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May 28, 2015

Mr. David Locey
NYSDEC Region 9
270 Michigan Avenue
Buffalo, NY 14203

RE: Revised Supplemental Remedial Investigative Report/Alternatives Analysis Report/Remedial Action Plan
ENRX, Inc. – Voelker Analysis Site (ID# C915150)
AFI Project: A12B-ENRX-BCP

Dear Mr. Locey:

Buffalo Environmental Consultants, Inc. dba AFI Environmental (AFI) is submitting this *Revised Supplemental Remedial Investigation Report/Alternatives Analysis Report/ Remedial Action Plan* (SRIR/AAR/RAP) on behalf of Diamond Hurwitz Scrap, LLC. (DHS) for the site located at 766 New Babcock Street in the City of Buffalo, Erie County, New York (the Site). The report was revised in accordance with the New York State Department of Environmental Conservation (NYSDEC) letter dated January 30, 2015, commenting on the original submittal of this report in December 2014. The Site is listed as "ENRX, Inc.-Voelker Analysis" in the NYSDEC Brownfield Cleanup Program (BCP) (Site number C915150). The work was completed in general accordance with the *Supplemental Remedial Investigative Work Plan Brownfield Cleanup Program* submitted by AFI to NYSDEC dated July 2014. The purpose of this work was to address the concerns and requests of NYSDEC "for additional sampling data" to fill data gaps, to address NYSDEC's letter of May 30, 2014, commenting on the submitted *Remedial Investigation/Alternatives Analysis Report/Interim Remedial Measures Report* (RI/AAR/IRM) submitted by AFI to NYSDEC dated April 2014, and to address and respond to the issues discussed during the conference call conducted with NYSDEC on June 18, 2014.

This report also presents the results of the work that was completed in general accordance with the *Supplemental Remedial Investigation Work Plan* submitted by AFI to NYSDEC dated March 2015. The purpose of this work was to address NYSDEC comments in the January 30, 2015, letter indicating a need to investigate the potential for off-site source material as well as collect sufficient data to be able to present a complete human health risk assessment for the Site. The work was completed in general accordance with NYSDEC Department of Environmental Remediation (DER)-10; *Technical Guidance for Site Investigation and Remediation*.

Additionally, this report presents the Alternatives Analysis discussing the rationale for the selected remedy for the site which includes the following:

- Installation of a cap over exposed surface soils with one or more semi-volatile organic compound (SVOC) and/or metal concentration exceeding 6 NYCRR Part 375 6.8 (b) Commercial Soil Cleanup Objectives (SCOs);
- Installation of a vapor mitigation system in the on-Site building; and
- Installation of a dedicated bedrock groundwater pump and control (GWP&C) system to prevent impacted bedrock groundwater from leaving the site.

Finally, this report/work plan presents the Remedial Action Plan (RAP) for implementing the aforementioned engineering controls (ECs) as well as a plan for implementing institutional controls (ICs) to ensure the continued integrity of any such control.

AFI/DHS intends to initiate implementation of the RAP in the second quarter of 2015.

If you have any questions or comments regarding our report, please contact AFI at 716-283-7645 at your convenience.

Sincerely,
AFI Environmental

Steven Leitten
Senior Project Manager

Cc: Mr. Mike Diamond, DHS
Mr. Steve Olgin, DHS
Ms. Deborah Chadsey, Kavinoky Cook LLP
Mr. William Heitzenrater, AFI Environmental
Document Repository, Buffalo and Erie County Public Library

Enclosure
A12B-ENRX-BCP FINAL Revised SRI-AA Report 05 28 15 rev6

CERTIFICATIONS

I, Leonard Preston, P.E., certify that I am currently a NYS registered professional engineer and that this *Revised Supplemental Remedial Investigation Report/Alternatives Analysis Report/ Remedial Action Plan* (SRIR/AAR/RAP) 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) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

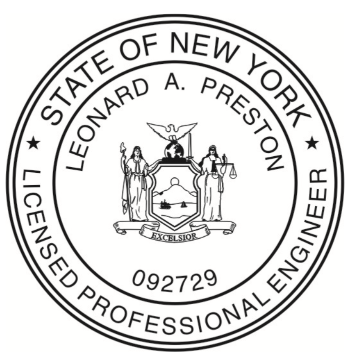
I certify that all documents generated in support of this report have been submitted in accordance with the DER's electronic submission protocols and have been accepted by the Department.

I certify that all data generated in support of this report will be submitted in accordance with the Department's electronic data deliverable.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Leonard Preston, P.E. of 7526 County Road 49, Caneadea, NY 14717, am certifying as Owner’s Designated Site Representative and I have been authorized and designated by all site owners to sign this certification for the site.

NYS Professional Engineer # 092729 Date 5/27/15 Signature______________________________

PE stamp



Revised Supplemental Remedial Investigation Report / Alternatives Analysis Report / Remedial Action Plan

Prepared For:
Diamond Hurwitz Scrap, LLC
267 Marilla Street
Buffalo, New York 14220

Project Location:
ENRX, Inc. – Voelker Analysis
766 New Babcock Street
Buffalo, New York 14206
Site ID. C915150

Prepared By:

AFI Environmental
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Niagara Falls, New York 14304
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May 2015

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1.0 INTRODUCTION

AFI Environmental (AFI) has prepared this *Revised Supplemental Remedial Investigation Report/Alternatives Analysis Report/ Remedial Action Plan* (SRIR/AAR/RAP) on behalf of Diamond Hurwitz Scrap, LLC. (DHS) for the site located at 766 New Babcock Street in the City of Buffalo, Erie County, New York (the Site). The report was revised in accordance with the New York State Department of Environmental Conservation (NYSDEC) letter dated January 30, 2015, commenting on the original submittal of this report in December 2014. The Site is listed as "ENRX, Inc.-Voelker Analysis" in the NYSDEC Brownfield Cleanup Program (BCP) (Site number C915150). The work was completed in general accordance with the *Supplemental Remedial Investigative Work Plan Brownfield Cleanup Program* (Ref 1) submitted by AFI to NYSDEC dated July 2014. The purpose of this work was to address the concerns and requests of NYSDEC "for additional sampling data" to fill data gaps, to address NYSDEC's letter of May 30, 2014, commenting on the submitted *Remedial Investigation/Alternatives Analysis Report/Interim Remedial Measures Report* (RI/AAR/IRM) (Ref 2) submitted by AFI to NYSDEC dated April 2014, and to address and respond to the issues discussed during the conference call conducted with NYSDEC on June 18, 2014.

This report also presents the results of the work that was completed in general accordance with the *Supplemental Remedial Investigation Work Plan* (Ref 3) submitted by AFI to NYSDEC dated March 2015. The purpose of this work was to address NYSDEC comments in the January 30, 2015 letter indicating a need to investigate the potential for off-site source material as well as collect sufficient data to be able to present a complete human health risk assessment for the Site. The work was completed in general accordance with NYSDEC Department of Environmental Remediation (DER)-10; *Technical Guidance for Site Investigation and Remediation* (Ref. 4).

DHS, as a volunteer, whose liability arises solely as a result of ownership, is submitting this SRIR/AAR/RAP in order to facilitate remediation of the Site under the BCP and to support a viable redevelopment and utilization of the property. The objective of the planned remediation activities, is to achieve a Track 4 cleanup consisting of installation of a demarcation layer and cover system over surface soils exceeding Soil Cleanup Objectives (SCOs) for Commercial use as identified in NYSDEC Title 6 (6) New York Codes, Rules and Regulations (NYCRR) Part 375 (Ref 5), installation of a bedrock groundwater pump and control (GWP&C) system to prevent impacted bedrock groundwater from exiting the site and installation of a sub-slab vapor mitigation system in the on-Site building to mitigate elevated sub-slab levels of volatile organic compounds (VOCs). A site location map is provided as **Figure 1**. A site map is provided as **Figure 2**.

1.1 Site History

The property history was developed through a review of: (i) previous environmental reports containing Sanborn Fire Insurance Maps dated 1986, 1981, 1950, 1926, 1899 and 1889; (ii) Polk's City Directory; (iii) United States Environmental Protection Agency (USEPA) files for EPA Site number 915150; and (iv) Buffalo Sewer Authority (BSA) records for the Site.

The Site (formerly Voelker Analysis) was operated as a permitted, hazardous waste chlorinated volatile organic compound (CVOC) recovery facility. The facility handled solvents such as methylene chloride, trichloroethylene (TCE), tetrachloroethylene (PCE) and 1-1-1-trichloroethane. According to the ABB Environmental Services *Preliminary Site Assessment* (Ref 6) discussed in Section 1.2.1, historical records indicated the presence of an unregulated underground storage tank (UST) associated with the Site which was registered to Voelker Analysis. Furthermore, the report indicates this tank was closed in 1988. AFI was not able to obtain records to confirm the location of this tank or if it was properly closed out. It was unknown whether orphan tanks existed on the Site. As such, it was suspected that soil and/or groundwater contamination may be present as a result of historically leaking USTs.

The facility was acquired by ENRX in August of 1987, and operations were moved to the adjacent garage where there was secondary containment. The facility did not complete inventory removal from the old wood frame "rendering" building, nor explore for the potential migration of waste to the environment. The facility's hazardous waste recovery permit was revoked in 1989.

In 1990, EPA began inventory removal of 398 drums of chlorinated solvents, 86 drums of chlorinated still bottoms, 74 lab packs and 15,000-gallons of chlorinated waste water. Approximately 15 to 20 drums were removed in January 1992, to complete the EPA removal action. Between 1998 and 1999, the older wood frame portion of the facility was demolished.

Prior to being owned by DHS, the Site was owned by Ms. Lorrain Stegura and operated as Hanna Demolition. Ms. Stegura utilized the Site as an office and heavy-equipment staging area for Hanna

Demolition. During the Site's ownership by Ms. Stegura and utilization by Hanna Demolition, a wood framed southern section of the existing building was abated for asbestos and demolished. The subsurface voids were reportedly filled with C&D debris from the building demolition. No records of the asbestos containing materials (ACM) abatement were available to AFI; however, in conversations with Al Steel, principal of Hanna Demolition, he stated that, "…all ACM was properly surveyed and all asbestos material, if present, was abated by his company prior to any building demolition". Mr. Steel only provided AFI with a copy of Hanna Demolition's (his company's) city of Buffalo's Asbestos Demolition license and a copy of his NYS Department of Labor (DOL) ACM Handler's license. No abatement records or previous asbestos surveys were provided to AFI during the initial Phase I Environmental Site Assessment (ESA). In subsequent conversations in July 2012, with the City of Buffalo Inspections and Permits Department, Clerk John Catuto stated that his review of the City Records going back to 1994 did not contain any demolition permits, or any asbestos survey(s), or any asbestos abatement records for the property with the 766 New Babcock address, by Hanna Demolition or the recorded owner. However, there were records for an asbestos survey (2006) and 2 Demolition permit(s) issued in (2008) for the former wood frame southern section with the address of 50 Hannah Street (also known as (aka) 738 New Babcock Street). It should be noted that during the implementation of the interim remedial measure (IRM) excavations in 2012 and 2013 and completion of the test pits in 2015 discussed later in this report, AFI did not observe any potential asbestos containing materials (ACMs) in the rubble that was excavated from the site.

The Site was previously assigned a Class 2a classification in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites because of insufficient data. The Site is currently listed as a Class 3 (Does not present a significant threat to the environment or public health - action may be deferred) site by NYSDEC in the Registry of Inactive Hazardous Waste Disposal Sites (Site number 915150).

In addition, Environmental Data Resource Co, Inc.'s ("EDR") City Directory Abstract is a report designed to evaluate potential liability on the Site resulting from past activities. The report includes a search and abstract of available city directory data and business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five (5) year intervals for the years spanning 1900 through 2009. A summary of the EDR report follows:

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Previous Owners/Operators 766 New Babcock Street, Buffalo, New York		
Year	**Uses**	**Source**
2009	HANNA Demolition Asbestos abatement demolition company	Polk's City Directory
2007	S and B Truck Services	Polk's City Directory
2004	Lorrain Stegura and Hanna Demolition	Polk's City Directory
1987 to 1999	ENRX- acquired the Voelker Analysis Site" in August 1987. The mixed use parcel included operations as former chlorinated solvent recovery and recycling facility	Polk's City Directory
Prior to 1987	Voelker Analysis – Operated small, permitted, hazardous waste chlorinated organic recovery facility, housed in multi-story wood frame and brick veneer building	AFI's 766 New Babcock Phase 1 Report and EDR Report #081610
Prior to 1900	Slaughter House/Tanning and Processing	Historical Sanborn Maps

1.2 Previous Investigations

1.2.1 ABB Environmental Services- Preliminary Site Assessment

ABB Environmental Services (ABB-ES) conducted a Preliminary Site Assessment (PSA) in October and November 1994. Results of the assessment were submitted to NYSDEC in the *Preliminary Site Assessment Report Volume I ENRX, Inc. formerly Voelker Analysis, City of Buffalo, New York Site No. 915150* (Ref 6) dated August 1995. Three (3) soil borings, three (3) groundwater monitoring wells, two (2) subsurface soil samples, two (2) surface soil samples, three (3) sump liquid samples, six (6) waste/sludge samples, two (2) sump samples, and three (3) groundwater samples were collected by ABB-ES. Laboratory analytical results of sump liquid samples, sediment samples and waste/sludge samples revealed the presence of hazardous waste-related VOC contamination. However, the data was insufficient to determine if the residual wastes pose a potential significant threat to public health or the environment.

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As part of this report, a reference on page ES-1 states "…previous investigations at the ENRX site include a RCRA Part A inspection and RCRA Facility Assessment (RFA), sewer sampling by the BSA and a removal action by the U.S. Environmental protection Agency (USEPA). The BSA sampling confirmed that Voelker Analysis, Inc. was improperly discharging solvent-contaminated wastewaters to the sewer system."

1.2.2 AFI Environmental – Phase I Environmental Site Assessment

In April 2010, AFI prepared a Phase I ESA (Ref 7) for 766 New Babcock which identified Recognized Environmental Concerns (RECs) in addition to the issues identified by ABB-ES pertaining to the potential presence of a UST and the presence of unregistered above ground storage tanks (ASTs) at the Site. Visual observations of the property showed signs of: surface spills (assumed to be petroleum in nature), potential for onsite disposal of metals, demolition debris, building materials, and remnants of the demolition/disposal of the wooden storage building and/or south sections of the existing metal/block building.

1.2.3 AFI Environmental – Phase II Environmental Site Assessment

In response to the RECs identified in the Phase I ESA, AFI completed a 'Limited' Phase II Environmental Site Investigation (ESI) and 'Limited' Phase III remedial activities (sump and interior drain cleaning) in May 2010. Results of the Phase II and Phase III activities were reported in the *Limited Phase II Environmental Site Assessment* (Ref 8) dated August 2011. The intent of this additional investigation was to evaluate the 'critical' RECs identified during the PSA and Phase I ESA, to quantify the gross environmental/financial risk related to acquisition of the property, and to conduct proper cleaning of a dry sump and onsite drainage lines of the interior of the warehouse prior to property acquisition or occupancy by DHS.

AFI's Limited' Phase II ESI field activities were performed in May 2010 which included the installation of test pits, inspection and sampling of subsurface soils from test pits, grab sample and hand auger collection of surface soil samples from select Areas of Concern (AOC) along with floor sump sampling, analysis, cleaning, and disposal of sump debris.

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Limited subsurface soil sampling showed concentrations of semi-volatile organic compounds (SVOCs), Resource Conservation and Recovery Act (RCRA) metals, and polychlorinated biphenyls (PCBs) in accordance with guidance values presented in NYSDEC Final Commissioner's Policy CP-51 (Ref 9) and 6NYCRR Part 375-6.8(a) Soil Cleanup Objectives (SCOs) (Ref 5).

1.2.4 AFI Environmental – Remedial Investigation / Interim Remedial Measures

In 2012, AFI was retained by DHS to complete a Remedial Investigation (RI) under the guidance of the NYSDEC BCP in accordance with the provisions of NYSDEC 6NYCRR Subpart 375-3 (Ref 5). DHS requested entry into the BCP for this newly acquired parcel of property, known as the 'Former ENRX-Voelker Analysis Site'. AFI began RI activities on June 13, 2012. Based on the results of RI field work and subsequent discussions with NYSDEC regarding DHS' change in remedial investigation goals to include implementation of Interim Remedial Measures (IRMs) such as tank removal and source material excavation, AFI prepared and submitted a series of Supplemental RI Work Plans to NYSDEC on June 18, 2012, July 27, 2012, February 27, 2013, and July 15, 2013. NYSDEC approved the Supplemental RI/IRM WPs and AFI conducted field activities from June 13, 2012 through July 2013. Results of the various RIs and IRMs were submitted to NYSDEC in the *Remedial Investigation/Alternatives Analysis Report/Interim Remedial Measures Report* (Ref 2) dated April 2014.

The purpose of the RI was to characterize the nature and extent of residual on-Site contamination remnant from the ENRX-Voelker Analysis Site operations and to quantify the potential for off-Site releases of environmental contamination from historical operations and activities at the Site.

The RI/IRM process involved:

- Site prep and EM-61 survey of the exterior of the building utilizing an EM-61 magnetometer;
- Test pit activities in suspect areas (magnetic anomalies) identified in the EM-61 survey;
- Delineating the nature and extent of surface spills previously observed at the Site;
- Delineating the extent of potential sources of residual contaminants in the vicinity of the former lateral sewer line running from the existing warehouse building west towards Hannah Street including sediment and sludge sampling from the sewer drainage inlet (DI);
- Sampling of the sediment and water from the BSA manholes located on Hannah Street. The location of the manholes sampled (SW-1 and SW-2) are shown on **Figure 2**. A summary of the

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analytical data for the sewer sediment is shown on **Table 1**, a summary of the analytical data for the sewer water is shown on **Table 2**;

- Pumping, cleaning and sealing with a concrete 'plug' the building interior sumps and drywells;
- Delineating the extent of, and the potential source of, residual contaminants within the AOCs related to the orphan USTs and previous AST storage locations;
- Further delineating the potential for, and extent of, contaminants of concern (COCs) in groundwater by installing and sampling of four (4) new bedrock monitoring wells;
- Evaluating the potential for soil vapor intrusion (SVI) into the working areas of the warehouse (office and shop) at the Site in accordance with New York State Department of Health (NYSDOH) approved guidelines;
- Installation of additional geoprobe soil borings and continuous soil sampling in areas not accessible to larger drill rigs or excavators;
- Test pit activities and sampling of the former Voelker basement storage vault;
- Installation of thirteen (13) test pits (based on EM-61 survey results) in the vicinity of the former foundation and basement of the now-demolished south portion of the site;
- Installation of four (4) test pits (based on EM-61 survey results) in the area north of the existing warehouse;
- A search for buried subterranean vault(s) and presence/absence of buried drums and to determine the condition of vault floor by installation of a series of additional test pits;
- Excavation, removal, cleaning and proper disposal of three (3) orphaned USTs;
- Sampling of a vault floor for PCBs to determine if the alleged drums of PCBs ever leaked;
- Excavation, transportation and proper disposal of 533.60 tons of contaminated soils and 23.49 tons of C&D debris;
- Backfilling of excavations with 331.3 tons of certified #3 &#4 stone, 177.13 tons of certified #1 & #2 stone, 120 tons of tested clean, virgin clay and 93.9 tons of certified sand; and,
- Collection, management, testing and proper disposal of 10,579-gallons of contaminated water pumped from the UST pits and seven (7) 55 gallon drums of tank cleaning sludge. Results of the laboratory analytical data for the water collected from TP-2 (UST 1) and TP-6 (UST 3) are shown on **Table 3**. The locations of UST 1 and UST 3 are shown on **Figure 2**.

Supplemental RI activities and IRM activities included:

- Installation and sampling of two (2) additional on-site bedrock monitoring wells (one on the northeast corner of the Site and one on the south east corner of the Site);
- Excavation and disposal of soils from two (2) areas of concern. This excavation was designed to eliminate soil source contaminates which could be impacting groundwater on the site;
- Further investigation of the former lateral sewer line running from the existing warehouse building west towards Hannah Street;
- Excavation, removal, cleaning and proper disposal of three (3) additional orphaned USTs;
- Excavation, removal and proper disposal of soils related to the three (3) additional orphaned USTs;
- Excavation, transportation and proper disposal of an additional 677.75 tons of contaminated soils;
- Backfilling of additional excavations with 258.8 tons of certified #3 & #4 stone, 69.17 tons of certified #1 stone, 120 tons of tested clean, virgin clay and 276.65 tons of certified sand;
- Installation and soil sampling of five (5) interior borings advanced through the concrete floor of the warehouse building;

1.3 Project Objectives

In a letter dated May 30, 2014, NYSDEC identified three (3) general areas of concern and expressed a need for the applicant to address data gaps prior to final review and approval of the RI/AAR/IRM report (Ref 2) dated April 2014, which included:

1. There is no justification to support the proposed remedy of natural attenuation; there is no evidence presented that contaminate degradation is occurring.
2. The evaluation of groundwater conditions (e.g. rate of flow, rate of groundwater migration, characteristics of the bedrock, and possible off-site impacts) is inadequate. The report speculates that there may be a potential off-site contaminant source to the south; this needs to be evaluated.
3. There is no discussion of possible off-site soil vapor intrusion concerns and, in fact, it isn't clear from the report whether or not there is an on-site concern.

