pollutants is migrating and attenuating (retardation and degradation) is computed. The results of the computations were utilized to estimate the plume lengths associated with each of the targeted pollutant.

The evaluation in the sections to follow was based on the following assumptions:

- Source areas are no longer present;
- Pollutant degradation can only be attributed to biotic processes;
- Degradation is aerobic;
- Oxygen, nutrients and metabolizing microorganisms are present in sufficient quantities and are not limiting factors.

3.6.1 Advection Transport

In accordance with the Darcian flow equations that govern the groundwater flow regime within the subject site, advective flow velocity can be obtained as follows:

$$Q = KiA$$

Where
Q = groundwater flow rate
K = hydraulic conductivity = 1.18×10^{-4} cm/sec (based on field tests)
i = hydraulic gradient = ranging between 0.01 to 0.03 (for the subject site)
A = cross-sectional area perpendicular to the direction of groundwater flow

$$v = Q/A = Ki = \text{ranges between } 1.18\text{x}10^{-6} \text{ cm/sec and } 3.54\text{x}10^{-6} \text{ cm/sec}$$

Where v = groundwater flow velocity

$$V_i = v/n_e = \text{ranges between } 3.9\text{x}10^{-6} \text{ cm/sec and } 1.18\text{x}10^{-5} \text{ cm/sec}$$

Where
v_i = intersticial velocity
n_e = effective porosity = assuming it is 0.3

R_d = retardation factor = $1 + \frac{K_{OC} * f_{o.c} * \rho_b}{n_e}$

Where
K_{oc} = organic carbon partitioning coefficient = 0.63 * K_{ow} (Karichoff et al., 1979[1])
K_{ow} = octanol/water partitioning coefficient

f_{oc} = fraction of organic carbon = 0.02% (assumed for sandy soils)
ρ_b = bulk density of the formation = 1.5 g/ml

Pollutant transportation rate is given by

$$V_{pt} = V_i/R_d$$

Where
V_{pt} = pollutant transportation rate
R_d = retardation factor

3.6.2 Biodegradation

The time it takes for contaminants to reach regulatory levels can be calculated using the following equation (first-order decay)

$$t = -\frac{\ln\frac{C}{C_0}}{k}$$

Where:
C = Final concentration (i.e., the applicable TOGS 1.1.1 regulatory limit for the target pollutant)
C_0 = Initial concentration
K = degradation rate constant for the target pollutant

A table summarizing the results of the above outlined evaluation, as applied to the contaminants at the Site is included below. The data indicates that the on-Site groundwater impacts will not migrate any significant distance before they attenuate to concentrations less than the applicable SCGs.

Pollutant	K_{oc}	C_0 (ug/L)	C (ug/L)	$t_{1/2}$ (hours)	k (days^{-1}) = 0.693 / $t_{1/2}$	t (days)	t (years)	R_d	V_{pt} (ft/day)	L (feet)
Acetone	0.37	321	50	336	0.0495	38	0.1	1.0003 7	3.3E-02	1.3
Benzene	83	12,900	0.7	240	0.0693	142	0.4	1.083	3.1E-02	4.4
Chloroform	44	29.4	7	4,320	3.85×10^{-3}	372	1	1.044	3.20E-02	11.9
Cis-1,2-Dichloroethene	59*	18	5	1,344	0.012	106	0.3	1.059	3.16E-02	3.3
Ethylbenzene	96	3,300	5	5,472	3.0395×10^{-3}	2136	5.9	1.096	3.05E-02	65.2
Toluene	115	9,300	5	8640	1.925×10^{-3}	3911	10.7	1.115	3E-02	117.3
Tetrachloroethene	263	40	5	17,280	9.63×10^{-4}	2,159	5.9	1.263	2.65E-02	57.2
Trichloroethene	65	32.2	5	7704*	2.16×10^{-3}	863	2.4	1.065	3.14E-02	27.1
Xylenes	347	14,200	5	336	0.0495	161	0.4	1.347	2.5E-02	4
2,4-dimethylphenol	117	135	50	672	0.0247	40	0.1	1.117	3E-02	1.2
2-methylnaphthalene	8,511	276	50	NA	NA	NA	NA	9.5	3.5E-03	NA
2-methylphenol	22	28.5	5	NA	NA	NA	NA	1.022	3.3E-02	NA
benzo(a)anthracene	1,380,384	2.3	0.002	32,640	5.103×10^{-3}	1,381	3.8	1,381	2.4E-05	0.0
benzo(a)pyrene	1,995,262	1.7	0.002	25,440	6.55×10^{-3}	1,030	2.8	1,996	1.7E-05	0.0
benzo(b)fluoranthene	549,540	1.6	0.002	29,280	0.568×10^{-3}	11,769	32.2	550	6.1E-05	0.7
benzo(k)fluoranthene	4,365,158	1.6	0.002	42,680 *	0.3897×10^{-3}	17,154	47	4,366	7.7E-06	0.1
bis(2-ethylhexyl)phthalate	100,000	10.8	5	240	0.0693	11	0.03	101	3.3E-04	0.0
chrysene	245,470	2.3	0.002	48,000	0.3465×10^{-3}	20,339	55.7	246	1.4E-04	2.8
Indeno(1,2,3-cd)pyrene	30,902,954	0.98	0.002	35,040	0.4747×10^{-3}	13,049	35.8	30,903	1.1E-06	0.0
naphthalene	549	682	10	24	0.693	6	0.02	1.549	2.2E-02	0.1