In response to this letter, AFI submitted the *Supplemental Remedial Investigative Work Plan Brownfield Cleanup Program* (Ref 1) dated July 2014, to NYSDEC. The purpose of this work was to address

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NYSDEC's comment letter of May 30, 2014, to the submitted RI/AAR/IRM report (Ref 2) dated April 2014, and to address and respond to the issues discussed during the conference call conducted with NYSDEC on June 18, 2014. AFI submitted the results of the field work for the July 2014 work plan in December 2014 (the original submittal of this report) to which NYSDEC issued a comment letter on January 30, 2015, indicating, among other comments, a need to investigate the potential for off-site source material as well as collect sufficient data to be able to present a complete human health risk assessment for the Site. In response to this letter, AFI submitted the *Supplemental Remedial Investigation Work Plan* (Ref 3) dated March 2015. The work was completed in general accordance with NYSDEC DER-10 (Ref 4) guidelines.

1.4 Project Organization and Responsibilities

AFI provided oversight during the execution of all field aspects of this project and was generally in daily contact with Leonard Preston, PE., the engineer of record for this BCP Site. The AFI provided technical oversight and directed the subcontractors to complete the work that has been deemed appropriate to achieve the project objectives. Listed below are the key project personnel and their office/primary phone numbers.

NYSDEC Region 9

Mr. Dave Locey,

NYSDEC Project Manager Hydrogeologist- 716-851-7220

William L. Heitzenrater,

AFI Project Manager- 716-940-2725

Mr. Heitzenrater was responsible for overall coordination of all phases of the project from implementation of the RI/IRM WP to completion of proposed Supplemental Remedial Investigation (SRI) and subsequent reporting and documentation of the work performed.

Leonard Preston, PE.,

Professional Engineer- 585-703-2523

Mr. Preston, PE, is the Professional Engineer (PE) of record for the project.

Steven Leitten,

AFI Senior Project Manager / Geologist**-** 716-283-7645

Mr. Leitten was responsible for implementing the supplemental remedial investigation tasks. Responsibilities included oversight of well installation and sample collection, well development and directing drilling and other subcontractors completing SRI field activities. This also included preparation and interpretation of data for reporting purposes.

Geoffrey S. Heitzenrater,

AFI Project Director- 716-283-7645

Mr. Heitzenrater was responsible for the overall quality assurance and review of all project deliverables. He interfaced with the Project Manager, Senior Geologist, and PE to address any technical issues and provided quality control for the entire project.

Elby Benton,

AFI Project Scientist and Safety Officer 716-283-7645

Mr. Benton was responsible for the safety of staff while implementing the SRI tasks and monitoring the CAMP and HASP.

Pat Ackerman,

AFI Field Scientist 716-283-7645

Mr. Ackerman was responsible for conducting remedial investigation and IRM tasks. Responsibilities included sample collection, well development and drilling and other subcontractors assisting in oversight of SRI activities.

Nature's Way Environmental

Dale Gramza,

Drilling contractor- 716-937-6527

Alpha Analytical

(NYSDOH ELAP ID No. 11148) – 508-898-9220

Alpha Analytical of Westborough, MA provided laboratory analytical services.

Lawrence Zygaj, PLS, PC.

Surveyor- 585-652-8483

Mr. Zygaj, LLS., is a New York State licensed land surveyor and conducted all boundary and topo surveys and provided stamped and sealed Site maps for the project.

Deborah Chadsey, Esq. of Kavinoky and Cook, LLP

Attorney 716-845-6000

Mrs. Chadsey, Esq., represented the Applicant and addressed all legal issues and property restrictions related to the BCP.

1.5 Limitations

This SRIR/AAR/RAP presents a summary of information known to AFI concerning the Site that AFI considers pertinent to the scope of work and stated project objectives. AFI has performed this work with the care and skill ordinarily used by members of the profession practicing under similar conditions. The conclusions presented herein are those that are deemed pertinent by AFI based on the assumed accuracy of the available information. No other warranty, expressed or implied, is made as to the professional opinions included in this report. The information presented in this report is not intended for any other use other than that stated of this project. This document was prepared for the sole use of DHS and NYSDEC, who are the only intended beneficiaries of the work.

2.0 SITE DESCRIPTON

2.1 General

The Site consists of one (1) parcel measuring approximately 0.85 acres with a street address of 766 New Babcock Street, Buffalo, Erie County, New York with Tax ID # 112.14-3-2.1. Coordinates of the property are 42° 53’ 02.08’’N, 78° 49’ 30.67’’W (WGS84). The Site consists of a warehouse/maintenance building with an attached office, fenced perimeter and parking lot, equipment storage area and two entrance driveways with electronic security gates. The Site is juxtaposed to, and across the street from, DHS’ existing operations located at 50 and 41 Hannah Street currently operating as Hannah Street Recycling. A site location map is included as **Figure 1**. A site map is included as **Figure 2**.

The mixed use surrounding area is developed with Hannah Street Recycling to the west, an unpaved employee parking area once occupied by a wood frame building to the south followed by NFTA bus garages to the southeast, vacant lots to the east, and industrial buildings and manufacturing to the north along William Street. There are no residential structures near the Site. A map showing the surrounding property uses is included as **Figure 3**.

2.2 Site Topography and Drainage

The Site is generally flat lying with limited topographic features. The United States Geological Survey (USGS) elevation of the site is 602 feet above sea level. The surface of the Site is primarily occupied by the building for the scrap yard operations with limited paving for driveways. The remainder of the site is unpaved. Precipitation (i.e., rain or melting snow) mainly drains via overland flow into storm drains along New Babcock Street to the east and Hannah Street to the west. The remainder infiltrates through the unpaved areas of the site and enters the groundwater.

2.3 Geology and Hydrogeology

2.3.1 Overburden

The U.S. Department of Agriculture Soil Conservation Service website (Ref. 10) describes the general soil type at the Site as Urban Land (Ud). This is indicative of the level to gently sloping land with at least

40 percent of the soil surface covered by asphalt, concrete, buildings, or other impervious structures typical of an urban environment.

According to this and previous investigations, soils observed consists of fill materials overlying bedrock with areas of one half to one foot of silt and clay overlying the bedrock. The fill materials include gravel, sand, silt clay and varying amounts and depths of anthropogenic materials such as brick and concrete fragments, wood fragments, clinker, glass, plastic, etc. Bedrock was found across the Site approximately 8 to 10 feet below grade (ftbg)

2.3.2 Bedrock

Based on the bedrock geologic map of Erie County (Ref. 11), the Site is situated over the Onondaga Limestone Formation of the Middle Devonian Series. The Onondaga Limestone Formation is comprised of a light gray limestone and dolostone containing numerous corals and considerable dark gray chert nodules. The unit has an approximate thickness of 160 feet. Depth to bedrock below the Site is approximately 8 to 10 ftbg based on this and previous investigations.

2.3.3 Hydrogeology

The major regional aquifer in the area of the Site is located in the upper bedrock, which consists of the Onondaga Limestone Formation. The Onondaga Formation is primarily a cherty limestone. This aquifer recharges through precipitation-induced infiltration into the bedrock. The numerous open joints and bedding planes of the bedrock provide the primary paths for groundwater flow within the rock. Regionally, the groundwater moving through the Onondaga discharges into other formations or to other surface water bodies directly.

Subsurface investigation activities conducted at or near the Site indicate that the uppermost groundwater bearing unit appears to be situated at or near the interface between the overburden soil and the bedrock.

Bedrock groundwater elevation and gradient information calculated with data collected by AFI indicates the flow is to the north. Groundwater elevation and gradient data collected from this supplemental investigation (Section 5.2) is consistent with previous groundwater elevation data.

2.4 Utilities and Groundwater Use

The Site has access to all major public and private utilities, including potable water (Buffalo Water Authority), sanitary and storm sewers (Buffalo Sewer Authority), electric (National Grid), and natural gas (National Fuel Gas).

Currently, there are no known deed restrictions on the use of groundwater at the Site; however, there are no known groundwater supply wells on the property. Regionally, groundwater in the area has not been developed for industrial, agriculture, or public supply purposes. Municipal potable water service is provided on-Site and off-Site.

2.5 Sensitive Receptors

Per the Erie County GIS System (Ref 12) there are no surface water bodies or State or Federal wetlands or floodplains located on the Site. No State or Federal wetlands or floodplains are located within a ½-mile radius of the Site. Per the NYSDEC Environmental Resource Mapper (Ref 13), the Site is in the vicinity of a critical habitat for a rare plant and two rare animals. Additionally, the Site does not have any institutional controls currently in place.

There are no known drinking water wells in the area.

2.6 Primary Constituents of Potential Concern

Based on findings to date, the primary constituents of potential concern (COPCs) presented by media are:

- ***Soil/Fill:*** SVOCs and select metals.
- ***Groundwater:*** VOCs, SVOCs and PCBs.
- ***Sub-slab/Indoor Air:*** VOCs

3.0 SUPPLEMENTAL REMEDIAL INVESTIGATION SCOPE OF WORK

Supplemental investigative measures were completed in August 2014 and September 2014, in accordance with the *Supplemental RI Work Plan* (Ref 1) dated July 2014. Additional supplemental investigative measures were completed in March and April 2015, in accordance with the *Supplemental RI Work Plan* (Ref 3) dated March 2015. The work was conducted in accordance with 6NYCRR Subpart Part 375-3 (Ref 5) and in general conformance with NYSDEC DER-10 (Ref 4).

3.1 Purpose and Objectives

The purpose of this work was to address the concerns and requests of NYSDEC "for additional sampling data" to fill data gaps, to address NYSDEC's letter of May 30, 2014, commenting on the submitted RI/AAR/IRM report (Ref 2) dated April 2014, and to address and respond to the issues discussed during the conference call conducted with NYSDEC on June 18, 2014 as well as to address NYSDEC comments in the January 30, 2015 letter indicating a need to investigate the potential for off-site source material as well as collect sufficient data to be able to present a complete human health risk assessment for the Site.

3.2 Site Characterization Investigation Elements

3.2.1 Governing Documents

3.2.1.1 Quality Assurance Project Plan (QAPP)

The Quality Assurance Project Plan (QAPP) was included as Appendix A of the *Supplemental RI Work Plan* dated July 2014 (Ref 1) approved by NYSDEC. The QAPP describes the specific policies, objectives, organization, functional activities and quality assurance/quality control (QA/QC) activities designed to achieve the project data quality objectives.

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3.2.1.2 Site Specific Health & Safety Plan (HASP)

All remedial work performed under this Remedial Action was in full compliance with governmental requirements, including Occupational Safety and Health Administration (OSHA) requirements contained in 29 CFR 1910.120.

The site specific Health and Safety Plan (HASP) was compiled for all remedial and invasive work performed at the Site. A copy of the HASP was included in Appendix B of the NYSDEC approved *Supplemental RI Work Plan* (Ref 1) dated July 2014.

3.2.1.3 Community Air Monitoring Plan (CAMP)

A Community Air Monitoring Plan (CAMP) that described particulate and vapor monitoring to protect the neighboring community during intrusive site investigation and remediation activities was included Appendix E of the NYSDEC approved *Supplemental RI Work Plan* (Ref 1) dated July 2014. Routine community air monitoring was performed during intrusive Site activities using a MiniRAE 3000 photoionization detector (PID) and a Dustrak II Aerosol Monitor. Weather conditions during intrusive Site activities, including wind speed and direction, were monitored using a Davis Instruments Vantage Pro2 weather station.

3.2.2 Contractors and Consultants

AFI Environmental served as the Engineer of Record. The following contractors also completed various tasks as noted:

- **Nature's Way Environmental Consultants and Contractors, Inc.** completed soil borings and installed bedrock monitoring wells.
- **Quality Inspection Services, Inc.** completed soil borings and installed bedrock monitoring wells.
- **Alpha Analytical, Inc.** (NYSDOH ELAP ID No. 11148) performed soil and groundwater sample analysis related to the investigation activities.
- **Lawrence J. Zygaj, PLS, PC** provided site surveying services.
- **The Environmental Service Group (NY), Inc.** provided waste transportation services.

- **Chemtron Corporation** provided waste disposal services.
- **Kenneth R. Applin, Ph.D.** of KR Applin & Associates provided third party laboratory analytical data validation services.

3.3 Site Preparation for the Supplemental Remedial Investigation

Prior to intrusive activities, Dig Safe New York was notified of the planned drilling activities and a pre-excavation utility clearance request was made on July 29, 2014 and March 26, 2015. AFI engineers reviewed the planned investigation locations to "pre-clear" on-Site areas for sub-grade utilities and production-related lines. Site preparation activities included the installation of AFI's office trailer and posting of required safety information signage.

3.3.1 General Site Controls

A construction office trailer was established at the primary ingress point with signage requiring all visitors to sign in at the office before proceeding on-Site. As per the CAMP, during intrusive activities, a PID was used to monitor VOC levels, a Dustrak II Aerosol Monitor was utilized to track particulates up and downwind of the site and a Vantage Pro 2 Weather Station tracked weather conditions. All subcontractor work was overseen by an experienced AFI scientist. First-Aid kits and eye-wash stations were installed in the Project Office Trailer. A schedule for conducting safety meetings was established as part of the HASP.

AFI personnel completed daily site notes to keep track of activities, on-Site visitors, contractors and any deviations from the *Supplemental Remedial Investigative Work Plan Brownfields Cleanup Program* (Ref 1) dated July 2014, and the *Supplemental Remedial Investigation Work Plan* (Ref 3) dated March 2015, as related to the remedial investigation activities. All project records were available on-Site in the construction office trailer during all phases of the Site characterization activities.

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3.4 Overburden Soil Sampling/Test Pit Investigation

All borings (BH-1, BH-2 and BR-7 through BR-15) were advanced through unconsolidated sediments to refusal at the top of bedrock located approximately 8 to 10 ftbg. Continuous soil sampling was completed using a 4-foot long, 2-inch inside diameter (ID) macrocore sampler fitted with a disposable plastic liner to contain the soil sample until the field geologist was ready to log the sample for borings BH-1, BH-2 and BR-7 through BR-11. Continuous soil sampling was completed using a 2-foot long, 3-inch ID split spoon sampler for borings BR-12 through BR-15.

During drilling, soil samples were collected in approximate 4-foot intervals for borings BH-1, BH-2 and BR-7 though BR-11 and approximate 2-foot intervals for borings BR-12 through BR-15. Soil samples were classified in the field by AFI personnel according to color, texture, odor, and relative moisture content. A portion of each sample collected was placed into a re-sealable plastic bag and screened for the presence of volatile organic vapors utilizing a PID equipped with a 11.7 electron-volt (eV) lamp, which was calibrated to a 100 parts per million by volume (ppmv) isobutylene standard. An 11.7 eV lamp was chosen based on the historical potential for the presence of chlorinated VOCs to ensure these compounds would be detected during the screening process. An 11.7 eV lamp is needed to detect the chlorinated VOCs due to the higher ionization potential of these compounds that a more widely used 10.6 eV lamp would not be able to detect. The sample that recorded the highest PID reading or exhibited the greatest visual/olfactory evidence of impact from each soil boring was submitted for laboratory analysis. Soil borings BH-1, BH-2 and BR-7 through BR-11 were submitted for analysis of total contaminant list (TCL) VOCs using United States Environmental Protection Agency (USEPA) Method 8260, TCL SVOCs using USEPA Method 8270, TAL Metals using USEPA methods 6010/7470/7471, PCBs using USEPA method 8082, total cyanide using USEPA method 9010/9012 and hexavalent/trivalent chromium using USEPA methods 6010/7470/7471. Soil borings BR-12 through BR-15 were submitted for analysis of TCL VOCs using USEPA Method 8260, TCL SVOCs using USEPA Method 8270 and PCBs using USEPA method 8082. Additionally, three (3) quality control samples consisting of a blind duplicate, a matrix spike (MS) and a matrix spike duplicate (MSD) were collected for each sampling event. Soil boring/monitoring well logs can be found in **Appendix A.** The photo log of the samples is included as **Appendix B**.

In addition to the soil borings, a total of eight (8) test pits (TP-18 through TP-25) were completed utilizing an excavator. During test pit excavation activities, soil samples were collected in approximate 2-foot intervals. Soil samples were classified in the field by AFI personnel according to color, texture, odor, and

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relative moisture content. A portion of each sample collected was placed into a re-sealable plastic bag and screened for the presence of volatile organic vapors utilizing a PID equipped with a 11.7 eV lamp, which was calibrated to a 100 ppmv isobutylene standard. The soil from all of the test pits did not exhibit field indicators (i.e. visual, olfactory or PID) characteristic of grossly impacted soil, therefore, per the work plan, the excavated soil was returned to the excavations as backfill and no laboratory samples were collected. Photos were taken to document the subsurface conditions of each test pit. Test pit logs can be found in **Appendix C**. The photo log of the test pits is included as **Appendix D**.

3.5 Bedrock Monitoring Well Installation

Upon completion of the overburden sampling, boring locations BR-7 thorough BR-15 were completed as bedrock monitoring wells. All bedrock monitoring well borings were advanced to refusal at the top of bedrock using 6-1/4-inch ID hollow stem augers. A truck mounted Acker Drill Rig was used to install bedrock monitoring wells BR-7 through BR-11 and an ATV mounted CME 550 was used to install bedrock monitoring wells BR-12 through BR-15. A 4-inch ID Schedule 40 polyvinyl chloride (PVC) casing was grouted in place from grade to the top of competent bedrock to seal off the overburden for bedrock monitoring wells BR-7 though BR-11 and a 4-inch ID steel pipe was grouted in place from grade to the top of competent bedrock to seal off the overburden for bedrock monitoring wells BR-12 though BR-15. At least 24 hours after each casing was set, each bedrock monitoring well was advanced through the casing, approximately 10 feet into bedrock, utilizing an air hammer. The wells were left as open-hole bedrock wells. A lockable J-plug was placed in the opening of each well and an 8-inch diameter flush mounted protective road box was installed at all newly installed well locations. Soil boring and bedrock monitoring well logs are included in **Appendix A**.

3.6 Bedrock Monitoring Well Development

Following installation, newly installed bedrock monitoring wells were developed in accordance with established methods and the approved work plan. Each well was left undisturbed for a minimum of 24 hours before development to allow the cement/bentonite grout mixture to cure. Prior to development, the static water level and well depth was measured for the newly installed wells as well as the existing wells.

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The newly installed bedrock monitoring wells were developed using a peristaltic pump. Well development protocols were considered complete when the pH, specific conductivity, temperature, and turbidity had stabilized after purging a minimum of three to five well volumes or a maximum of 10 well volumes had been purged. Stability is defined as variation between measurements of 10 percent or less and no overall upward or downward trend in the measurements. If the well was pumped dry before three to five volumes of water was removed, the well was allowed to re-charge for approximately 30 minutes and pumping was resumed. If the well was pumped dry again before three to five well volumes of water was removed, the well was considered to be developed. Copies of the well development/sampling logs are included in **Appendix E**.

3.7 Bedrock Groundwater Monitoring and Sampling

Following bedrock monitoring well installation and development, bedrock groundwater samples were collected from all six (6) existing and five (5) newly installed bedrock monitoring wells (BR-7 through BR-11) in August 2014 and from the newly install bedrock monitoring wells (BR-12 through BR-15) in April 2015. As indicated in Section 3.6, prior to development and/or sampling, the depth to groundwater and total depth was measured to the nearest 0.01 foot in each bedrock monitoring well. The newly installed wells (I.e., BR-7 through BR-15) were sampled following completion of the development activities discussed in Section 3.6 utilizing a peristaltic pump. The existing wells (i.e., BR-1 through BR-6) were purged and sampled using dedicated bailers. Approximately three (3) to five (5) well volumes were removed prior to sampling. Field parameters identified in Section 3.6 were measured during purging. If the well was purged dry before three (3) to five (5) volumes of water was removed, the well was allowed to re-charge for approximately 30 minutes and purging was resumed. If the well was purged dry again before three (3) to five (5) well volumes of water was removed, the well was allowed to re-charge and then sampled.

A total of fifteen (15) bedrock groundwater samples were collected from bedrock monitoring wells BR-1 through BR-15. Additionally, samples consisting of a trip blank for VOCs, a blind duplicate, a matrix spike (MS) and a matrix spike duplicate (MSD) were also collected for each sampling event for a total of eight (8) quality control samples. Bedrock groundwater samples from bedrock groundwater monitoring wells BR-1 through BR-11were analyzed for TCL VOCs by USEPA method 8260, TCL SVOCs using

USEPA method 8270, TAL Metals using USEPA methods 6010/7470/7471, PCBs using USEPA method 8082, total cyanide using USEPA method 9010/9012 and hexavalent/trivalent chromium using USEPA methods 6010/7470/7471. Bedrock groundwater samples from bedrock groundwater monitoring wells BR-12 through BR-15were analyzed for TCL VOCs by USEPA method 8260, TCL SVOCs using USEPA method 8270 and PCBs using USEPA method 8082. Copies of the well development/sampling logs are included in **Appendix E**.

3.8 Pumping Tests

In order to more fully understand the shallow bedrock groundwater aquifer on and in the vicinity of the Site, a series of pumping tests were completed from September 9 through September 12, 2014, and April 15 through April 17, 2015. Specifically, bedrock monitoring wells BR-1, BR-2, BR-3 and BR-10 were chosen as pumping wells for the September 2014, pumping tests, and bedrock monitoring wells BR-7 though BR-9 were chosen for the April 2015, pumping tests.

For the September 2014, pumping tests, BR-1 was chosen as the initial pumping well because it was in the area of greatest bedrock groundwater impact and, based on well development and sampling data, was able to produce water without running dry. Based on the results of BR-1 as described in Section 3.8.1, BR-3 was chosen as the next pumping well to determine if pumping from the southern portion of the Site could produce a response on the northern portion of the Site. Due to lack of response in observation wells as described in Section 3.8.2, BR-2 was chosen as the next pumping well to investigate if pumping from the southern portion of the Site could produce a response on the northern portion of the Site. BR-10 was chosen as the final pumping well to investigate the potential impact of the former sewer trench carved into the bedrock under Hannah Street on bedrock groundwater levels on-Site.

For the April 2015, pumping tests, BR-7 was chosen as the initial pumping well to determine if pumping on the northern portion of the site could produce a response on the southern portion of the site. BR-8 and BR-9 were chosen as pumping wells to determine if pumping on the eastern portion of the site could produce a response on the western portion of the site.

A Grundfos Redi-Flow II submersible pump with variable speed control was utilized for pumping. A total of five (5) In-Situ Level Troll 700 series data loggers were deployed in September 2014 and eight (8) In-

Situ Level Troll 700 series data loggers were deployed in April 2015, to monitor and record bedrock groundwater levels in the pumping well and surrounding observation wells before, during and after pumping. Additionally, bedrock groundwater levels were monitored manually with a water level meter to confirm data logger readings as well as collect additional bedrock groundwater level data from select wells. The data loggers were programmed to collect pressure, temperature and depth-to-water (DTW) readings every 30 seconds. Manual readings were collected to confirm data logger readings at approximate 30 to 60-minute intervals or as testing conditions allowed. Bedrock groundwater pumped during the tests was collected and stored in an on-Site storage tank for later transportation and disposal as discussed in Section 3.11.

3.8.1 BR-1 Pumping Test

On September 9, 2014, a data logger and submersible pump were deployed in pumping well BR-1 and data loggers were deployed in observation wells BR-2, BR-3, BR-9 and BR-11 to allow sufficient time for the bedrock groundwater level in the wells to stabilize before pumping was to commence the following day. The data loggers were programmed to start recording pressure, temperature and DTW at 8 PM that evening to obtain background information. **Figure 4** shows the background water level readings recorded from 8 PM on September 9, 2014, to 7 AM on September 10, 2014. A review of this data indicates water levels were relatively stable prior to initiation of the pump test, therefore, any drawdown observed in the observation wells could be attributed to pumping conditions and not a naturally occurring condition. Please note the data recorded in BR-3 is not included in this figure since it was determined later the data logger was apparently malfunctioning as described below.

On September 10, 2014, prior to the start of the pumping test, DTW readings were manually gauged to confirm data logger readings. It was discovered the DTW reading from the data logger in BR-3 was reading approximately one (1) foot deeper than what was measured with the water level meter, therefore, the background data that was collected overnight was determined to be invalid due to this apparent malfunction. The DTW readings of the remaining data loggers were adjusted as needed (<0.1 foot adjustment) based on manual measurement and pumping from BR-1 was started at 8:20 AM. Drawdown in the pumping well and pumping rate were monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 10 feet of drawdown). The initial pumping rate of approximately 0.3 gallons-per-minute (GPM) resulted in approximately 3.5

feet of drawdown, therefore, 40 minutes into the test, the pump rate was slightly increased to 0.45 GPM. This resulted in approximately 7 feet of drawdown, therefore, 120 minutes into the test, the pump rate was increased to approximately 0.63 GPM. This resulted in a steady drop of the water level in the pumping well which would have resulted in the level dropping below the target, therefore, the pumping rate was decreased to approximately 0.48 GPM 140 minutes into the test. This pumping rate resulted in the desired draw down. Therefore, it was determined the sustainable yield of BR-1 is approximately 0.45-0.48 GPM.

Pumping was continued at this rate for the remainder of the test. The test was run for a total of 360 minutes or 6 hours when it was determined the drawdown in the observation wells had reached a static state. The data loggers were left in the wells to record bedrock groundwater recovery after pumping was complete. **Figure 5** shows the water levels recorded by the data loggers during and after pumping. **Figure 6** shows the bedrock groundwater elevation contour before pumping commenced and **Figure 7** shows the bedrock groundwater elevation contour when the pump was shut off.

3.8.2 BR-3 Pumping Test

At approximately 4:15 PM on September 10, 2014, the data logger in BR-11 was removed and placed in BR-4 and the pump was removed from BR-1 and placed in BR-3 to allow sufficient time for the bedrock groundwater levels in the wells to stabilize before pumping was to commence the following day. The data loggers in BR-1, BR-2, BR-3 and BR-9 were left in place.

On September 11, 2014, prior to the start of the pumping test, DTW readings were manually gauged to confirm data logger readings. The DTW readings of the data loggers were adjusted as needed (< 0.1 foot adjustment) based on manual measurement and pumping from BR-3 was started at 8:30 AM. Drawdown in the pumping well and pumping rate were monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 10 feet of drawdown). The pumping rate in BR-3 was extremely slow (i.e., less than 0.25 GPM) and therefore, was difficult to accurately determine with the equipment on hand. Minor adjustments in the pumping rate were made to achieve the desired drawdown of approximately 10 feet. The final pumping rate and thus sustainable yield of BR-3 was estimated to be less than 0.1 GPM. Pumping was continued at this rate for the remainder of the test.

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It should be noted manual DTW readings in BR-3 were observed to be deeper than data logger readings throughout the start of the test. Once the desired drawdown level was achieved in BR-3 the data logger was recording a DTW of approximately 12.15 feet while actual DTW was measured to be 14.39 feet with the water level meter. Because of this apparent malfunction, approximately 135 minutes into the test, the data logger was pulled from BR-3 and was inspected for any apparent damage. The data logger was cleaned and placed back in BR-3. The DTW reading for the data logger was re-set in an attempt to remedy the apparent malfunction.

The test was run for a total of 214 minutes or approximately 3.5 hours when it was determined there was lack of conclusive drawdown in the observation wells due to the extremely low sustainable yield of BR-3. **Figure 8** shows the water levels recorded by the data loggers during and after pumping. **Figure 9** shows the bedrock groundwater elevation contour before pumping commenced and **Figure 10** shows the bedrock groundwater elevation contour when the pump was shut off.

3.8.3 BR-2 Pumping Test

At approximately 11:55 AM on September 11, 2014, the pump was removed from BR-3 and placed in BR-2. The data logger in BR-3 was removed and placed in BR-8. Data was not collected from BR-3 during the pump test on BR-2. Because of the low rate of recharge in BR-3, sufficient time since pumping had not elapsed to allow the bedrock groundwater level to return to a static state. Therefore, any data collected from BR-3 would be erroneous. The data loggers in BR-1, BR-2, BR-4 and BR-9 were left in place. Manual DTW readings were collected in bedrock monitoring wells BR-6 and BR-7 while pumping out of BR-2 to fully evaluate the site-wide effect of pumping out of BR-2.

Prior to the start of the pumping test, DTW readings were manually gauged to confirm data logger readings. The DTW readings of the data loggers were adjusted (< 0.1 foot adjustment) as needed based on manual measurement and pumping from BR-2 was started at 12:45 PM. Drawdown in the pumping well and pumping rate were monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 9 feet of drawdown). The initial pumping rate of approximately 0.6 gallons-per-minute (GPM) resulted in approximately 4 feet of drawdown, therefore, 25 minutes into the test, the pump rate was slightly increased to 0.83 GPM. This resulted in approximately 7 feet of drawdown. Please note due to time constraints, additional increases in pumping rates to determine the maximum sustainable yield of the well was not possible. However, based on observations during the previous test at BR-1 and observations during the test at BR-2, it is estimated the sustainable yield of BR-2 is between 0.83 and 1 GPM.

It should be noted light non-aqueous phase liquid (LNAPL) was noted on the water level probe during a manual gauging event approximately one (1) hour into the pumping test. The exact thickness of the LNAPL accumulating in BR-2 was not able to be accurately determined because an oil/water interface probe was not available. Based on the differential in readings from the data logger (DTW = 13.51 feet) and the DTW of the water level meter (DTW = 13.60 feet) it is estimated at approximately one hour into the pumping test, approximately 0.09 feet of LNAPL had accumulated in BR-2.

Pumping was continued at 0.83 GPM for the remainder of the test. The test was run for a total of 240 minutes or 4 hours when it was determined the drawdown in the observation wells had reached a static state. The data loggers were left in the wells to record groundwater recovery after pumping was complete. **Figure 11** shows the water levels recorded by the data loggers during and after pumping. **Figure 12** shows the bedrock groundwater elevation contour before pumping commenced and **Figure 13** shows the bedrock groundwater elevation contour when the pump was shut off.

It should be noted the following day on September 12, 2014, when a manual DTW reading was collected in BR-2 to confirm the data logger readings, LNAPL was noted on the water level meter probe. The exact thickness of the LNAPL that had accumulated in BR-2 was not able to be accurately determined because an oil/water interface probe was not available. Based on the differential in readings from the data logger (DTW = 6.06 feet) and the DTW of the water level meter (DTW = 6.19 feet) it is estimated approximately 0.13 feet of NAPL had accumulated in BR-2.

3.8.4 BR-10 Pumping Test

At approximately 10:30 AM on September 12, 2014, the data loggers were removed from BR-1, BR-2 and BR-9 and placed in BR-7, BR-10 and BR-11. The pump was removed from BR-2 and placed in BR-10. The data loggers in BR-4 and BR-8 were left in-place. Pumping from BR-10 was started at 12:05 PM. Drawdown in the pumping well and pumping rate was monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 8 feet of drawdown). As was observed during the pumping test at BR-3, the pumping rate in BR-10 was extremely slow (i.e., less than 0.25 GPM) and therefore, was difficult to accurately determine with the equipment on hand. Minor adjustments in the pumping rate were made to achieve the desired drawdown of approximately 6.5 feet. The final pumping rate and thus sustainable yield of BR-10 was estimated to be approximately 0.1 GPM. Pumping was continued at this rate for the remainder of the test.

Due to time constraints the test was run for a total of 240 minutes or 4 hours. Lack of significant drawdown was seen in all observation wells with the exception of BR-4. At the time the pump was shut off (4:05 PM), the water level in BR-4 had dropped 0.98 feet and was still exhibiting signs of additional drawdown although it appeared the drawdown was approaching a static state. Additional drawdown of approximately 0.01 feet was observed in BR-4 20 minutes after the pump was shut off when the water level in BR-4 began to recover. The data loggers were left in BR-4 and BR-10 to continue recording through the weekend until retrieval on September 15, 2014. **Figure 14** shows the water levels recorded by the data loggers during and after pumping. **Figure 15** shows the groundwater elevation contour before pumping commenced and **Figure 16** shows the groundwater elevation contour when the pump was shut off.

3.8.5 BR-7 Pumping Test

On April 14, 2015, a data logger and submersible pump were deployed in pumping well BR-7 and data loggers were deployed in observation wells BR-1, BR-3, BR-4, BR-8, BR-9, BR-13 and BR-15 to allow sufficient time for the bedrock groundwater level in the wells to stabilize before pumping was to commence the following day. The data loggers were programmed to start recording pressure, temperature and DTW at 8 PM that evening to obtain background information. **Figure 17** shows the background water level readings recorded from 8 PM on April 14, 2015, to 7 AM on April 15, 2014. A review of this data indicates water levels were relatively stable prior to initiation of the pump test, therefore, any drawdown observed in the observation wells could be attributed to pumping conditions and not a naturally occurring condition.

On April 15, 2015, prior to the start of the pumping test, DTW readings were manually gauged to confirm data logger readings and DTW readings were collected from all of the remaining bedrock groundwater monitoring wells without data loggers. The DTW readings of the remaining data loggers were adjusted as needed (<0.1 foot adjustment) based on manual measurement and pumping from BR-7 was started at 9:05 AM. Drawdown in the pumping well and pumping rate were monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 5 feet of drawdown). The pumping rate was adjusted until the desired drawdown was achieved and maintained. It was determined the sustainable yield of BR-7 is approximately 0.3 GPM.

Pumping was continued at this rate for the remainder of the test. The test was run for a total of 430 minutes or 7.17 hours when it was determined the drawdown in the observation wells had reached a static state. The data loggers were left in the wells to record bedrock groundwater recovery after pumping was complete. **Figure 18** shows the water levels recorded by the data loggers during and after pumping. **Figure 19** shows the bedrock groundwater elevation contour before pumping commenced and **Figure 20** shows the bedrock groundwater elevation contour when the pump was shut off.

3.8.6 BR-8 Pumping Test

At approximately 7:30 AM on April 16, 2015, the pump was removed from BR-7 and placed in BR-8. All the data loggers were left in-place in BR-1, BR-3, BR-4, BR-7, BR-8, BR-9, BR-13 and BR-15. Prior to the start of the pumping test, DTW readings were manually gauged to confirm data logger readings. The DTW readings of the data loggers were adjusted (< 0.1 foot adjustment) as needed based on manual measurement and pumping from BR-8 was started at 9:00 AM. Drawdown in the pumping well and pumping rate were monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 10 feet of drawdown). The pumping rate in BR-8 was extremely slow (i.e., less than 0.25 GPM) and therefore, was difficult to accurately determine with the equipment on hand. Minor adjustments in the pumping rate were made to achieve the desired drawdown of approximately 10 feet. The final pumping rate and thus sustainable yield of BR-8 was estimated to be less than 0.1 GPM. Pumping was continued at this rate for the remainder of the test.

The test was run for a total of 246 minutes or approximately 4.1 hours when it was determined there was lack of significant drawdown in the observation wells due to the extremely low sustainable yield of BR-8. **Figure 21** shows the water levels recorded by the data loggers during and after pumping. **Figure 22** shows the bedrock groundwater elevation contour before pumping commenced and **Figure 23** shows the bedrock groundwater elevation contour when the pump was shut off.

3.8.7 BR-9 Pumping Test

At approximately 3:05 PM on April 16, 2015, the pump was removed from BR-8 and placed in BR-9 in preparation for pumping the next day. Based on the lack of response observed in BR-3 for the pumping tests in BR-7 and BR-8, the data logger was removed and placed in BR-12. The data loggers were left in-place in BR-1, BR-4, BR-7, BR-8, BR-9, BR-13 and BR-15.

On April 17, 2015, prior to the start of the pumping test, DTW readings were manually gauged to confirm data logger readings. The DTW readings of the data loggers were adjusted (< 0.1 foot adjustment) as needed based on manual measurement and pumping from BR-9 was started at 8:10 AM. Drawdown in the pumping well and pumping rate were monitored to achieve maximum drawdown while maintaining a water level at least two (2) feet above the intake of the pump (i.e. approximately 9 feet of drawdown). The pumping rate was adjusted until the desired drawdown was achieved and maintained. It was determined the sustainable yield of BR-9 is approximately 0.3 GPM.

Pumping was continued at this rate for the remainder of the test. The test was run for a total of 305 minutes or 5.08 hours when it was determined the drawdown in the observation wells had reached a static state. The data loggers were left in the wells to record bedrock groundwater recovery after pumping was complete. **Figure 24** shows the water levels recorded by the data loggers during and after pumping. **Figure 25** shows the bedrock groundwater elevation contour before pumping commenced and **Figure 26** shows the bedrock groundwater elevation contour when the pump was shut off.

3.9 Comparative Groundwater Monitoring and Sampling

AFI completed additional bedrock groundwater sampling at bedrock groundwater monitoring wells BR-11 and BR-12 to evaluate the effects of the pumping tests on the concentration of contaminants in bedrock groundwater and to determine if there were any reductions in VOC and/or SVOC concentrations in BR-11 over time. Samples were collected after each of the pumping tests were complete (i.e. the morning of April 16th, the afternoon of April 16th and the afternoon of April 17th). In addition, four (4) quality control samples consisting of a trip blank for VOCs, a blind duplicate, a matrix spike (MS) and a matrix spike duplicate (MSD) were also collected. The samples collected were analyzed for TCL VOCs by USEPA method 8260 and TCL SVOCs using USEPA method 8270. It should be noted, the wells were purged of only approximately 2-gallons of water before samples were collected. This was to ensure the bedrock groundwater in the immediate vicinity of the well was sampled for analysis. This was to prevent bedrock groundwater outside the immediate vicinity of the well from entering the well if the wells were purged of three to five well volumes as per standard sampling protocol which may have invalidated or skewed the results of the sampling.

3.10 Site Survey

On September 23, 2014, and April 29, 2015, under the guidance of Lawrence Zygaj, the professional surveyor on record for the site, a survey was conducted of the following site features shown on **Figure 2**:

- The location and surface elevation of newly completed soil borings BH-1 and BH-2;
- The location and surface elevation of the newly installed bedrock monitoring wells BR-7 though BR-15;
- The well casing elevations of all bedrock monitoring wells BR-1 through BR-15;
- The location and surface elevation of previously completed soil borings SB-1 and SB-2;
- The location of underground utilities marked as a result of the Dig Safe New York notification;
- The location and elevation of the sewer line under Hannah Street where accessible via sewer manholes SW-1 and SW-2 as shown on **Figure 2**, and;
- The location of the storm water drains along Hannah Street.

3.11 Investigation Derived Waste Disposal

Materials generated during the performance of the Site investigation included incidental personal protective equipment (PPE), water, and soil. PPE was collected, double bagged, and properly disposed of off-Site. All drill cuttings were collected and containerized in eight (8) properly labeled 55-gallon DOT-approved steel drums and stored on-site. Drill cuttings will be disposed of with any soil that may be generated during the remedial system installation activities described in Section 13. During the pump test in September 2014 described in Section 5, two (2) drums of development and purge water were pumped into the storage tank used to store the water generated by pump test. On October 30, 2014, the combined water from well development, sampling and pumping tests in the storage tank was transferred into properly labeled 55-gallon DOT-approved steel drums. The storage tank was cleaned out on-site and water generated by the tank washing was also transferred into a properly labeled 55-gallon DOT-approved steel drums. A total of seven (7) drums were generated and stored on-site until it was picked up for disposal at Chemtron Corporation in Avon, Ohio on November 24, 2014. The waste manifest is included in **Appendix F**.

The well development and pump test water from the April 2015, well development, sampling and pump testing was stored on-site in a storage tank for treatment and/or disposal later. Waste manifests will be submitted under separate cover.

4.0 MODIFICATIONS TO WORK PLAN

Section 2.7 of the *Supplemental Remedial Investigative Work Plan Brownfield Cleanup Program* (Ref 1) dated July 2014, outlines a work plan to conduct a soil vapor intrusion (SVI) investigation. The plan included installation of four (4) sub-surface vapor points around the exterior perimeter area of the Site property boundary and two (2) sub slab sampling points with corresponding ambient air monitoring points in the interior of the on-site building.

Base on a review of the preliminary data from the overburden and bedrock investigation portion of the work plan, on September 25, 2014, AFI petitioned NYSDEC to omit completion of the SVI portion of the work plan. This request was made due to the low to non-detect levels of VOCs in the soil from the supplemental soil borings/bedrock monitoring wells and the decreasing trends in VOC concentrations in bedrock groundwater along the northern property line of the site. Additionally, although bedrock groundwater concentrations indicate a soil vapor investigation (SVI) is warranted on-site, this investigation was previously completed and results submitted to NYSDEC.