K_{oc} - Organic Carbon Partion Coeff.
C_0 (ug/L) - Initial Conc. (Max. Pollutant Conc.)
C (ug/L) – Final Conc. (Groundwater Cleanup Criteria/ Standards)
$t_{1/2}$(hours) - half life (Degradation Rate) - High Values for Aerobic Conditions
K_{oc} – Organic Carbon partitioning coefficient (values from Remediation Engineering Design Concepts. CRC Lewis Publishers)

k (days^{-1}) - Degradation Rate (values from Remediation Engineering Design Concepts. CRC Lewis Publishers)
t (days) – Duration needed to achieve TOGS 1.1.1 criteria/ standards
L (feet) - Plume length of targeted pollutant

Note: Calculations are based on multiple assumptions about key parameters (e.g., f_{oc} etc.). Site-specific values of these parameters will likely estimate contaminant longevity and extent of migration.

3.7 *Human Health Exposure Assessment*

A qualitative human health exposure assessment (HHEA) has been performed by Atlantic Environmental to qualitatively evaluate whether the site soils, groundwater, and soil vapor poses a potential hazard to the surrounding population. The HHEA is included in Appendix C.

The HHEA was completed in accordance with the New York State Department of Health's *Qualitative Human Health Exposure Assessment* guidance document. Sampling data was reviewed along with the physical conditions of the contaminant sources or physical hazards near the site. Potential on-site and off-site exposures have been evaluated. The HHEA describes the nature and size of the population exposed, or potentially exposed, to the contaminants that are present at, or migrating from, the site. The HHEA also characterizes the exposure setting, identifies the exposure pathways and evaluates contaminant fate and transport.

Applicable NYSDEC guidance, including NYSDEC TAGM 4046 for soil and Class GA groundwater regulations for groundwater, were used for purposes of identifying site COCs. Lists of carcinogens and non-carcinogens that exceeded the NYSDEC, TAGM and TOGS criteria were developed. The levels found in the samplings were inserted in risk-based formulas for EPA's Risk-Based Preliminary Remediation Goals using EPA Region III Risk-Based Concentration (RBC) Tables dated October 11, 2007. Both Residential and Commercial RBC values were inserted into the formulas.

An assessment of current and future site activities and site use was conducted in relation to potential human exposure. Potential pathways were identified and each element of the exposure pathway was evaluated.

The report makes the following conclusions:

- Based on soil, sediment, soil vapor, and groundwater test results available at the time of this report, the only carcinogen with an increased lifetime risk is benzene, found in one soil sample at the gas station sampling point (MW6) (Table I). The increased risk is only slightly above the one-in-a-million risk and must be described as "LOW," which would indicate the need for further assessment or corrective action. Based on a single sample, the prudent approach is to conduct additional sampling to more clearly identify the extent of the contamination. This will allow a clearer determination of cancer risk and any possible corrective action.

- Also based on the site testing, no concentration of non-carcinogens exceeded the Reference Dose risk and thus, the risk is considered minimal to the surrounding population (Table II, in Appendix C).

- Site activities for the 2 to 3 years of site development may impact workers and the surrounding community. The presence of benzene at the gas station, residual carcinogens, pesticides, PCB's, and heavy metals and their exposure potential must be addressed during construction, site development as part of a site specific Health and Safety Plan (HASP).

- A site specific Health and Safety Plan must be developed to evaluate site workers' exposure potential and risk to surrounding population. The HASP must include initial site testing, exposure potential, protection/corrective measures, and regulatory compliance. There is a high probability that at least some of the site buildings may contain asbestos and lead-based paint. Surveys are required to determine the presence of these materials. The asbestos must be removed prior to demolition. The contractors must be informed of the presence of lead-based paint in order to properly protect their workers and comply with OSHA regulations.

3.8 Fish and Wildlife Impact Analysis

A Fish and Wildlife Impact Analysis (FWIA) was completed by PK Environmental, Inc. This analysis identified fish and wildlife resources that may potentially come into contact with site contaminants, evaluated potential exposure pathways, and determined the route, intensity, frequency, and duration of actual or potential exposures to chemicals for these resources. The FWIA further characterized the site, with particular attention to the Saw Mill River, and fish and wildlife habitats at the site. The report concludes that "potential adverse effects and ecological risks to fish and wildlife resources will be unlikely from migration of constituents of potential ecological concern. The FWIA is included in Appendix D.

4.0 DATA USABILITY SUMMARY REPORT

To validate laboratory analytical data, Data Usability Summary Reports (DUSR) for each laboratory analytical data package have been completed. The reports are included as an appendix to this report. The DUSR for the additional samples collected in November and December will be submitted as an addendum to the RIR.

5.0 RECOMMENDATIONS

5.1 Summary of RI Results

1. Historical uses of the site may have impacted the site soils, groundwater, and river sediment; however, it is possible that the impacts are a result of area-wide

contamination. These impacts have not affected the surface water quality of the portion of the Saw Mill River passing through the site.

2. Analytical results of soil samples indicate metal concentrations above NYSDEC unrestricted use criteria in 35 of the sample locations, and concentration above NYSDEC commercial use criteria in 13 of the sample locations. In particular, mercury was identified at 26 and 10 locations in concentrations above NYSDEC unrestricted and commercial use criterion respectively. SVOCs, pesticides, and metals were all identified in the site soils with concentrations above NYDEC commercial use criteria. It should be noted that rodent control measures may have caused pesticide impacts.

3. Historic investigations on parts of the site were conducted by PS&S using USEPA's mobile lab in November 2005 and by Warren and Panzer Engineers in November 2004. The analytical data from those investigations also indicates soil impacts from metals concentrations greater than NYSDEC unrestricted use SCOs and NYSDEC commercial use SCOs.

4. Analytical results of unfiltered samples indicate that shallow groundwater in all the 26 sampled monitoring wells is impacted with a combination of VOCs, SVOCs, Pesticides, PCBs and metals at concentrations that exceed the Division of Water Technical and Operational Guidance Series (1.1.1) and Technical and Administrative Guidance Memorandum 4046 criterion. However, analytical results of filtered samples indicate concentrations that exceed NYSDEC standards for barium in 1 well; for iron in 7 wells; for magnesium in 8 wells; for manganese in 11 wells, for selenium in 1 well, and for sodium in 25 wells. These are all naturally occurring metals. The filtered results indicate that the exceedances for most metals, and in particular mercury, in the unfiltered samples were due to the presence of sediment in the groundwater samples as a result of high turbidity affected during sample collection procedures. Petroleum shallow groundwater impacts, potentially associated with a gasoline station on School Street, or historic spills from the firehouse, were observed in monitoring wells MW-3, MW-4, MW-5, MW-6 and MW-8. Maximum concentrations of the targeted analytes were detected at the location of monitoring well MW-6. A contamination plume follows the local groundwater flow in a westerly direction.

5. Chlorinated volatile organic compounds (CVOCs) (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, cis-1,2-dichloroethene, chloroform) were detected in shallow groundwater, primarily along the southeastern property boundary. The CVOC concentrations are relatively low (e.g., maximum PCE concentration of 23.9 ug/L in monitoring well MW-23).