NYSDEC has indicated in their January 30, 2015, letter that this work will not need to be completed.

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5.0 SUPPLEMENTAL REMEDIAL INVESTIGATION RESULTS

5.1 Overburden Soil Sampling/Test Pit Results

A soil analytical data map for the August 2014, sampling event is included as **Figure 27**. A soil analytical data map for the April 2015, sampling event is included as **Figure 28**. A laboratory soil analytical data summary is included as **Table 4**. Laboratory analytical reports are included in **Appendix G**.

VOCs

None of the soil samples sent for laboratory analysis exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCO levels for VOCs. The concentration of acetone exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCOs in the sample from BR-8, BR-13 and BR-15. Concentration of total VOCs ranged from 0.0027 milligrams per kilogram (mg/kg) in the sample from BR-10 to 0.24512 mg/kg in the sample from BR-11.

SVOCs

The majority of the concentrations of SVOCs in the soil samples sent for laboratory analysis were reported as non-detectable or at trace (estimated) levels below the sample quantitation limit. Soil samples collected from BH-1, BH-2, BR-9, the duplicate sample from BR-9 and BR-14 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs for benzo(a)pyrene (4.7, 2.4, 6.6, 8.3 and 3 mg/kg respectively), the samples from BR-9 and the duplicate sample from BR-9 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs for benzo(a)anthracene (5.9 and 7.5 mg/kg respectively), the samples from BH-1, BR-9 and the duplicate sample from BR-9 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs for benzo(b)fluoranthene (5.8, 8.9 and 10 mg/kg respectively), the sample from BH-1, BR-9, the duplicate sample from BR-9 and BR-14 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs for dibenzo(a,h)anthracene (0.69, 1.1, 1.5 and 0.58 mg/kg respectively) and the duplicate sample from BR-9 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs for indeno(1,2,3-cd)pyrene (7.2 mg/kg).

The samples from BH-1, BH-2, BR-9, the duplicate sample from BR-9 and BR-14 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCOs for benzo(a)anthracene (5.3, 2.4, 5.9, 7.5 and 4.6 mg/kg respectively), benzo(b)fluoranthene (5.8, 3.3, 8.9, 10 and 3.6 mg/kg respectively) and chrysene (5.2, 2.3, 6.3, 7.2 and 4.9 mg/kg respectively). The samples from BH-1, BR-9 and the duplicate sample from BR-9 exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCOs for benzo(k)fluoranthene (2.2, 2.7 and 3.7 mg/kg respectively). Concentration of total SVOCs ranged from non-detect in the sample from BR-10 to 95.72 mg/kg in the duplicate sample collected from BR-9.

METALS

None of the soil samples sent for laboratory analysis exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCO concentrations for metals with the exception of arsenic in BH-1, BH-2 and BR-8 (17, 22 and 16 mg/kg respectively) and copper in BR-9 (1,600 mg/kg). None of the soil samples sent for laboratory analysis exceeded 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCO concentrations for metals with the exception of arsenic in BH-1, BH-2 and BR-8 (17, 22 and 16 mg/kg respectively), lead and manganese in BR-9 (490 and 2,400 mg/kg respectively) and mercury (0.85 mg/kg) in BR-8.

GENERAL CHEMISTRY

None of the soil samples sent for laboratory analysis exceeded 6NYCRR Part 375 6.8 (b) (Ref 4) Commercial or Protection of Groundwater SCO concentrations for trivalent or hexavalent chromium or total cyanide.

PCBs

None of the soil samples sent for laboratory analysis exceeded 6NYCRR Part 375 6.8 (b) (Ref 4) Commercial or Protection of Groundwater SCO concentrations for PCBs. Concentration of total PCBs ranged from non-detect in the samples collected from BR-8, BR-10 and BR-11 to 0.272 mg/kg in the sample collected from BR-9.

TEST PITS

The locations of the test pits are shown on **Figure 28**. Based on the observations made during the completion of the eight test pits (i.e., TP-18 through TP-25), there is no evidence of orphaned USTs or grossly impacted soil to the south of the Site acting as a source for contamination of groundwater. It should be noted there was no evidence of a sheen on any groundwater that collected in the test pits during excavation.

5.2 Bedrock Groundwater Monitoring and Sampling Results

A bedrock groundwater monitoring and sampling map for the August 2014 sampling event is included as **Figure 29**. A bedrock groundwater monitoring and sampling map for the April 2015 sampling event is included as **Figure 30**. A bedrock groundwater elevation summary for the August 2014 gauging event is included as **Table 5**. A bedrock groundwater elevation summary for the April 2015 gauging event is included as **Table 6**. A laboratory bedrock groundwater analytical data summary is included as **Table 7**. Laboratory analytical reports are included in **Appendix G**.

A review of the bedrock groundwater contours shown on **Figures 29 and 30** bedrock groundwater elevations shown in **Tables 5 and 6** indicate the apparent bedrock groundwater flow on the site is predominately to the north with a gradient of approximately 0.01. This is consistent with historical bedrock groundwater data collected and reported in the RI/AAR/IRM report (Ref 2). The average depth to water across the site was 6.93 feet below top-of-casing (TOC) during the August 2014 gauging event and the depth to bedrock groundwater ranged from 4.72 feet below TOC in BR-6 to 10.10 feet below TOC in BR-4. A trace amount of LNAPL (< 0.01 ft) was present in BR-11 prior to sampling. The average depth to water across the site was 5.57 feet below top-of-casing (TOC) during the April 2015 gauging event and the depth to bedrock groundwater ranged from 4.40 feet below TOC in BR-8 to 8.36 feet below TOC in BR-4. Approximately 0.1 feet of LNAPL was present in BR-2 and a trace amount of LNAPL (< 0.01 ft) was present in BR-11.

VOCs

Concentrations of one or more VOCs exceeded NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (Ref 14) groundwater standards in all bedrock monitoring wells sampled with the exception of bedrock monitoring well BR-5. Concentration of total VOCs ranged from 0.79 micrograms per liter (µg/l) in the sample collected from BR-5 to 14,016 µg/l in the sample collected from BR-1.

SVOCs

The majority of the concentrations of SVOCs in the bedrock groundwater samples sent for laboratory analysis were reported as non-detectable or at trace (estimated) levels below the sample quantitation limit. Concentrations of one or more SVOCs exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards

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in bedrock monitoring wells BR-2, BR-3 and BR-9. The sample from BR-2 exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for concentrations of bis(2-ethylhexyl)phthalate (15 µg/l) and chrysene (0.2 µg/l). The sample from BR-3 exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for the concentration of phenol (6.6 µg/l). The sample from BR-9 exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for concentrations of phenol (3 µg/l), benzo(a)pyrene (0.09 µg/l), benzo(b)fluoranthene (0.07 µg/l), chrysene (0.05 µg/l) and indeno(1,2,3-cd)pyrene (0.14 µg/l). Concentration of total SVOCs ranged from non-detect in the sample from BR-5, BR-13 and BR-15 to 18.05 µg/l in the sample from BR-9.

METALS

Concentrations of one or more metal(s) exceeded TOGS 1.1.1 (Ref 14) groundwater standards in all wells sampled. Concentrations of iron and sodium exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards in all wells sampled. Concentration of manganese exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards in all wells sampled with the exception of BR-5, BR-6 and BR-10. Concentration of magnesium exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards in all wells sampled with the exception of BR-6, BR-7, BR-8, BR-10 and BR-11, however, per the third party validation discussed in Section 5.3, there results were rejected and should not be considered valid. Concentration of lead exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards in samples from BR-3 (76.25 µg/l), BR-4 (35.41 µg/l) and BR-9 (30.5 µg/l). Concentration of antimony exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards in the sample collected from BR-5 (18.78 µg/l).

GENERAL CHEMISTRY

None of the bedrock groundwater samples sent for laboratory analysis exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards concentrations for trivalent or hexavalent chromium or total cyanide.

PCBs

Concentrations of one or more PCBs exceeded NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards in samples collected from BR-2 and BR-11. Concentration of total PCBs ranged from non-detect in the samples collected from BR-3, BR-4, BR-5, BR-6, BR-7, BR-8, BR-9, BR-10, BR-12, BR-13, BR-14 and BR-15 to 8 µg/l in the sample collected from BR-2.

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5.3 Data Validation Results

In accordance with section 8.2 of the Quality Assurance Project Plan (QAPP) included as Appendix A in the *Supplemental Remedial Work Plan Brownfield Cleanup Program* (Ref 1) dated July 2014, the laboratory data was validated by Kenneth R. Applin, Ph.D. (third party data validator for the project). The Data Usability Summary Reports (DUSR) are included as **Appendix H**. A summary of the data validation results for the soil and groundwater laboratory analytical data is as follows:

For the soil samples collected from BH-1, BH-2 and BR-7 through BR-11 (lab report number L1417931), eight samples were analyzed and results were reported for 1,056 analytes. Eight results for 1,4-Dioxane were rejected. Even though some results were flagged with a "J" as estimated, all other results (99%) are considered usable. Please refer to the complete DUSR in **Appendix H** for more detail.

For the bedrock groundwater samples collected from BR-1 through BR-11 (lab report number L1419240), twelve samples and a trip blank were analyzed and results were reported for 1,900 analytes. Twenty-four results for magnesium and potassium were rejected. Even though some results were flagged with a "J" as estimated, all other results (99%) are considered usable. Please refer to the complete DUSR in **Appendix H** for more detail.

For the soil samples collected from BH-1, BH-2 and BR-7 through BR-11 (lab report number L1417931), eight samples were analyzed and results were reported for 1,056 analytes. Eight results for 1,4-Dioxane were rejected. Even though some results were flagged with a "J" as estimated, all other results (99%) are considered usable. Please refer to the complete DUSR in **Appendix H** for more detail.

For the soil samples collected from BR-12 through BR-15 (lab report number L1506780), five samples were analyzed and results were reported for 650 analytes. Five results for 1,4-Dioxane were rejected. Even though some results were flagged with a "J" as estimated, all other results (99%) are considered usable. Please refer to the complete DUSR in **Appendix H** for more detail.

For the bedrock groundwater samples collected from BR-12 through BR-15 (lab report number L1507448), five samples and a trip blank were analyzed and results were reported for 703 analytes. Six results for 1,4-Dioxane were rejected. Even though some results were flagged with a "J" as estimated, all other results (99%) are considered usable. Please refer to the complete DUSR in **Appendix H** for more detail.

For the bedrock groundwater samples collected from BR-11 and BR-12 (lab report number L1507982), seven samples and a trip blank were analyzed and results were reported for 900 analytes. Eight results for 1,4-Dioxane were rejected. Even though some results were flagged with a "J" as estimated, all other results (99%) are considered usable. Please refer to the complete DUSR in **Appendix H** for more detail.

5.4 CAMP Results

AFI conducted community air monitoring in accordance with the CAMP included as Appendix E of the NYSDEC approved *Supplemental Remedial Investigative Work Plan Brownfield Cleanup Program* (Ref 1) dated July 2014. Air monitoring was conducted both upwind and downwind of the intrusive activities, using a MiniRae PID (Serial Number 592-907933) to continuously monitor for VOCs and a Dustrak II Aerosol Monitor (Serial Number 8530102707) to monitor particulates. Weather conditions during intrusive site activities, including wind speed and direction, were monitored using a Davis Instruments Vantage Pro2 weather station. Results of the CAMP monitoring are included in **Appendix I**. It should be noted at approximately 10:30 AM on August 12, 2014, it was discovered there was an exceedance of the background particulate level by more than 150 micrograms per cubic meter (ug/m^3). By the time this could be communicated to the drillers who were advancing monitoring well BR-8 into bedrock using an air hammer at the time of the exceedance, they had reached the target depth and drilling activities were complete for the day. Therefore, no further action was required. At approximately 11:15 AM and 12:45PM on April 7, 2015, it was it was discovered there was an exceedance of the background particulate level by more than 150 µg/m^3. The drillers were instructed to utilized dust control measures consisting of using a water mister at the well head which successfully lowered particulate levels to acceptable ranges. Other than these single exceedances, all monitoring results for VOCs and particulates conformed to the CAMP perimeter particulate requirements of 100 ug/m^3 and the organic vapor requirement of less than 5 parts per million over background. Please note it was discovered the weather station was malfunctioning for the April 2015 SRI activities and was not recording weather data therefore this data is not included in **Appendix I**. The wind direction, however, was monitored visually and adjustments to the placement of the downwind CAMP monitoring station was completed as needed.

5.5 Pumping Test Results

Bedrock groundwater elevations during and after the seven (7) pumping tests and bedrock groundwater elevation contour maps prior to pumping and at the completion of pumping are shown on **Figure 5** through **Figure 26**. Based on this data, the drawdown versus distance graphs for the pumping tests for BR-1, BR-2, BR-7 and BR-9 are shown on **Figure 31** through **Figure 34**. It should be noted during the pumping test in BR-2, there was no observable drawdown in BR-6 (located 73 feet from BR-2) while observable drawdown was recorded in observation wells BR-4 and BR-7 nearly 180 and 170 feet away from BR-2 respectively. This is most likely attributed to the fact the shallow groundwater aquifer observed at the Site is located within the fractured bedrock and groundwater flow through this bedrock is facilitated through faults and fractures. Therefore, the faults and fracture that allow hydraulic communication between BR-2 and BR-4 and BR-7 do not intersect with BR-6 thus isolating BR-6 from the pumping conditions induced in BR-2. Additionally, for a majority of the pump tests, little to no response was observed in BR-3 which, corresponds with little to no response observed in the surrounding wells when pumping from BR-3, most likely for the same reasons as BR-6. Drawdown versus distance graphs were not completed for the tests conducted in BR-3, BR-8 and BR-10 due to the lack of significant observable drawdown in the observation wells with the exception of drawdown in BR7 when pumping on BR-8 and BR-4 when pumping on BR-10.

A review of **Figure 31** through **Figure 34** indicate the pumping test has established a radius of influence (ROI) greater than 100 feet at a pumping rate of approximately 0.48 GPM in BR-1, an ROI greater than 200 feet at a pumping rate of approximately 0.83 GPM in BR-2, an ROI of approximately 225 to 250 feet at a pumping rate of approximately 0.3 GPM from BR-7 and an ROI of approximately 175 feet at a pumping rate of approximately 0.3 GPM from BR-9. A pumping test ROI map is shown on **Figure 35**.

5.6 Comparative Groundwater Monitoring and Sampling

A comparative laboratory bedrock groundwater analytical data summary is included as **Table 8**. Laboratory analytical reports are included in **Appendix G**. For the purposes of comparison, the sample collected from BR-11 on August 21, 2014, and the sample collected from BR-12 on April 13, 2015, are considered to be the baseline, pre-pumping samples. The subsequent samples are representative of bedrock groundwater post BR-7 pumping test (i.e., the morning of April 16, 2015, designated by the letter

A in the sample name), post BR-8 pumping test (i.e., the afternoon of April 16, 2015, designated by the letter B in the sample name) and post BR-9 pumping test (i.e., the afternoon of April 17, 2015).

VOCs

A review of **Table 8** indicates, there was a significant drop in VOC concentrations in BR-11 from the sample collected in 2014 to the samples collected in 2015 (i.e, 13,976 µg/l dropped 71% to an average of 4,038 µg/l); but it should be noted there were also pumping tests completed at BR-1, BR-3, BR-2 and BR-10 in addition to the pumping test completed at BR-7 as well as seven (7) months of time had passed. Nonetheless, VOC concentrations did significantly diminish from the pre to post pumping test sampling. The VOC concentrations for the samples collected on April 16 and 17, 2015, did not, however, show any significant upwards or downwards trend. Similar to the results for BR-11, the VOC concentrations in BR-12 dropped from pre pumping to post pumping (i.e., 252.41 µg/l dropped 24% to an average of 191.16 µg/l) and the VOC concentrations for the samples collected on April 16 and 17, 2015, did not show any significant upwards or downwards trend.

SVOCs

A review of **Table 8** indicates, there were no significant upward or downward trends for SVOC concentrations over the sampling period.

6.0 CONCLUSIONS

The following conclusions presented by affected media are based on the previous environmental investigations discussed in Section 1.2 as well as data presented in Sections 3 and 5 of this report.

6.1 Soil Conclusions

A soil analytical data map for the August 2014, sampling event is shown on **Figure 27**. A soil analytical data map for the April 2015, sampling event is shown on **Figure 28**. Supplemental remedial investigation soil analytical data is shown in **Table 4**. The location of historic test pits and limits of excavations including soil analytical data is shown on **Figure 36**. The location and final depths of the IRM excavations/test pits are shown in **Figure 37** and the location and thickness of the backfill and clean cover placed during the IRMs is shown in **Figure 38**. Historic soil analytical data for samples removed during implementation of the IRMs is shown in **Table 9**. Historic soil analytical data for soil samples remaining in-place after the completion of the IRMs in 2012 and 2013 are shown in **Table 10**.

A review of **Tables 9 and 10** indicates, during the implementation of the IRMs in 2012 and 2013, impacted soil with concentrations one or more sampling parameter exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs were detected in samples from TP1, TP2, TP8, TP10, TP12, TP15, TP16 and TP17. As previously reported, a total of 1,211.35 tons of impacted soil along with 23.49 tons of construction and demolition (C&D) debris has been excavated from the test pits/excavations shown on **Figure 37** and transported for off-site disposal. A total of 1,446.95 tons of clean backfill/cover has been brought to the site as shown in **Figure 38**. It should be noted all of the soil samples listed on **Table 10** remaining on-site after implementation of the IRMs that contain concentrations of one or more compound that exceed 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs are either covered with at least 1-2 feet of clean fill (i.e. TP-1-1'and TP-1-8') or are below more than two (2) feet of excavation backfill (i.e., TP-8 (floor), TP-10 (floor), TP-12 and TP-16). It should be noted, although samples were not collected from the soil left in-place to be protective of the in the gas line that services the on-Site building, it is assumed this soil contains concentrations of one or more compound that exceeds 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs based on visual and olfactory observations in the field. Therefore, 1-2 feet of clean cover was placed over the gas line as shown on **Figure 38** as a precautionary measure.

A review of **Table 4** indicates for the most recent sampling events in August 2014, and April 2015, impacted soil with concentrations one or more sampling parameter exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs were detected in samples from BH-1 (0-4'), BH-2 (0-4'), BR-8 (4-7.5'), BR-9 (0-4'), and BR-14 (4-6'). It should be noted, although the samples from BR-8 and BR-14 exceeded the 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCO for one or more compound, these exceedances, however, are located at least four (4) ftbg.

It should be noted based on the results of the overburden and test pit excavations conducted in April 2015, there is no evidence of off-Site orphaned USTs or grossly impacted soil acting as a source for the groundwater impacts discussed in Section 6.2.

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6.2 Bedrock Groundwater Conclusions

A bedrock groundwater monitoring and sampling map for the August 2014, sampling event is shown on **Figure 29**. A bedrock groundwater monitoring and sampling map for the April 2015, sampling event is shown on **Figure 30**. Bedrock groundwater elevation data summaries for the August 2014 and April 2015 sampling events are shown in **Tables 5 and 6** respectively. A bedrock groundwater analytical data summary for the August 2014 and April 2015 sampling events is shown in **Table 7**. Historic bedrock groundwater monitoring and sampling maps are shown on **Figure 39 and Figure 40**. Historic bedrock groundwater elevation data and analytical data is shown in **Table 11 and Table 12** respectively.

A review of the bedrock groundwater monitoring and sampling maps indicate the apparent bedrock groundwater flow is predominantly to the north. A review of the bedrock groundwater analytical data indicates that for the wells that were sampled in 2013 and again in 2014 (BR-1 through BR-6) concentrations for total VOCs, total SVOCs and total PCBs remained relatively stable or decreased with the exception of total VOCs in BR-1. It should be noted there was a significant decrease in total SVOCs and PCBs in BR-2. Therefore, it can be concluded the IRM excavation of source material during the IRMs was effective in reducing dissolved phase impacts to bedrock groundwater on-Site.

A review of the groundwater analytical data from the August 2014 sampling event for metals in **Table 7** indicates there is significant site wide exceedances of NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for concentrations of total iron, total magnesium, total manganese and total sodium which would suggest this is naturally occurring. A review of the soil analytical data in **Table 4 and Table 10** show exceedances of the 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCO for manganese in soils remaining on-site in the vicinity of TP-16 and BR-9 which are located on the southern portion of the site. Since the exceedances of NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for concentrations of total manganese are site wide, this suggests these exceedances are from a source other than the soil on-site. Elevated levels of magnesium (replacement element in limestone to form dolostone) could be attributed to the water table residing in the shallow bedrock underlying the site. There is a lone exceedance of NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for antimony in BR-5. A review of the groundwater elevations shown in **Tables 5 and 6** indicates BR-5 is upgradient of the Site and therefore, it is reasonable to conclude this exceedance is not originating from the site or could be due to the localized chemistry of the bedrock in the vicinity of BR-5. The remainder of the exceedances of NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards are for the concentration of lead in BR-3, BR-4 and BR-9 (76.25

µg/l, 35.41 µg/l and 30.5 µg/l respectively). A review of **Tables 4 and 10** indicates there is soil on-site in the vicinity of TP-10 and BR-9 with exceedances of the 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCO for lead which could contribute to the concentrations of lead detected in BR-3, BR-4 and BR-9. Ultimately, as discussed in Section 2.4 and Section 7.5, groundwater in the area is not used for potable water therefore is it reasonable to conclude the exceedances of NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for metals in bedrock groundwater should not be considered in the final remedial design.

A review of the August 2014, bedrock groundwater analytical data in **Table 6** indicates the greatest impacts to bedrock groundwater for total VOCs, SVOCs and total PCBs exceeding NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards are on the southwestern portion of the site (BR-1, BR-2, BR-9 and BR-11). Of these wells, the greatest total VOC concentrations are in BR-1 and BR-11 (14,016 µg/l and 13,976 µg/l respectively). The greatest number of individual concentrations of SVOCs exceeding NYSDEC TAGM 1.1.1 (Ref 14) groundwater standards is in BR-9 (five [5] compounds) and the greatest total PCB concentrations are in BR-2 and BR-11 (8 µg/l and 1.37 µg/l respectively). Most of the SVOC exceedances in BR-9 could be attributed to the exceedances of the 6NYCRR Part 375 6.8 (b) (Ref 5) Protection of Groundwater SCOs for SVOCs show in in **Table 4**. Furthermore, a review of the well development and sampling records in **Appendix C** indicate LNAPL was present in BR-11, and as discussed in Section 3.8.3, during the pumping test in BR-2, LNAPL was observed to accumulate in BR-2 as the test progressed. It should be noted, as is shown in the bedrock groundwater elevation contours on **Figures 29, 30, 39 and 40,** wells BR-1, BR-2, BR-9 and BR-11, which are the most impacted wells, are located on the upgradient portion of the Site. Therefore, the final remedy should be capable of capturing bedrock groundwater in this area to ensure bulk reduction in bedrock groundwater contamination to asymptotic levels is achieved to the extent feasible.

Groundwater quality significantly improves, however, downgradient across the Site to the north. Groundwater in BR-5 meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for VOCs, SVOCs and PCBs. Total VOCs in BR-4, BR-7, BR-8 and BR-10 are less than one (1) ppm and range from 43.4 µg/l in BR-4 to 631.3 µg/l in BR-7. Groundwater in BR-4, BR-7, BR-8 and BR-10 meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for SVOCs and PCBs. No LNAPL has been detected in any of these wells. This would suggest groundwater exiting the site meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for SVOCs and PCBs, and meets or slightly exceeds NYSDEC TOGS 1.1.1 (Ref

14) groundwater standards for VOCs. The final remedy for the site should be capable of controlling bedrock groundwater in this area to prevent impacted groundwater from exiting the Site.

A review of the April 2015, bedrock groundwater analytical data in **Table 6** indicates the groundwater quality off-Site, upgradient to the south also significantly improves with distance from the most impacted area of the Site in the vicinity of BR-1, BR-9 and BR-11. Groundwater in BR-12, BR-13, BR-14 and BR-15 meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for SVOCs. There are exceedances for one or more VOC in each of the off-Site upgradent wells, however, total VOCs in BR-12, BR-13, BR-14 and BR-15 are less than one (1) ppm and range from 6.63 µg/l in BR-14 to 252.41 µg/l in BR-12. No LNAPL has been detected in any of these wells. Because there is no evidence of orphaned USTs or grossly impacted soil to the south of the Site, these VOC exceedances could be attributed to the former on-site orphaned USTs and grossly impacted soil that were removed during the IRMs.

A review of the soil borings/well logs for BR-13 and BR-15 included in **Appendix A** indicates these wells were installed within the footprint of the former building demolished in-place as evidenced by the rubble/fill material noted to 6-feet bgs. Therefore, the impacts noted in BR-13 and BR-15 could be a result of the foundation of the former building acting as a preferential pathway for impacts to travel from the vicinity of BR-1 and BR-9. This assertion is supported by a review of the soil boring/monitoring well log for BR-14 included in **Appendix A** indicating this well is installed outside of the footprint of the former building. VOC impacts in BR-14 are an order of magnitude less than those noted in BR-13 and BR-15 and groundwater quality in BR-14 meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for both VOCs and SVOCs except for a lone exceedance of vinyl chloride at 3 µg/l.

The impacts noted in BR-12 are the greatest of the off-site upgradient wells to the south of the Site but are several orders of magnitude less that those noted in BR-1 and BR-11. Because BR-12 is located in Hannah Street, the trenches for the utilities under Hannah Street (i.e. sewer, water and electricity) could be potential preferential pathways for the impacts.

In both cases of the former building foundation and the utilities under Hannah Street acting as preferential pathways for impacts, the driving force for the impacts to travel upgradient could be attributed to the six (6) orphaned USTs removed from the vicinity of BR-1, BR-9 and BR-11. Due to the presence of these tanks, there was the potential for liquids possibly leaking from these tanks creating an artificially induced outward hydraulic gradient causing some of the impacts to bedrock groundwater to migrate upgradient to the south contrary to the natural downgradient north flow direction.

6.3 Comparative Groundwater Monitoring and Sampling Conclusions

As discussed in Section 5.6, the comparative sampling results indicated there was a decrease in concentration of total VOCs in BR-11 and BR-12 of 71% and 24% respectively from pre-pumping to post pumping sampling events. There are two related scenarios that could account for this, both of which, suggest bedrock groundwater quality improves off-site to the west.

The first scenario is based on the fact the initial pre-pumping samples were collected after purging at least three well volumes of bedrock groundwater from BR-11 and BR-12 and the post samples were collected after purging only approximately 1 to 2-gallons of bedrock groundwater. As was determined by the pumping tests, the ROI achieved by pumping from wells at the Site at a flow rate of approximately 0.5 GPM is somewhere between 100 to 200 feet. This was the approximate pumping rate during well development based on a review of the well development/sampling logs provided in **Appendix E**. Therefore, it is reasonable to conclude pumping approximately 20 gallons from each well before the pre-pumping sampling events could have resulted in drawing in more severely impacted groundwater from the Site (to the east in the case of BR-11 and to the northeast in the case of BR-12), thus artificially elevating pre-pumping bedrock groundwater impacts over the "no-purge" post-pumping impacts.

The assertion that groundwater quality improves to the west of the site is further supported by the second related scenario in which pumping east of BR-11 and BR-12 (i.e., pumping from BR-1, BR-2, BR-7 and/or BR-9) would artificially induce groundwater to flow from the west to the east towards the depression caused by pumping. Therefore, the bedrock groundwater in BR-11 and BR-12 post-pumping sampling events is representative of water from west of these wells. Again, the concentrations were shown to drop after pumping so it is reasonable to conclude groundwater quality improves to the west of the site.

In addition to the aforementioned pumping scenarios demonstrating reductions in concentrations in both BR-11 and BR-12 are a function of distance from the former location of the USTs and source material removed from the site, a portion of the reduction of concentrations in BR-11 could also be attributed to reduction of dissolved phase impacts to bedrock groundwater as a function of time (i.e., 7 months between pre-pumping sample and post pumping samples). Grossly impacted soil source removal and removal of six (6) orphaned USTs was implemented during the IRMs in 2012 and 2013. Due to the presence of the soil and tanks, there was the potential for liquids possibly leaking from these tanks creating an artificially induced outward hydraulic gradient causing some of the impacts to bedrock groundwater to migrate upgradient to the south (i.e., BR-11 and possibly to some extent BR-12) contrary to the natural downgradient north flow direction. Because the tanks and potentially artificially induced hydraulic head have since been removed, the natural north bedrock groundwater flow towards the site has resumed and the impacts that were "pushed" off-Site are now decreasing over time as evident by the reductions observed in BR-11.

6.4 Sewer Bedding Conclusions

As per the *Supplemental Remedial Investigative Work Plan Brownfield Cleanup Program* (Ref 1) dated July 2014, BR-10 and BR-11 were installed approximately five (5) feet east of the sanitary sewer in Hannah Street to facilitate monitoring of bedrock groundwater between the sewer line and the Site. The pumping test conducted at BR-10 was completed to evaluate if the sewer bedding for the sanitary sewer installed under Hannah Street could be acting as a preferential pathway to drain impacted bedrock groundwater from the site. A review of the bedrock groundwater elevations shown on **Figure 14** indicate that pumping as little as 0.1 GPM from BR-10 resulted in approximately 6.5 feet of drawdown in BR-10 which, in turn, induced a drawdown of approximately 1.0 feet in BR-4 (located on site and approximately 26 feet from BR-10). This suggests if bedrock groundwater were draining into the sewer at a rate as slow as 0.1 GPM, it could affect bedrock groundwater levels on-site.

In order to understand the potential for the current sewer to act on bedrock groundwater on-site, the elevation of the sewer line at manhole locations SW-1 and SW-2 (previously sampled in March 2013) as shown on **Figure 2** was surveyed on September 23, 2014. Based on observation when the sewer manholes were opened, flow in the sewer is from SW-1 to SW-2 (north to south). The elevation of the sewer line is 590.81 ft and 589.84 ft at locations SW-1 and SW-2 respectively, correlating to the observed north to south flow.

A review of the bedrock groundwater elevations in **Tables 5 and 6** show the elevation of bedrock groundwater in monitoring wells BR-10 and BR-11 on August 22, 2014, were measured to be 591.54 ft

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and 592.66 ft respectively and on April 13, 2014, were measured to be 592.69 ft and 593.88 ft respectively, indicating a south to north flow contrary to the sewer flow. This would suggest the sewer is not affecting bedrock groundwater flow on-Site. Additionally, bedrock groundwater levels in BR-10 and BR-11were approximately 1-3 feet higher than the sewer line elevation. If bedrock groundwater were leaking into the sewer, even at a rate as slow as 0.1 GPM, the bedrock groundwater elevation in BR-10 and BR-11 would be approximately equal to the elevation of the sewer, which was not the case.

An additional concern regarding the sewer is; according to historical BSA records, the current sewer line is installed on top of a former sewer line excavated out of the bedrock that flowed the opposite direction (south to north) to a sewer main located under William Street north of the site. This opposite flow direction could suggest the former sewer is acting as a drain for impacted bedrock groundwater on-site. This, however, cannot be substantiated due to the fact this line existed below the current sewer (below approximately 590 ft) and groundwater elevations in BR-10 and BR-11 were measured to be above this elevation. As indicated above, if bedrock groundwater were leaking into the former sewer bedding, even at a rate as slow as 0.1 GPM, the bedrock groundwater elevation in BR-10 and BR-11 would be approximately equal to the elevation of the sewer, which was not the case.

Therefore, based on these multiple lines of evidence, it is reasonable to conclude the current sewer and the former sewer bedding is not acting as a drain for impacted bedrock groundwater on-site.

6.5 Soil Vapor Conclusions

Please refer to Appendix A of the previously submitted RI/AAR/IRM report (Ref 2), dated April 2014, for the complete *Soil Vapor Intrusion Investigation Report*. A summary of the work that was completed follows.

In November 2012, five (5) air samples (SV1-SS, SV2-A, SV3-SS, SV4-A and SV5-O) were collected during the soil vapor intrusion (SVI) study. Two (2) samples (SV1-SS and SV3-SS) were collected from below the warehouse concrete floor (sub-slab), two (2) corresponding breathing zone indoor air samples (SV2-A and SV4-A) were collected in proximity to the sub-slab samples and one (1) outdoor background sample (SV5-O) was collected. Analytical results were compared to the NYSDOH decision matrices presented in the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref

14). Compounds associated with the matrices include carbon tetrachloride, 1-1-dichloroethene, cis-1,2 dichlorothene, tetrachloroethene (PCE), 1,1,1-trichloroethane, trichloroethene (TCE) and vinyl chloride. For the non-matrix compounds, values from the 90th percentile as presented in the *NYSDOH Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in NYS, 1997-2003* (Ref 16) were used as guidance values. The locations of the interior air samples is shown on **Figure 41**. The location of the outdoor air sample is shown on **Figure 42**. Laboratory analytical sample results from the air samples are included in **Table 13**.

Before making a determination if action is needed based on sub-slab and indoor air sampling results, a review of the background outdoor air sampling results should be conducted to determine if there are concentrations of VOCs in the outdoor air that may contribute to potential VOC detections in the sub-slab and/or indoor air samples. A review of the laboratory analytical results for outdoor air sample SV5-O indicate concentrations of chloromethane, vinyl bromide, acetone, MEK, and toluene were detected above the analytical test reporting limit. It is reasonable then, to conclude a detection of these compounds in the indoor air and/or sub-slab samples could be attributed in part or entirely to impact from outside sources. Of the five (5) compounds detected in the outdoor air sample, three (3) were detected in both the sub-slab and indoor air samples (acetone, MEK, and toluene), one (1) was detected in the indoor air samples only (chloromethane) and one (1) was not detected in either the indoor or sub-slab samples (vinyl bromide). Although this data suggests there could be influence from outdoor air on the detection of one or more of these compounds in the indoor and/or sub-slab samples, none of the five (5) compounds are addressed in the decision matrices presented in the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref 14), therefore, an evaluation against the NYSDOH 90th percentile value is warranted. There was only one (1) exceedance of the NYSDOH 90th percentile for acetone in outdoor air (220 ug/m^3). The indoor air and sub-slab detections, however, were below the 90th percentile value, therefore, no further action is warranted.

Non-Matrix Compounds

A review of **Table 13** indicates several non-matrix compounds were detected in sub-slab and indoor air samples above NYSDOH 90th percentile values. Specifically, chloroform exceeded at SV1-SS, tetrahydrafuran exceeded at SV1-SS and SV4-A, xylene-m,p exceeded at SV4-A, styrene exceeded at all indoor and sub-slab sample locations, and 1,2-dichlorobenzene exceeded at SV4-A. Based on this data mitigation is recommended.

Matrix Compounds

When determining if action is needed when reviewing the NYSDOH decision matrices, a sub slab sample and corresponding indoor air sample collected in the breathing zone proximate to the sub-slab sample is necessary. Therefore, for the purposes of determining if action is needed when reviewing the NYSDOH decision matrices, SV1-SS is considered with SV2-A and SV3-SS is considered with SV4-A. As indicated in the NYSDOH guidance, Soil Vapor/Indoor Air Matrix 1 is used to evaluate concentrations of carbon tetrachloride, vinyl chloride and trichloroethene. Soil Vapor/Indoor Air Matrix 2 is used to evaluate concentrations of 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene and 1,1,1-trichloroethane.

SV1-SS and SV2-A

Sub-slab and indoor air concentrations of carbon tetrachloride and vinyl chloride are non-detect or below the lowest category for sub-slab and indoor air vapor concentrations presented on Matrix 1 (< 5 ug/m^3 and < 0.25 ug/m^3 respectively). According to Matrix 1, no further action is recommended based on concentrations of carbon tetrachloride and vinyl chloride. The sub-slab concentration of trichloroethene (1,200 ug/m^3) exceeds the highest concentration category for sub-slab vapor concentrations presented on Matrix 1 (> 250 ug/m^3) while the indoor air concentration of trichloroethene is non-detect and therefore falls into the lowest category for indoor air vapor concentration (< 0.25 ug/m^3). According to Matrix 1, mitigation may be recommended based on the concentration of trichloroethene.

Sub-slab and indoor air concentrations of 1,1-dichloroethene and cis-1,2-dichloroethene are non-detect or below the lowest category for sub-slab and indoor air vapor concentrations presented on Matrix 2 (< 100 ug/m^3 and < 3 ug/m^3 respectively). According to Matrix 2, no further action is recommended based on concentrations of 1,1-dichloroethene and cis-1,2-dichloroethene. The sub-slab concentration of 1,1,1-trichloroethane and tetrachloroethene (490 ug/m^3 and 390 ug/m^3 respectively) falls into the midrange concentration category for sub-slab vapor concentrations presented on Matrix 2 (100 to < 1000 ug/m^3) while the indoor air concentration of 1,1,1-trichloroethane and tetrachloroethene is non-detect and therefore falls into the lowest category for indoor air vapor concentration (< 5 ug/m^3). According to Matrix 2, monitoring may be recommended based on the concentrations of 1,1,1-trichloroethane and tetrachloroethene.

According to the notes on NYSDOH Matrices 1 & 2 the type and frequency of monitoring is determined on a site-specific and building specific basis, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

SV3-SS and SV4-A

Sub-slab and indoor air concentrations of carbon tetrachloride and vinyl chloride are non-detect or below the lowest category for sub-slab and indoor air vapor concentrations presented on Matrix 1 (< 5 ug/m^3 and < 0.25 ug/m^3 respectively). According to Matrix 1, no further action is recommended based on concentrations of carbon tetrachloride and vinyl chloride. The sub-slab concentration of trichloroethene (210 ug/m^3) falls into the high-midrange concentration category for sub-slab vapor concentrations presented on Matrix 1 (50 to < 250 ug/m^3) while the indoor air concentration of trichloroethene is non-detect and therefore falls into the lowest category for indoor air vapor concentration (< 0.25 ug/m^3). According to Matrix 1, monitoring may be recommended based on concentrations trichloroethene.

Sub-slab and indoor air concentrations of 1,1-dichloroethene and tetrachloroethene are non-detect or below the lowest category for sub-slab and indoor air vapor concentrations presented on Matrix 2 (< 100 ug/m^3 and < 3 ug/m^3 respectively). According to Matrix 2, no further action is recommended based on concentrations of 1,1-dichloroethene and tetrachloroethene. The sub-slab concentration of cis-1,2-dichloroethene (55 ug/m^3) is below the lowest category for sub-slab air vapor concentrations presented on Matrix 2 (< 100 ug/m^3) while the indoor air concentration (5.3 ug/m^3) falls into the low midrange concentration category for indoor air vapor concentrations presented on Matrix 2 (3 to < 30 ug/m^3). According to Matrix 2, reasonable and practical actions should be taken to identify the source(s) and reduce exposures based on the concentration of cis-1,2-dichloroethene. The sub-slab concentration of 1,1,1-trichloroethane (360 ug/m^3) falls into the midrange concentration category for sub-slab vapor concentrations presented on Matrix 2 (100 to < 1000 ug/m^3) while the indoor air concentration of 1,1,1-trichloroethane is non-detect and therefore falls into the lowest category for indoor air vapor concentration (< 3 ug/m^3). According to Matrix 2 monitoring may be recommended based on the concentrations of 1,1,1-trichloroethane.

In summary, for both sampling pairs, no further action or taking reasonable and practical actions to identify the source(s) and reduce exposures is recommended for a majority of NYSDOH chemicals of concern. However, monitoring may be recommended based on the concentration of 1,1,1-trichloroethane and tetrachloroethene in SV1-SS and SV2-A and the concentration of trichloroethene and 1,1,1-

trichloroethane in SV3-SS and SV4-A. Mitigation may be recommended based on the concentration of trichloroethene in SV1-SS and SV2-A. These recommendations should be considered in the final engineering design.

It should be noted a soil boring program was conducted in July 2013, which consisted of completing five (5) soil borings (ISB-1 through ISB-5) to evaluate if impacted soil was present under the on-Site building. The location of the borings as well as laboratory analytical data is shown on **Figure 36**. A review of the historical laboratory analytical data shown in **Table 10** indicates soil under the on-site building meets 6NYCRR Part 375 6.8 (a) (Ref 5) Unrestricted SCOs for VOCs with the exception of acetone (a common laboratory contaminant) and therefore is not a contributing factor to the soil vapor impacts identified during the SVI investigation. Therefore it is reasonable to conclude the soil vapor impacts are a result of impacted groundwater below the on-Site building and should be considered in the final engineering design.

7.0 FATE AND TRANSPORT OF COPCS

The results for the soil/fill, bedrock groundwater, soil vapor and indoor air samples were considered in conjunction with the physical characterization of the Site, to evaluate the fate and transport of contaminants of potential concern (COPCs) in Site media. The mechanisms by which the COPCs can migrate to other areas or media as well as the potential exposure pathways are briefly outlined below.