6. Results of deep monitoring well also samples contained limited petroleum and CVOC compounds above NYSDEC standards, and concentrations of metals

above NYSDEC standards. Deep groundwater samples did not exhibit concentrations of mercury above laboratory non-detect levels. Chlorinated volatile organic compounds (CVOCs) (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, cis-1,2-dichloroethene, chloroform) were detected in deep groundwater, in monitoring wells MW-35, MW-36, and MW-38. The CVOC concentrations are relatively low (e.g., maximum PCE concentration of 40 ug/L in monitoring well MW-38).

7. CVOC impacts were encountered in both the shallow and deep groundwater onsite; and shallow and deep CVOC plume maps were developed and are shown on Sheet RI-2D. The plume maps indicate that the shallow and deep CVOC impacted areas overlap.

8. Naturally occurring metals, including iron, manganese, selenium, and sodium were detected in various combinations in all the deep groundwater monitoring wells at concentrations that exceeded the NYSDEC standards.

9. Concentrations of VOCs were found at each of the five soil vapor sampling locations, and one sample contained concentrations of PCE above guidance levels for indoor air and sub-slab even though this sample was collected outside of a building.

10. Bis (2-Ethylexyl)phthalate, aluminum, and iron were detected in the Saw Mill River surface water with concentrations above the Division of Water Technical and Operational Guidance Series (1.1.1) and Technical and Administrative Guidance Memorandum 4046 criterion. This contamination likely exists as background levels and is not a result of impacts to the river from the site.

11. All six sediment sample locations contained at least three SVOC compounds with concentrations exceeding "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations," which are part of the New York State Division of Water Quality Technical and Operational Guidance Series (1.1.1). Four of the six samples contain pesticide compounds with concentrations above the guidance criteria. Metal concentrations above the "Severe Effect Level" criteria were detected in each sediment sample location. No trends in constituent concentrations were observed.

12. A review of the analytical results associated with samples collected from borings advanced along the proposed alignment of the Saw Mill River indicates that only one sample SB-3, collected from the depth interval of about 16'-18' below ground surface (bgs) is impacted. Aroclor-1248 was detected in this sample at a concentration of 0.7 ug/gOC, which exceeded the applicable most stringent sediment criteria of 0.0008 ug/gOC. Additionally, manganese and nickel were detected in samples SB-2 (1,600 mg/Kg at a depth of about 15'-17' bgs) and SB-6 (79 mg/kg at depth of about 28'–30' bgs) at concentrations that exceeded the applicable Severe Effects Level, respectively.

13. The Fish and Wildlife Impact Analysis concluded that "potential adverse effects and ecological risks to fish and wildlife resources will be unlikely from migration of the site's constituents of potential ecological concern.

14. The Human Health Exposure Assessment (HHEA) concluded that a low level increased risk to human health exists at the site based on a benzene concentration in well MW-6. The report also indicated that asbestos and lead based paint must be evaluated in the buildings on site prior to demolition.

5.2 Data Limitations and Recommendations for Future Work

All areas on the site were not accessible to drilling because of existing buildings, high concentrations of underground utilities, and/or high traffic areas. The Remedial Action Work Plan (RAWP) will specify additional soil and groundwater sampling requirements and locations that will become more accessible during site excavation to obtain the data that was not able to be collected during the RI.

The RAWP will specify the required long term monitoring wells, and the required sampling protocols for the wells.

5.3 Recommended Remedial Action Objectives

A RAWP will be developed to address site specific remediation methods, alternatives, and future sampling actions that will take place during the Remedial Action (RA). The objectives of the RAWP will include providing measures to:

- Remove identified contaminated soil source area and prevent direct contact with residual contaminated soil;
- Eliminate or mitigate on-site environmental and public health exposures to on-site contamination that may remain in soil, groundwater and soil gas;
- Prevent exposure from contaminants volatilizing through the soil from groundwater through the installation of a vapor mitigation system in each on-site building;
- Ensure site contamination does not impact existing surface water quality in the Saw Mill River;
- Provide restriction upon groundwater use;
- Ensure site redevelopment does not impact existing surface water quality; Prevent direct contact with contaminated sediments in the Saw Mill River and ,
- Prevent off-site migration of on-site contamination.

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