7.1 Fugitive Dust Generation

Volatile and non-volatile contaminates present in soil can be released to ambient air as a result of fugitive dust generation. Based on the conclusions presented in Section 6.1 exposed surface soil in the vicinity of BH-1, BH-2 and BR-9 should be evaluated for potential fugitive dust generation. These sample points are located in areas of site traffic which, under dry conditions, could result in fugitive dust generation. It should be noted BR-9 was installed along the property line adjacent to the IRM excavations completed in 2012 and 2013. A review of the monitoring well log for BR-9 included in **Appendix A** indicates approximately 0.5 feet of limestone gravel at the surface was noted at this location and can be attributed to backfill brought to the site for the adjacent excavations. This helps reduce the potential for fugitive dust generation in this location, but does not meet the minimum requirements for one (1) foot cover for exposed surface soils that do not meet appropriate SCOs. A review of the boring logs for BH-1 and BH-2 included in **Appendix A** indicates there is no imported clean limestone gravel in this area. Therefore, the fugitive dust migration pathway is considered relevant in the vicinity of BH-1, BH-2 and BR-9.

7.2 Volatilization

Volatile chemicals present in soil/fill and bedrock groundwater may be released to ambient or indoor air through volatilization either from or through the soil/fill underlying current or future building structures. Volatile chemicals typically have a low organic-carbon partition coefficient, low molecular weight, and a high Henry's Law constant.

Upon completion of the previously discussed remediation activities, no concentrations of VOCs were detected in on-Site soils above 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. Therefore the migration pathway for volatilization from soil is not considered relevant under the current and reasonably anticipated future land use.

Bedrock groundwater in the central and southwest portion of the site (BR-1, BR-2, BR-9 and BR-11) exhibits elevated levels of VOCs. Additionally LNAPL was observed in BR-11 during the bedrock groundwater monitoring and sampling on August 22, 2014, and LNAPL was observed entering BR-2 during the pumping test on September 11, 2014. These areas are upgradient of the on-Site building which indicates the potential for migration under the building and, thus, for the potential for volatilization into soil vapor and/or ambient air in and around the building. Additionally, the SVI investigation conducted in 2012, returned concentrations of VOCs in soil vapor and indoor air. When these results are compared to the appropriate NYSDOH Matrix, monitoring or mitigation is indicated as an appropriate response. A review of the bedrock groundwater laboratory analytical results shown in **Table 7** and the SVI laboratory analytical results shown in **Table 13**, it is apparent there are similar elevated VOCs in both groundwater and soil vapor. However, concentrations of VOCs drop significantly in bedrock groundwater from wells to the north (i.e., BR-4, BR-5 and BR-7). Even though apparent bedrock groundwater flow is to the north, soil vapor impact to the north of the Site is not a concern due to the decreasing trends in VOC concentrations in bedrock groundwater along the northern property line. Therefore, the migration pathway for volatilization from bedrock groundwater is considered relevant only for the on-Site building under the current and reasonably anticipated future land use of the Site.

7.3 Surface Water Runoff

The potential for soil particle transport with surface water runoff is low since the Site has been cleaned up to 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs with the exception of the areas noted in Section 6.1, and asphalt and building foundations will cover a majority of the Site. Furthermore, the Site is serviced by the BSA's combined sanitary/storm water collection system. BSA's collection system provides a mechanism for controlled surface water transport that will ultimately result in sediment capture in the BSA's grit chambers followed by disposal at a permitted sanitary landfill. As such, surface water runoff is not considered a relevant migration pathway.

7.4 Leaching

Leaching refers to chemicals present in soil/fill migrating downward to groundwater as a result of infiltration of precipitation. A review of the soil analytical data presented in **Table 4 and Table 10** indicate there are several VOCs, SVOCs and metals at concentrations above 6NYCRR Part 375 6.8 (b) (Ref 5) protection of groundwater SCOs at various sampling locations throughout the site. The site, however, is predominantly covered by the on-site building, with pavement or consists of clean fill from the excavations conducted during the IRM's implemented in 2012 and 2013. Additionally, surface water run-off is collected by the BSA's combined sanitary/storm sewer system that services the Site. As such, leaching is considered a relevant migration pathway where there is no existing hard surface (i.e., in the vicinity of the gas line servicing the building, BH-1, BH-2, TP1, TP8, TP10, TP12, TP16 and BR-9).

7.5 Bedrock Groundwater Transport

Bedrock groundwater underlying the Site migrates generally to the north. Chemicals present in bedrock groundwater may be transported across the Site via this pathway. Bedrock groundwater quality significantly improves from the most impacted southern (upgradient) portion of the site to the north (downgradient) portion of the site but there are still exceedances of NYSDEC TOGS 1.1.1 (Ref 14)

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groundwater standards for several VOCs and select metals in the downgradient wells (i.e., BR-4 and BR-7). As such, bedrock groundwater transport is considered a relevant migration pathway.

7.6 Exposure Pathways

Based on the analysis of chemical fate and transport provided above, potential exposure pathways by which contaminants may reach onsite and offsite receptors include fugitive dust generation, volatilization of VOCs into soil vapor and/or indoor air, exposure (dermal contact and/or ingestion) to impacted soil, leaching of contaminants into bedrock groundwater where there is no hard cover, and/or bedrock groundwater transport.

8.0 QUALITATIVE RISK ASSESSMENT

8.1 Human Exposure Assessment

8.1.1 Nature and Extent of Chemical Constituents

Sections 5.0 and 6.0 of this report provide a detailed description of the nature and extent of chemical constituents detected on-Site and in relevant off-Site locations.

8.1.2 Chemical Fate and Transport

Section 7.0 of this report provides a detailed description of the fate and transport of COPCs detected on-Site and in relevant off-Site locations.

8.1.3 Selection of COPCS

Several classes of chemicals were detected in the environmental media at the Site. COPCS for the Site were selected following the practice established by the USEPA in the *Risk Assessment Guidance for Superfund, Human Health Evaluation Manual,* Part A (Ref 17). Selection criteria were as follows:

- Site-wide frequency of detection was considered. Chemicals with a frequency of detection of less than 5 percent in a data set of 20 or more samples were excluded from the assessment. Also, consideration was given as to whether the detected chemical is related to historic and current uses of the site.
- Chemicals not detected at least once above the limit of detection were excluded from the assessment.
- Chemicals detected infrequently in one or two environmental media and detected ao low concentrations were excluded from the assessment.

A summary of COPCs by medium follows:

	COPCs		
Medium	**VOCs**	**SVOCs/PCBs**	**Metals**
On-Site Surface Soils	ND	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene,	ND
Off-Site Surface Soils	NA	NA	NA
On-Site Sub-Surface Soils	ND	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene	ND
Off-site Sub-Surface Soils	ND	ND	NA
On-Site Indoor Air	Styrene	NA	NA
On-Site Sub-Slab Air	1,1,1 –Trichloethane Trichloroethene Tetrachloroethene Styrene	NA	NA

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On-Site Bedrock Groundwater	1,1,1-Trichloroethane 1,1-Dichloroethane cis-1,2-Dichloroethene Freon-113 Trichloroethene Vinyl chloride	ND	ND
Off-Site Bedrock Groundwater	cis-1,2-Dichloroethene Vinyl chloride	ND	NA

8.1.4 Exposure Setting and Identification of Potentially Exposed Populations

The identification of potential human receptors is based on the characteristics of the Site, the surrounding land uses, and the probable future land uses. The Site is currently sitting idle with occasional site workers moving equipment and remaining scrap metal from the site. Currently, the off-Site utilization is the same as the on-Site utilization since the property to the south and west of the site is within the same facility as the Site. In terms of planned future use, the current Site owner (Diamond Hurwitz Scrap, LLC) intends to redevelop the Site for commercial/industrial use. This planned use is consistent with surrounding property use and Site zoning. Accordingly, the reasonably anticipated future use of the Site is for commercial purposes.

Current human populations considered in this exposure assessment include on and off-site adult commercial workers, and on-and off-site adult and child trespassers. While trespassing at the site is unlikely given the current security measures (i.e., security fencing surrounding the site), the potential for trespasser exposure was considered because the Site could be accessed, with difficulty, over the fence. Potential exposure to surface soil and indoor air is possible for on-Site commercial workers and potential exposure to surface soils is possible for on-Site trespassers.

Future human populations considered in this exposure assessment include on and off-Site adult commercial workers, on and off-Site adult construction workers, on-and off-site adult and child visitors and, on-and off-site adult and child trespassers. Potential exposure to surface soil and indoor air is possible for future on-Site commercial workers, potential exposure to surface and sub-surface soil is possible for future on-Site construction workers, potential exposure to groundwater is possible for future on and off-Site construction workers and potential exposure to surface soils is possible for future on-Site visitors and on-Site trespassers.

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8.1.5 Identification of Exposure Pathways

Section 8.1.4 provides a description of the potentially complete exposure pathways for potential current and future on and off-Site human populations. No potential complete exposure pathways have been identified that pose a significant imminent threat (as defined by NYSDEC 6NYCRR Part 375 (Ref 5)) to human health such that an interim remedial measure is required to protect human health. Under current site use conditions, the on-Site commercial worker and on-Site trespasser has the potential for exposure to surface soil via the ingestion (oral), dermal and inhalation (of particulates) exposure pathways. The on-Site commercial worker has the potential for exposure to indoor air via the inhalation exposure pathway.

Under future use Site conditions, the future on-Site commercial worker, construction worker, visitor and trespasser has the potential for exposure to surface soil via the ingestion, dermal and inhalation exposure pathways. The future on-Site construction worker has the potential for exposure to sub-surface soil via the ingestion, dermal and inhalation exposure pathways. The future on-Site commercial worker has the potential for exposure to indoor air via the inhalation exposure pathway. The future on and off-Site construction worker has the potential for exposure to groundwater through the ingestion and dermal exposure pathways

8.1.6 Conclusions

There are several distinct human populations, both on-Site and off-Site who have the potential for exposures to site-related COPCs. The current on-Site populations include adult commercial workers, and adult and child trespassers. The future on-Site populations include adult commercial workers, adult and child visitors, adult construction workers and, adult and child trespassers. The future off-Site populations include adult construction workers.

The qualitative human exposure assessment indicate there are pathways through which people on and off-Site could be exposed to potentially hazardous materials related to former site activities. However, there are no significant and imminent threats to human health that warrant an interim remedial action. Based on the findings of the RI, remedial actions, where warranted, will be addressed in the Remedial Action Plan (RAP) presented in Section 13 of this report.

8.2 Fish and Wildlife Resources Impact Analysis

No Fish and Wild Life Resources Impact Analysis (FWRIA) is required as part of the RI. The FWRIA Decision Key in Appendix 3C of NYSDEC DER-10 (Ref 5) was used to come to this conclusions as follows:

1. Is the site or area of concern a discharge or spill event? – No
2. Is the site or area of concern a point source of contamination to the groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas. – No
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation? – Yes
4. Does the site contain habitat of an endangered, threatened or special concern species? – No
5. Has the contamination gone off-site? – Yes
6. Is there any discharge or erosion of contamination to surface water or the potential for discharge or erosion of contamination? – No
7. No Fish and Wildlife Resources Impact Analysis needed.

9.0 REMEDIAL GOALS AND REMEDIAL ACTION OBJECTIVES

In order to be able to effectively evaluate and ultimately recommend a remedial alternative for the site, remedial goals and objectives should be established to provide a basis for evaluation.

9.1 Remedial Goals/Standards, Criteria and Guidelines (SCGs)

9.1.1 Overburden Soils

Based on the Site's current and anticipated future use as a scrap yard, as well as the current commercial zoning of the Site, 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs are considered appropriate for the Site.

9.1.2 Bedrock Groundwater

Based on requirements for BCP remedial programs to address impacted groundwater, class GA criteria as outlined in NYSDEC TOGS 1.1.1 (Ref 14) are considered appropriate for the site.

9.1.3 Soil Vapor

Based on results of the SVI investigation performed in 2012, guidelines for compounds included in the decision matrixes presented in NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref 15) and values for non-matrix compounds from the 90th percentile as presented in the *NYSDOH Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in NYS, 1997-2003* (Ref 16) are considered appropriate for the site.

9.2 Remedial Action Objectives

In order to select an appropriate remedial alternative for the Site, a list of appropriate RAOs should first be developed to establish the criteria the remedial alternatives are evaluated against. In accordance with guidance presented in chapter 4, section 4.1, paragraph c of NYSDEC DER-10 (Ref 5), "Where applicable, the generic RAOs identified on the DEC website identified in the table of contents are to be used for the various media." An analysis of the applicability of the aforementioned generic RAOs taken from the NYSDEC website follows.

9.2.1 Bedrock Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

With respect to the first RAO for public health protection; because regional bedrock groundwater in the area has not been developed for industrial, agriculture, or public supply purposes and municipal potable water service is provided both on-Site and off-Site, this RAO is not considered appropriate for the Site.

With respect to the second RAO for environmental protection; since the IRMs conducted in conjunction with the RI completed in 2012 and 2013 included removal of six (6) orphaned USTs in addition to pumping, cleaning and sealing the building interior sumps and drywells with a concrete ‘plug’, this RAO is not considered appropriate for the Site.

9.2.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

With respect to the first RAO for environmental protection; since the IRM activities conducted in conjunction with the RI in 2012 and 2013 resulted in the removal and disposal of six (6) orphaned USTs, the excavation, transport and disposal of a total of 1,211.35 tons of impacted soil along with 23.49 tons of C&D debris with the exception of the impacted soil left in-place near the gas line servicing the on-Site building, this RAO is not considered appropriate for the site.

With respect to the second RAO for environmental protection; as discussed in Section 8.2, since there are no significant ecological resources on the site, this RAO is not considered appropriate for the site.

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9.2.3 *Sediment*

RAOs for Public Health Protection

- Prevent direct contact with contaminated sediments
- Prevent surface water contamination which may result in fish advisories.

RAOs for Environmental Protection

- Prevent releases of contaminant(s) from sediments that would result in surface water levels in excess of (ambient water quality criteria).
- Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain.
- Restore sediments to pre-release/background conditions to the extent feasible.

With respect to the RAOs for sediment; since impacted sediments have not been identified on-Site and the Site is serviced by the BSA's combined sanitary/storm water collection system which provides a mechanism for controlled surface water transport that will ultimately result in sediment capture in the BSA's grit chambers followed by disposal at a permitted sanitary landfill, these RAOs are not considered appropriate for the site.

9.2.4 *Soil Vapor*

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

9.2.5 *RAO Summary*

A summary of the appropriate RAOs derived from the generic RAOs obtained from the NYSDEC website are as follows:

RAOs for Public Health Protection

- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

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- Remove the source of ground or surface water contamination.
- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil
- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

RAOs for Environmental Protection

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.

9.3 Additional Evaluation Criteria

In addition to a selected remedy capable of achieving applicable RAOs, as indicated in 6NYCRR Part 375 1.8 (f) (Ref 5) "A remedy shall be selected upon consideration of these nine factors:"

- **Overall Protection of Public Health and the Environment.** This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment, engineering controls, or institutional controls.
- **Compliance with Standards, Criteria, and Guidance (SCGs).** Compliance with SCGs addresses whether a remedy will meet applicable environmental laws, regulations, standards, and guidance.
- **Long-Term Effectiveness and Permanence.** This criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: (i) the magnitude of the remaining risks (i.e., will there be any significant threats, exposure pathways, or risks to the community and environment from the remaining wastes or treated residuals), (ii) the adequacy of the engineering and institutional controls intended to limit the risk, (iii) the reliability of these controls, and (iv) the ability of the remedy to continue to meet RAOs in the future.
- **Reduction of Toxicity, Mobility or Volume with Treatment.** This criterion evaluates the remedy's ability to reduce the toxicity, mobility, or volume of site contamination. Preference is

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given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.

- **Short-Term Effectiveness.** Short-term effectiveness is an evaluation of the potential short-term adverse impacts and risks of the remedy upon the community, the workers, and the environment during construction and/or implementation. This includes a discussion of how to control the identified adverse impacts and health risks to the community or workers at the site, and the effectiveness of the controls. This criterion also includes a discussion of how to mitigate short term impacts (i.e. dust control measures) through engineering controls, and an estimate of the length of time needed to achieve the remedial objectives.
- **Implementability.** The implementability criterion evaluates the technical and administrative feasibility of implementing the remedy. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.
- **Cost.** Capital, operational, maintenance, and monitoring costs are estimated for the remedy and presented on present worth basis.
- **Community Acceptance.** This criterion evaluates the public's comments, concerns, and overall perception of the remedy.

10.0 IDENTIFICATION OF TECHNOLOGIES AND DEVELOPMENT OF ALTERNATIVES

10.1 General Response Actions

A review of the most recent bedrock groundwater monitoring and sampling data presented in **Table 7** indicates concentrations of one or more VOC, SVOC, and/or PCB exceeded TOGS 1.1.1 (Ref 14) groundwater standards in all on-site bedrock monitoring wells sampled with the exception of BR-5. Therefore, the selected remedy should prevent impacted bedrock groundwater from leaving the entire site with the exception of bedrock groundwater in the vicinity of BR-5.

A review of the current and historical soil data indicates the majority of source material on the southwest of the site has been remediated through the IRMs implemented during the RI in 2012 and 2013 to meet 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. The remaining on-site soil that exceeds 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs is located in the vicinity of the gas line servicing the on-Site building (left in-place to prevent damage to the gas line) and in the vicinity of TP1, TP8, TP-10, TP12, TP16, BR-8, BR-9, BH-1 and BH-2. As discussed in Section 6.1 the soil in the vicinity of the gas line, TP1, TP8, TP-10, TP12, TP16, and BR-8 have at least one (1) foot of cover in-place. Soil, however, in the vicinity of BR-9, BH-1 and BH-2 needs to be considered in the final remedial design.

A review of the data presented in Section 6.4 indicates soil vapor VOC impacts under the on-Site building due to impacted bedrock groundwater should be considered in the final remedial design.

10.2 Presumptive Remedies

In order to streamline the development of remedial alternatives, preference is given to proven presumptive remedies. NYSDEC DER-10 (Ref 4), and NYSDEC 6NYCRR Part 375 (Ref 5), both define "presumptive remedy" to mean: "technologies or approaches appropriate for the remediation of specific types of contamination which, based on historical patterns of remedy selection and NYS DEC's scientific and engineering evaluation of performance data, can be used to accelerate the remedy selection process." Based on this definition, and the conclusions presented in Section 6.0, the following presumptive remedies are considered.

10.2.1 Bedrock Groundwater (VOCs):

- Extraction and treatment
- Air stripping
- Treatment via granular activated carbon (GAC)
- Treatment via chemical oxidation
- Separate phase recovery
- Air sparging
- In-well air stripping
- Bioremediation

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10.2.2 Bedrock Groundwater (SVOCs):

- Extraction and treatment
- Treatment via GAC
- Treatment via chemical oxidation
- Separate phase recovery

10.2.3 Bedrock Groundwater (PCBs):

- Extraction and treatment
- Treatment via GAC

10.2.4 Soil (SVOCs):

- Thermal desorption
- Incineration
- Treatment via chemical oxidation
- Excavation with off-Site disposal
- Capping with institutional controls

10.2.5 Soil (Metals):

- Immobilization
- Excavation with off-Site disposal
- Capping with institutional controls

10.2.6 Soil Vapor (VOCs):

- Soil vapor extraction
- Vapor mitigation system
- Catalytic oxidation
- Thermal oxidation

10.3 Development of Alternatives

10.3.1 Bedrock Groundwater

In order to mitigate bedrock groundwater impacts, remedial technologies that can address all or a combination of VOCs, SVOCs and PBCs is preferred. This would preclude the use of the presumptive remedies air stripping, air sparging, treatment via chemical oxidation, in-well air stripping and bioremediation. Therefore, the preferred presumptive remedies that are considered appropriate for bedrock groundwater at this site are as follows:

- Extraction and treatment
- Separate phase recovery
- Treatment via GAC

10.3.2 Soil

In order to mitigate soil impacts, remedial technologies that can address all or a combination of SVOCs and metals is preferred. This would preclude the use of the presumptive remedies, thermal desorption, incineration, treatment via chemical oxidation and immobilization. Therefore, the preferred presumptive remedies that are considered appropriate for soil at this site are as follows:

- Excavation with off-Site disposal
- Capping with institutional controls

10.3.3 Soil Vapor

As presented in Section 6.4 soil vapor impacts below the on-Site building are not due to impacted soil. This would preclude the use of presumptive remedies soil vapor extraction, catalytic oxidation and thermal oxidation which target mitigation of soil impacts. Therefore, the preferred presumptive remedies that are considered appropriate for soil vapor at this site are as follows:

- Vapor mitigation system

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11.0 ALTERNATIVES ANALYSIS

In accordance with NYSDEC DER-10 (Ref 4) guidelines, the Alternatives Analysis Report (AA) for a BCP site will develop at a minimum, "two or more alternatives, if the proposal is for restricted use, where one alternative will achieve unrestricted use relative to soil contamination, without the use of institutional/engineering controls." Taking into account the remedies determined in Section 10.3, the following remedial alternatives are evaluated:

1. No further action beyond the IRMs already completed including engineering controls in-place.
2. Track 4 cleanup via soil capping with institutional and engineering controls (IC/ECs), bedrock groundwater and LNAPL extraction via High Intensity Targeted (HIT) remediation events with off-site disposal and soil vapor mitigation.
3. Track 4 cleanup via soil capping with (ICECs), bedrock groundwater extraction via dedicated downwell pumps with treatment via GAC, and soil vapor mitigation.
4. Track 2 cleanup via soil excavation with off-Site disposal to achieve commercial use SCOs, bedrock groundwater extraction via dedicated downwell pumps and treatment via GAC and soil vapor mitigation.
5. Track 1 cleanup via soil excavation with off-Site disposal to achieve unrestricted use SCOs and bedrock groundwater extraction via downwell pumps and treatment via GAC.

A detailed evaluation of remedial alternatives is included as **Table 14**. A detailed cost analysis of the remedial alternatives is included in **Table 15** through **Table 19**. A summary of the lifecycle costs for the remedial alternatives is included as **Table 20**.

11.1 Alternative #1: No Further Action

11.1.1 Identification and Description

Remedial alternative #1: "No further action" is defined as conducting no additional cleanup, monitoring activities and/or IC/ECs beyond what is already in place at the Site. It should be noted that no further action should not imply no remedial action has been implemented by DHS at the Site. Rather, significant remedial actions have been completed at the site when the IRMs were implemented during the remedial investigation in 2012 and 2013. These remedial actions included:

- Test pit activities in suspect areas (magnetic anomalies) identified in the EM-61 survey;

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- Pumping, cleaning and sealing with a concrete ‘plug’ the building interior sumps and drywells;
- Test pit activities and sampling of the former Voelker basement storage vault;
- Installation of thirteen (13) test pits (based on EM-61 survey results) in the vicinity of the former foundation and basement of the now-demolished south portion of the site;
- Installation of four (4) test pits (based on EM-61 survey results) in the area north of the existing warehouse;
- Excavation, removal, cleaning and proper disposal of six (6) orphaned USTs;
- The excavation and disposal of soils from two (2) areas of concern. This excavation was designed to eliminate soil source contaminates which could be impacting groundwater on the site;
- Excavation, transportation and proper disposal of 1,211.35 tons of contaminated soils and 23.49 tons of C&D debris generated by the test pit/excavation activities;
- Backfilling of test pits and excavations with 590.1 tons of certified #3 &#4 stone, 246.3 tons of certified #1 & #2 stone, 240 tons of tested clean, virgin clay and 370.55 tons of certified sand; and,
- Collection, management, testing and proper disposal of 10,579-gallons of contaminated water pumped from the UST pits and seven (7) 55 gallon drums of tank cleaning sludge.

The ECs already in place at the Site include:

- Security fence encompassing the Site to restrict unauthorized access to the property;
- Approximately eight (8) feet of clean backfill placed in the areas that were excavated to bedrock including where soil remains in-place at depth exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs in the vicinity of TP8, TP10, TP12 and TP16; and,
- Installation of a least one (1) foot of clean fill over where surface soil remains in-place exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs in the vicinity of TP-1 and the gas line that services the on-Site building (**Figure 38**).

With respect to conclusions regarding groundwater impacts at the Site as discussed in Section 6.2, it is apparent the soil source removal implemented during the IRMs outlined above were successful in reducing dissolved phase impacts to bedrock groundwater on-Site. This is evident, most notably, in the significant decrease in total SVOCs and PCBs in BR-2 when comparing the laboratory analytical data from the sampling event in 2013 to the data from the sampling event in 2014 (**Tables 7 and 10**).

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Additionally, as discussed in Section 6.3, groundwater quality is improving to the west of the Site and decreasing concentrations of VOCs to the west of the Site have been observed over time. This can be attributed to the six (6) orphaned USTs removed from this area of the Site. Due to the presence of these tanks, there was the potential for liquids possibly leaking from these tanks creating an artificially induced outward hydraulic gradient causing some of the impacts to bedrock groundwater to migrate upgradient to the south contrary to the natural downgradient north flow direction. Because the tanks and potentially artificially induced hydraulic head have since been removed, the natural north bedrock groundwater flow has resumed. This could account for the greatest impacts to groundwater on-Site being located on the southwestern, upgradient portion of the Site in BR-1.

Groundwater quality significantly improves, however, downgradient across the site to the north. Groundwater in BR-5 meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for VOCs, SVOCs and PCBs. Total VOCs in BR-4, BR-7, BR-8 and BR-10 are less than one (1) ppm and range from 43.4 µg/l in BR-4 to 631.3 µg/l in BR-7. Groundwater in BR-4, BR-7, BR-8 and BR-10 meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for SVOCs and PCBs. No LNAPL has been detected in any of these wells. This would indicate, although there may be impacted groundwater entering the site in part due to the aforementioned rebound scenario, groundwater exiting the site meets NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for SVOCs and PCBs, and meets or slightly exceeds NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards for VOCs.

11.1.2 Screening and Analysis

"No further action" was evaluated as a remedial alternative. A detailed evaluation of the alternative is presented on **Table 14**. This alternative is readily implementable and would not be overly administratively burdensome. Implementing no additional remedial measures would not reduce the toxicity, mobility and volume of hazardous waste beyond what was achieved from implementing the IRMs during the RI. The remedy would not provide compliance with the RAOs established in Section 9.0. Although, within this remedy there would be soil remaining on-site exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs, it would be compliant with SCGs where the EC consisting of at least one (1) foot of cover has been placed in the vicinity of the gas line supplying the on-Site building and in the vicinity of TP1, TP8, TP10, TP12, TP16 and BR-8 as shown on **Figure 38**. The remedy would not be compliant with SCGs in the vicinity of BR-9, BH-1 and BH-2 where surface soil exceeds 6NYCRR Part 375 6.8 (b) (Ref 5)

Commercial SCOs and no cover has been placed. The remedy would not be compliant with groundwater standards contained in NYSDEC TOGS 1.1.1 (Ref 14) and soil vapor guidance contained in NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref 15). Because the remedy does not mitigate bedrock groundwater impacts and soil vapor impacts it would not result in long-term effectiveness.

The short-term effectiveness of the technology would be high because there is no need for implementation of a physical remedy, for a guarantee of technical effectiveness or for the addition of engineering controls beyond what already exists at the site.

Since the remedy would not have any additional costs beyond what DHS has already spent on investigation and remedial efforts to-date, this remedy ranks high from a cost perspective since it is the least expensive out of the four alternatives considered. A detailed costs analysis of the remedial alternative is included as **Table 15** which indicates the net present value of remedial option #1 is total costs already incurred by DHS which includes the costs for conducting the RI, implementation of the IRMs and conducting the supplemental remedial investigation and the pumping tests which totals approximately $1,169,146.

Because of the inability of this remedial option to mitigate bedrock groundwater and soil vapor impacts, it would most likely be negatively perceived by the community. Further, this alternative is not compliant with the requirement for IC/ECs such as cover over surface soils exceeding the SCOs, preparation of a Site Management Plan (SMP) and periodic review of the IC/ECs to ensure the continued integrity of any such control.

11.2 Alternative #2: Track 4 Cleanup with HIT Events and Vapor Mitigation

11.2.1 Identification and Description

Remedial alternative #2 is defined as a Track 4 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) via capping of exposed surface soils with one or more SVOC and/or metal concentration exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. Bulk reduction in bedrock groundwater contamination to asymptotic levels is achieved to the extent feasible through extraction of bedrock groundwater and LNAPL via HIT events with appropriate off-site disposal of bedrock groundwater and any LNAPL. Soil vapor impacts are mitigated through installation of a sub-slab vapor extraction system.

This remedy will include a number of long term IC/ECs. The engineering controls include maintaining the security fencing encompassing the site to prevent unauthorized personnel from accessing the Site and placement of asphalt/concrete pavement or at least one (1) foot of clean cover where contamination is present in the exposed surface soil above 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. Additionally, two short term ECs utilized as part of the remedy are the bedrock groundwater and LNAPL recovery HIT events coupled with the sub-slab vapor extraction system for the on-Site building. The ICs include obtaining an environmental easement that restricts site use to commercial/industrial use only and prohibits the use of groundwater at the site, preparation of a SMP and periodic review of the IC/ECs to ensure the continued integrity of any such control.

11.2.2 Screening and Analysis

A Track 4 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) including bedrock groundwater and LNAPL extraction HIT events and soil vapor mitigation was evaluated as a remedial alternative. A detailed evaluation of the alternative is presented on **Table 14**. This alternative is not technically and administratively difficult and, therefore, is readily implementable. A Track 4 cleanup would not reduce the soil impacts beyond what was achieved from implementing the IRMs during the RI but the bedrock groundwater and LNAPL extraction HIT events and soil vapor mitigation would reduce the toxicity, mobility and volume of impacted bedrock groundwater and soil vapor beyond what was achieved from implementing the IRMs during the RI. A map showing the areas where a demarcation layer and asphalt/concrete pavement or at least one (1) foot of clean cover will be placed where contamination is present in the exposed surface soil above 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs is included as **Figure 43**. The remedy would provide compliance with all the RAOs established in Section 9.0. This remedy would not achieve 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs but would be compliant with guidance outlined in NYSDEC DER-10 (Ref 4) regarding appropriate measures to take regarding exposed surface soil that does not meet appropriate SCOs. The remedy would strive to be compliant with groundwater standards contained in NYSDEC TOGS 1.1.1 (Ref 14) and would be compliant with soil vapor guidance contained in NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref 15). Because the remedy achieves the RAOs for soil impacts on-Site and mitigates bedrock groundwater and soil vapor impacts, it would result in long-term effectiveness with the exception that impacted groundwater may exit the site in-between HIT events.

The short-term effectiveness of the technology would be high because of the minimal potential for exposure of environmental workers to the most impacted soil because cover will be placed over these soils as shown on **Figure 43**. Additionally, there are no intrusive activities planned for the bedrock groundwater and LNAPL extraction HIT events thus eliminating potential exposure to impacted soils. Although dust, noise, odor and increased truck traffic could be a potential risk to the community, the risk is minimized over remedial alternatives #3, #4 and #5. This remedy would not require temporary or permanent re-routing of the gas line servicing the on-Site building thus eliminating the potential to expose workers to an explosion hazard. This alternative eliminates soil being transported off-site for disposal as well as minimizing the amount of clean fill/cover that is needed to be brought to the site.

This remedy ranks high from a cost perspective because this alternative is the least expensive of the remedial alternatives that can achieve all the RAOs for the Site. A detailed cost analysis of this remedial option is included as **Table 16** which indicates the net present value of remedial option #2 is $1,525,698 inclusive of the capital cost of the IRM, the supplemental remedial investigation and the pumping tests which is approximately $1,169,146.

This option provides for mitigation of bedrock groundwater and soil vapor impacts and minimizes excavation activities resulting in minimized dust, noise, truck traffic and potential nuisance odors. Therefore, this remedial option would most likely be positively perceived by the community.

11.3 Alternative #3: Track 4 Cleanup with GWP&C and Vapor Mitigation

11.3.1 Identification and Description

Remedial alternative #3 is defined as a Track 4 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) via capping of exposed surface soils with one or more SVOC and/or metal concentration exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. Bulk reduction in bedrock groundwater contamination to asymptotic levels is achieved to the extent feasible through extraction of bedrock groundwater via pump(s) followed by treatment of bedrock groundwater via (GAC) and permitted discharge in the BSA combined sanitary/storm sewer system servicing the Site. Soil vapor impacts are mitigated through installation of a sub-slab vapor extraction system.

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This remedy will include a number of long term IC/ECs. The engineering controls include maintaining the security fencing encompassing the site to prevent unauthorized personnel from accessing the Site and placement of a demarcation layer and asphalt/concrete pavement or at least one (1) foot of clean cover where contamination is present in the exposed surface soil above 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. Additionally, two long term ECs utilized as part of the remedy are the bedrock groundwater pump and control (GWP&C) system coupled with the sub-slab vapor extraction system for the on-Site building. Please note, the GWP&C system evaluated for remedial option #3 differs from the systems evaluated in remedial options #4 and #5. The difference is because for the bedrock GWP&C system, bedrock groundwater is collected from the less impacted downgradient portion of the site to prevent impacted groundwater from exiting the site and treat bedrock groundwater over time; whereas the bedrock groundwater pump and treat (GWP&T) systems evaluated in remedial options #4 and #5 collect groundwater form the more impacted northern portion of the site to not only control groundwater but to aggressively treat it, thus costing more overall, but results in a shorten operational timeframe. This, however, does not mean the GWP&C system is not capable of remediating the groundwater, it will just take longer than the more aggressive pumping well selection evaluated in Alternatives #4 and #5. The ICs include obtaining an environmental easement that restricts site use to commercial/industrial use only and prohibits the use of groundwater at the site, preparation of a SMP and, periodic review of the IC/ECs to ensure the continued integrity of any such control.

11.3.2 Screening and Analysis

A Track 4 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) including bedrock GWP&C, and soil vapor mitigation was evaluated as a remedial alternative. A detailed evaluation of the alternative is presented on **Table 14**. This alternative is not technically and administratively difficult and, therefore, is readily implementable. A Track 4 cleanup would not reduce the soil impacts beyond what was achieved from implementing the IRMs during the RI but bedrock GWP&C and soil vapor mitigation systems would reduce the toxicity, mobility and volume of impacted bedrock groundwater and soil vapor beyond what was achieved from implementing the IRMs during the RI. A map showing the areas where a demarcation layer and asphalt/concrete pavement or at least one (1) foot of clean cover will be placed where contamination is present in the exposed surface soil above 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs is included as **Figure 43**. The remedy would provide compliance with all the RAOs established in

Section 9.0. This remedy would not achieve 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs but would be compliant with guidance outlined in NYSDEC DER-10 (Ref 4) regarding appropriate measures to take regarding exposed surface soil that does not meet appropriate SCOs. The remedy would strive to be compliant with groundwater standards contained in NYSDEC TOGS 1.1.1 (Ref 14) and would be compliant with soil vapor guidance contained in NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref 14). Because the remedy achieves the RAOs for soil impacts on-Site, provides hydraulic control and mitigates soil vapor impacts it would result in long-term effectiveness.

The short-term effectiveness of the technology would be high because of the minimal potential for exposure of environmental workers to the most impacted soil because cover will be placed over these soils as shown on **Figure 43**. The proposed bedrock GWP&C system piping trench is anticipated to be installed predominantly in areas that have previously been excavated, thus minimizing potential exposure to impacted soils. This would also minimize the potential to place the surrounding community at risk from vapors and odors, therefore, it is unlikely odor suppression agents such as foam would be necessary. Although dust, noise and increased truck traffic could be a potential risk to the community, the risk is minimized over remedial alternatives #4 and #5. This remedy would not require temporary or permanent re-routing of the gas line servicing the on-Site building thus eliminating the potential to expose workers to an explosion hazard.

Installing a permanent bedrock GWP&C system instead of the HIT events discussed above may necessitate trenching through soil/fill where concentrations exceed 6NYCRR Part 375 6.8 (a) (Ref 5) Commercial SCOs. Soils in these areas would need to be transported and disposed of at a permitted disposal facility. Of the alternatives that necessitates soil disposal (Alternatives #3, 4 and 5), this alternative minimizes the amount of soil needed to be transported off-site for disposal as well as the amount of clean fill/cover that is needed to be brought to the site.

This remedy ranks neutral from a cost perspective because the installation and operation of a dedicated bedrock GWP&T system to mitigate impacts to the groundwater are greater than the costs for HIT events as described above. A detailed cost analysis of this remedial option is included as **Table 17** which indicates the net present value of remedial option #3 is $2,473,511 inclusive of the capital cost of the IRM, the supplemental remedial investigation and the pumping test which is approximately $1,169,146.

This option provides for mitigation of bedrock groundwater and soil vapor impacts and minimizes excavation activities resulting in minimized dust, noise, truck traffic and potential nuisance odors. Therefore, this remedial option would most likely be positively perceived by the community.

11.4 Alternative #4: Track 2 Cleanup with GWP&T and Vapor Mitigation

11.4.1 Identification and Description

Remedial alternative #3 is defined as a Track 2 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) via excavation of impacted on-Site soils with one or more SVOC and/or metal concentration exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. Bulk reduction in bedrock groundwater contamination to asymptotic levels is achieved to the extent feasible through extraction of bedrock groundwater via pump(s) followed by treatment of bedrock groundwater via (GAC) and permitted discharge in the BSA combined sanitary/storm sewer system servicing the Site. Soil vapor impacts are mitigated through installation of a sub-slab vapor extraction system. There are no long term IC/ECs associated with this remedy beyond the short term operation of the bedrock GWP&T and vapor mitigation systems.

11.4.2 Screening and Analysis

A Track 2 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) with bedrock GWP&T, and soil vapor mitigation was evaluated as a remedial alternative. A detailed evaluation of the alternative is presented on **Table 14**. This alternative is technically and administratively difficult and, therefore, is not readily implementable. A Track 2 cleanup would reduce the soil impacts below 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs on-Site and the bedrock GWP&T and soil vapor mitigation systems would reduce the toxicity, mobility and volume of impacted bedrock groundwater and soil vapor beyond what was achieved from implementing the IRMs during the RI. A map showing the extent of excavation required to meet 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs on-Site is included as **Figure 44**. The remedy would provide compliance with all the RAOs established in Section 9.0. This remedy would achieve 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. The remedy would strive to be compliant with groundwater standards contained in NYSDEC TOGS 1.1.1 (Ref 14) and be compliant with soil vapor guidance contained in NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*

(Ref 15). Because the remedy reduces soil impacts on-Site, provides hydraulic control and mitigates soil vapor impacts it would result in long-term effectiveness.

The short-term effectiveness of the technology would be low because of the potential exposure of environmental workers to the most impacted soil on-Site via open excavation. Excavation activities would have the potential to put the surrounding community at risk from vapors, odors, dust, noise and increased truck traffic. Odor suppression agents such as foam and dust suppression agents such as water would need to be kept at-the-ready. This remedy would require removal of impacted soil in the vicinity of the gas line servicing the on-Site building requiring temporary re-routing of the line followed by re-installation exposing workers to a potential explosion hazard. Additionally, the property owner would lose access to most of the property for approximately three to four weeks.

A Track 2 remediation alternative would necessitate excavation of all soil/fill where concentrations exceed 6NYCRR Part 375 6.8 (a) (Ref 5) Commercial SCOs as shown on **Figure 44** and in **Tables 4 and 10**. Taking into account the area of excavation shown on **Figure 44** (approximately 14,300 ft^2) excavated to the top of bedrock at approximately eight (8) ftbg, results in excavation of approximately 4,300 yd^3 or approximately 6,500 tons of soil.

Due to the costs associated with re-routing and re-installation of the gas line, and extensive soil excavation, disposal and subsequent backfill, this remedy ranks low from a cost perspective since it is the second most expensive out of the four alternatives considered. A detailed cost analysis of this remedial option is included as **Table 18** which indicates the net present value of remedial option #4 is $3,872,256 inclusive of the capital cost of the IRM, the supplemental remedial investigation and the pumping test which is approximately $1,169,146

Although this option provides for mitigation of bedrock groundwater and soil vapor impacts, due to the long term excavation activities resulting in increased dust, noise, truck traffic and potential nuisance odors, this remedial option would most likely be negatively perceived by the community

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11.5 Alternative #5: Track 1 Cleanup with GWP&T

11.5.1 Identification and Description

Remedial alternative #5 is defined as a Track 1 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) via excavation of impacted on-Site soils with one or more VOC, SVOC, PCB and/or metal concentration exceeding 6NYCRR Part 375 6.8 (a) (Ref 5) Unrestricted SCOs. Bulk reduction in bedrock groundwater contamination to asymptotic levels is achieved to the extent feasible through extraction of bedrock groundwater via pump(s) followed by treatment of bedrock groundwater via (GAC) and permitted discharge in the BSA combined sanitary/storm sewer system servicing the Site. Soil vapor impacts will not need to be mitigated since the on-Site building would need to be demolished to facilitate soil removal. There are no long term IC/ECs associated with this remedy beyond the short term operation of the bedrock GWP&T system.

11.5.2 Screening and Analysis

A Track 1 cleanup as defined in 6NYCRR Subpart 375-3 (Ref 5) with bedrock GWP&T and soil vapor mitigation was evaluated as a remedial alternative. A detailed evaluation of the alternative is presented on **Table 14**. This alternative is technically and administratively difficult and, therefore, is not readily implementable. A Track 1 cleanup would eliminate the soil impacts and reduce the toxicity, mobility and volume of impacted bedrock groundwater and soil vapor beyond what was achieved from implementing the IRMs during the RI. A map showing the extent of excavation required to meet 6NYCRR Part 375 6.8 (a) (Ref 5) Unrestricted SCOs on-Site is included as **Figure 45**. This remedy would provide compliance with all the RAOs established in Section 9.0. This remedy would achieve 6NYCRR Part 375 6.8 (a) (Ref 5) Unrestricted SCOs. This remedy would strive to be compliant with groundwater standards contained in NYSDEC TOGS 1.1.1 (Ref 14) and be compliant with soil vapor guidance contained in NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (Ref 15). Because the remedy eliminates soil impacts on-Site, provides hydraulic control and eliminates the need to mitigate soil vapor impacts, it would result in long-term effectiveness.

The short-term effectiveness of the remedy would be low because of the potential exposure of environmental workers to the most impacted soil on-Site via open excavation. Excavation activities would have the potential to put the surrounding community at risk from vapors, odors, dust, noise and increased truck traffic. Odor suppression agents such as foam and dust suppression agents such as water would need to be kept at-the-ready. This remedy would require removal of impacted soil in the vicinity of the gas line servicing the on-Site building requiring removal of the line exposing workers to a potential explosion hazard. This remedy would also expose workers to the hazards associated with demolition of the on-Site building to facilitate soil removal. Additionally, the property owner would lose access to nearly all of the property for approximately four to five weeks in addition to the loss of the on-Site building.

A Track 1 remediation alternative would necessitate excavation of all soil/fill where concentrations exceed 6NYCRR Part 375 6.8 (a) (Ref 5) Unrestricted SCOs as shown on **Figure 45** and in **Tables 4 and 10**. This option would require demolition and disposal of the current building on-Site to facilitate soil removal. Taking into account the area of excavation shown on **Figure 45** (approximately 25,000 square feet [ft^2]) excavated to the top of bedrock at approximately eight (8) ftbg, results in excavation of approximately 7,500 cubic yards (yd^3) or approximately 11,500 tons of soil.

Due to the costs associated with removing gas line, demolition of the warehouse and extensive soil excavation, disposal and subsequent backfill, this remedy ranks low from a cost perspective since it is the most expensive out of the four alternative considered. A detailed cost analysis of this remedial option is included as **Table 19** which indicates the net present value of remedial option #5 is $4,356,913 inclusive of the capital cost of the IRM, the supplemental remedial investigation and the pumping test which is approximately $1,169,146.

Although this option provides for mitigation of bedrock groundwater impacts and eliminates the need for mitigation of soil vapor impacts, due to the long term excavation, demolition and construction activities resulting in increased dust, noise, truck traffic and potential nuisance odors, this remedial option would most likely be negatively perceived by the community

12.0 RECOMENDATIONS

Based on the analysis provided in Section 11.0, the detailed alternative analysis in **Table 14** and the summary of lifecycle costs shown in **Table 20**, remedial alternative #3 (Track 4 cleanup with GWP&C and Vapor Mitigation), is the preferred remedial option. This option presents the least short term exposure risk to environmental workers and the community as well as being the most cost effective of the remedial

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alternatives that is compliant with SCGs and can achieve all the RAOs for the Site as well as provide hydraulic control to prevent impacted groundwater from leaving the Site. It reduces the toxicity, mobility and volume of contamination at the Site and provides long term effectiveness to maintain protection of human health and the environment through the use of IC/ECs. Additionally, this alternative is most likely to be positively perceived by the community.

13.0 REMEDIAL ACTION WORK PLAN

13.1 Introduction and Purpose

As discussed in Section 1, several IRMs have been implemented at the site resulting in a total of 1,211.35 tons of impacted soil along with 23.49 tons of C&D debris excavated from the test pits/excavations shown on **Figure 23** and transported for off-site disposal. A total of 1,446.95 tons of clean backfill has been brought to the site thus removing and/or covering impacted soil exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs. In addition to a number of other remedial actions, a total of six (6) orphaned USTs were removed and properly disposed of.

Results of the initial RI indicate the grossly impacted soil and source material were excavated and disposed of, but there were data gaps concerning soil quality on the north of the site, the effect of the sewer located under Hannah Street on the on-Site bedrock groundwater table, if there was potential for soil vapor impact to the property to the north of the Site and there was an incomplete understanding of the source of the most impacted groundwater on the upgradient portion of the Site. To this end, the supplemental RI and pumping tests were conducted to fill in the data gaps. The supplemental RI and pumping tests provided the needed data to characterize the soil on the north of the site, to dismiss the effect of the sewer on the on-Site bedrock groundwater table, to dismiss the potential for soil vapor impact to the property to the north of the Site, to determine the greatest impacts to bedrock groundwater on the upgradient portion of the site are most likely related to the soil and orphaned USTs removed during the IRMs and, to determine the bedrock groundwater impacts are localized because there is no evidence of off-Site grossly impacted sources and groundwater quality improves to the south and west of BR-1.

As discussed in Section 11 and 12, the AAR recommended a Remedial Action (RA) be conducted to address potential exposure risks discussed in Section 8.0. The RA is intended to address the exposure risks related to remaining SVOC and select metals impacts in exposed surface soil, elevated VOC concentrations in soil vapor and indoor air, and elevated VOC, SVOC and PCB impacts in bedrock groundwater. The RAs recommended include, placement of a demarcation layer and soil cover or asphalt/concrete pavement over remaining surface soils with contaminant concentrations exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs, installation and operation of a vapor mitigation system for the on-Site building and installation and operation of a GWP&C system. Details of the design and implementation of the aforementioned RAs are provided in following sections of this Remedial Action Work Plan (RAP).

All work conducted during implementation of the RAP will be completed in accordance with the RAP support documents discussed in Section 14.

13.2 Soil Cap Design and Installation

13.2.1 Design Basis and Remedial Goals

The soil analytical data discussed in Section 6.1 was used as the basis for determining where exposed surface soil contaminant concentrations exceed 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs as shown on **Figure 43**. The remedial goal of the cap is to prevent contact or exposure to this soil, therefore, in accordance with guidance contained in NYSDEC DER-10 (Ref 4), a demarcation layer will be placed and these areas will be capped with asphalt/concrete pavement or a minimum of one (1) foot of clean fill.

13.2.2 Cap Installation

Pavement and/or concrete will be used as the cap over exposed surface soil with contaminant concentrations exceeding 6NYCRR Part 375 6.8 (b) (Ref 5) Commercial SCOs in the areas depicted on **Figure 43**. Fill material may be brought to the site for grading purposes. Fill material will be gravel, rock or stone consisting of virgin material from a permitted mine or quarry, or recycled concrete or brick from a NYSDEC registered construction and demolition debris processing facility provided the material conforms to the requirements of Section 304 of the New York State Department of Transportation Standard Specifications Construction and Materials Volume 1 (2002). Therefore, as specified in NYSDEC DER-10 (Ref 4), no documentation samples are required for this material.

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13.3 Soil Cap Maintenance

Procedures for inspecting and maintaining the cap system will be outlined in the operation and maintenance (O&M) plan included in the SMP discussed in Section 13.8. At a minimum, the cap components will be inspected once a quarter for evidence of degradation, erosion or failure. Any such deficiency will be documented any corrected as soon as reasonable feasible.

13.4 Vapor Mitigation System Design and Installation

13.4.1 Design Basis and Remedial Goals

Sub slab and indoor air sampling data as discussed in Section 6.4 were used as the basis for the design of the vapor mitigation system. The remedial goal of the vapor mitigation system is to create a minimum negative pressure differential of at least 0.004 inches of water below the on-Site building concrete slab to prevent potential soil vapor intrusion into indoor air until such time as bedrock groundwater impacts have been remediated to where it would be appropriate to turn the system off.

13.4.2 Pre-Installation Activities

Prior to any installation, the concrete slab of the on-Site building will be inspected for any cracks and/or gaps that may compromise the integrity of the slab. A sealant will be used to fill and repair any cracks or gaps that are identified.

13.4.3 Vapor Extraction Points

In order to achieve sufficient negative pressure (minimum pressure differential of 0.004 inches of water) under the concrete slab of the on-Site building, AFI anticipates installing two vapor extraction points in the vicinity of sub-slab sample points, SV1-SS and SV3-SS installed to conduct the SVI investigation in 2012 as shown on **Figure 41**. Details of the vapor mitigation system including a typical suction point are shown on **Figure 46**. The suction point will be constructed by drilling a 6-inch diameter hole through the existing concrete slab. One (1) to two (2) cubic feet of soil will be removed from beneath the slab to create the suction point sump. The sump will then be left open to create a void from which sub-slab soil

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gas is drawn from under the concrete slab. The vent pipe riser will be secured to a PVC cover plate over the suction point. Silicone caulk will be used to seal the cover plate in place to minimize leakage of indoor air into the vapor mitigation system.

13.4.4 System Components

The vent pipe riser design will be generally consistent with USEPA (2008) and ASTM (2009) design parameters. The proposed vent pipe riser will be composed of 4-inch Schedule 20 PVC pipe. The bottom of the vent pipe riser will be secured to prevent downward migration of the vent pipe riser into the suction points. Each vent pipe riser will be equipped with a sample port to monitor sub-slab soil gas removed by the system. Each vent pipe riser will be equipped with a differential pressure gauge. This pressure gauge will be a U-tube filled with colored fluid. This gauge will allow quick and easy confirmation that the system fan remains operational. An alarm will also be installed to alert building occupants if the system fails. A sticker with AFI contact information will be fixed on the vent pipe riser adjacent to the differential pressure gauge with instructions to contact AFI if the differential pressure gauge or alarm indicates that the system is not operating as intended.

From each suction point, the vent pipe riser will extend vertically up the nearest building wall. A 90^{o} PVC elbow will be used to run the vent pipe horizontally along the wall to connect to a common vent exhaust pipe. PVC joints and fittings will be used as needed to route the vent pipe riser around utilities or other building features as necessary. Supports for the vent pipe riser will be installed at least every eight (8) feet along length of the riser pipe. All PVC joints will be permanently sealed with PVC pipe cement to prevent leakage from the vent pipe riser.

The common vent exhaust pipe riser will run through the building wall and extend vertically up the outside of the building to the fan located at the vent discharge. The vent pipe riser will discharge at least two feet above the top of the roof, and at least ten feet from the nearest window.

The vapor mitigation system exhaust fan will be a typical inline fan utilized in radon mitigation systems. Specifications and blower curves for the fan that is installed will be included in the O&M plan included in the SMP discussed in Section 13.8. The exhaust fan will be hard wired into the building's existing electrical system to help ensure that the fan remains in continuous operation. For system safety and maintenance, a disconnect switch will be located within sight of the fan.

13.5 Vapor Mitigation System Operation and Maintenance

Complete procedures for start-up, operating and maintaining the vapor mitigation system will be outlined in the O&M plan included in the SMP discussed in Section 13.8.

13.5.1 Verification of System Integrity

Following installation of the vapor mitigation system components, caulked joints and seals will require a minimum of one (1) day or more to cure, depending on manufacturer recommendations for each caulk and/or sealant used. Therefore, system start-up will be at least one (1) week from system installation. Upon system start-up, joints and seals will be visually and audibly inspected for leaks. If leaks are detected, the system will be turned off so that leaks can be repaired and allowed to set. The system will be initiated again as soon as feasible after leak repair (small leaks may only require a few minutes to set sufficiently for system start-up).

If no leaks are detected, all of the critical safety devices will be triggered to ensure correct operation. Any unsafe operating conditions and/or safety device deficiencies will be corrected before continuing to verification of system performance as described in Section 13.5.2. NYSDEC will be informed of any delays in system start-up as well as an anticipated resolution if the delay is expected to be greater than three (3) days.

13.5.2 Verification of System Performance

Pending successful system start-up as described in Section 13.5.1, adequate system performance will be verified by installing several sub slab monitoring points at various points inside the on-Site building and verifying a minimum pressure differential of 0.004 inches of water. The sub slab monitoring points will be installed by drilling a ½-inch hole that penetrates at least six (6) inches below the concrete slab. A tube will be placed into the hole and the space between the tubing and concrete will be sealed. A pressure gauge will be connected to the tube to measure the pressure differential between the indoor air and the sub slab air. If in-sufficient pressure differential readings are obtained at any monitoring point, options for correcting the system deficiency will be evaluated and implemented. Additional testing and modifications will be conducted until such time as sufficient pressure differentials are obtained at all monitoring points.

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Once sufficient pressure differentials are obtained at all monitoring points, the tubing will be removed from the monitoring points and the holes in the concrete slab will be sealed off. No further sub slab testing or system modifications will be conducted and routine system inspection and maintenance will be initiated as discussed in Section 13.5.3.

13.5.3 Quarterly System O&M Visits

Pending verification of adequate system performance as described in Section 13.5.2, quarterly system O&M visits will be conducted to verify that the system is operating as expected. Full details of the O&M procedures will be outlined in the O&M plan included in the SMP discussed in Section 13.8. At a minimum, the visit will include the following:

- A differential pressure gauge reading will be taken at each vapor extraction point and recorded.
- The condition of system piping, fittings, and pipe supports will be evaluated and recorded.
- The condition of foundation sealing will be evaluated and recorded.
- Changes to building structure will be evaluated and recorded.

Deficiencies identified during quarterly O&M visit will be corrected as soon as possible, typically within 30 days of discovery.

13.6 Bedrock GWP&C System Design and Installation

13.6.1 Design Basis and Remedial Goals

Bedrock groundwater monitoring and sampling data as discussed in Section 6.2 and 6.3 and results of the various pumping tests discussed in Section 3.8 and 5.5 were used as the basis for the design of the bedrock GWP&C system. The remedial goals of the system are as follows:

- Bulk reduction in bedrock groundwater contamination to asymptotic levels to the extent feasible.
- Create an inward bedrock groundwater gradient to prevent impacted bedrock groundwater from exiting the site.

The following remedial design may be modified based on actual operating data. This operational data will be continuously evaluated to determine if system operation will be continued as designed, if operation with a modified design is appropriate, or if system shut down is appropriate. NYSDEC will be notified in writing of any such proposed design or operational changes.

13.6.2 Bedrock Groundwater Extraction Well Network

A review of **Table 7** indicates the greatest impacts to bedrock groundwater for total VOCs, SVOCs and total PCBs exceeding NYSDEC TOGS 1.1.1 (Ref 14) groundwater standards are on the southwestern portion of the site (BR-1, BR-2, BR-9 and BR-11). As is shown in the bedrock groundwater elevation contours on **Figures 29, 30, 39 and 40**, wells BR-1, BR-2, BR-9 and BR-11 are located on the upgradient portion of the site. Therefore, it is important to ensure groundwater capture in this area. As discussed in Section 5.5, a review of **Figure 35** shows a site-wide in-ward gradient resulting in prevention of impacted groundwater from exiting the site could be achieved by pumping at approximately 0.3 GPM out of BR-7. Therefore, in order to ensure bedrock groundwater recovery in the most impacted area of the site and to ensure impacted groundwater does not exit the site, BR-7 will be used as the bedrock groundwater extraction well for the bedrock GWP&C system. **Figure 47** shows the anticipated ROI for the bedrock GWP&C system.

13.6.3 System Components

A conceptual process and instrumentation diagram (P&ID) for the bedrock GWP&C system is included as **Figure 48**. Complete details of the actual bedrock GWP&C system installed will be included in the O&M plan included in the SMP discussed in section 13.8. The bedrock GWP&C equipment enclosure will be constructed in the location shown on **Figure 43**. In order to recover bedrock groundwater in the extraction well, a submersible pump will be placed in the bedrock groundwater extraction well (BR-7). Details of the actual pump utilized will be included in the O&M plan included in the SMP discussed in Section 13.8. Pump power and fluid discharge lines will run from the remedial system enclosure to the pumping well in the proposed bedrock GWP&C system trench as shown on **Figure 43**. A typical bedrock GWP&C system trench cross section is shown on **Figure 49**. The trench will be excavated to sufficient depth to facilitate installation of the piping on a six (6) inch bed of pea gravel and remain at least 36-inches below grade to protect the lines from freezing. Additionally, the bedrock GWP&C system

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discharge line will slope away from the remedial system at 1 foot per 50 feet ensuring positive drainage from the system.

The soil around the pumping well will be removed to sufficient depth to facilitate necessary wellhead connections. It is anticipated the well casing will be cut off approximately 3-4 feet below grade where the pump power supply and fluid discharge lines will exit from the remedial system trench. The well cap will be fitted with a fastener to attach the support cable that will suspend the pump in the well. A traffic rated flush mount well vault of sufficient size (3 ft X 3 ft minimum) will be installed to provide adequate working room to perform maintenance activities as necessary.

Based on the data collected during the pumping test on BR-7, the total flow from the pumping well is expected to be approximately 0.5 GPM.

The discharge from the pump will enter the remedial system enclosure and flow into an equalization tank. The water will then be pumped via a transfer pump through a 10 micron followed by a 5 micron particulate filer before entering two (2) 1,000 pound GAC units in series.

The granulated activated carbon (GAC) usage calculations shown in **Table 21** using the latest bedrock groundwater sampling data from BR-7, indicates approximately 9.86 pounds of GAC per day is needed to treat the VOCs and SVOCs in the extracted bedrock groundwater prior to discharge. Due to the size of the anticipated remedial area, the maximum size of GAC vessels to be used are two (2) 1,000 pound units in series. This should provide adequate treatment for average concentration plus a measure of safety in the unlikely event LNAPL enters the system.

The water will then flow through a 0.5 micron particulate filter followed by a flow totalizer and final permitted discharge into the BSA combined sanitary/storm sewer system.

The system will be connected to a central control panel and interlocked to automatically shut down on any of the following fault conditions:

- High water in the EQ tank;
- High pressure in the filters if they become clogged;
- High pressure in the GAC units if they become fouled;
- Any additional fault conditions identified during system installation.

An alarm will be installed to alert building occupants if any of the aforementioned fault conditions occur. A sticker with AFI contact information will be fixed on the remedial system equipment enclosure with instructions to contact AFI if the alarm indicates that the system is not operating as intended.

13.7 Bedrock GWP&C Operation and Maintenance

Complete procedures for start-up, operating and maintaining the bedrock GWP&C system will be outlined in the O&M plan included in the SMP discussed in Section 13.8.

13.7.1 Verification of System Integrity

Following installation of the bedrock GWP&C system components, glued joints and seals will require a minimum of one (1) day or more to cure, depending on manufacturer recommendations for each caulk and/or sealant used. Therefore, system start-up will be at least one (1) week from system installation. Prior to system start-up, each bedrock monitoring well will be measured for static groundwater level and LNAPL using an oil/water interface probe. Upon system start-up, joints and seals will be visually and audibly inspected for leaks. If leaks are detected, the system will be turned off so that leaks can be repaired and allowed to set. The system will be initiated again as soon as feasible after leak repair (small leaks may only require a few minutes to set sufficiently for system start-up).

If no leaks are detected, all of the critical safety devices will be triggered to ensure correct operation. Any unsafe operating conditions and/or safety device deficiencies will be corrected before continuing to verification of system performance as described in Section 13.7.2. NYSDEC will be informed of any delays in system start-up as well as an anticipated resolution if the delay is expected to be greater than three (3) days.

13.7.2 Verification of System Performance

Pending successful system start-up and critical safety device validation as described in Section 13.7.1, daily system O&M visits will be conducted for a minimum of three (3) consecutive days. The following

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tasks and any additional tasks identified during system install and/or system start-up will be completed during the system shakedown period:

- Monitor the water level in the pumping well to ensure maximum drawdown is maintained;
- Monitor the water/LNAPL levels in the remaining bedrock monitoring wells and compare to the pre start-up static water levels to verify system ROI;
- Inspect the system piping and components for leaks that may develop over time;
- Monitor the transfer pumps, pressure gauges and liquid levels in the system components to ensure flow rates are optimized.
- Monitor the pressure differential across the particulate filters and the GAC units for excessive blockage preventing adequate system flow.
- At least once, collect a water sample to be sent for laboratory analysis for TCL VOCs by USEPA method 8260, TCL SVOCs using USEPA method 8270 and PCBs using USEPA method 8082 at the following locations:
    - Influent to the GAC units;
    - In-between the GAC units; and,
    - Effluent to the BSA combined sanitary/storm sewer system (laboratory analysis dependent on permit requirements).

If system operating deficiencies are discovered, system operation, components and/or configuration will be modified as necessary to achieve required system performance objectives. Any system design or component modifications will be reported to NYSDEC. Additional daily O&M visits will be conducted as needed to ensure the bedrock GWP&C system is operating as designed. Once the system has been optimized and is operating as designed, routine O&M will be initiated as described in the following sections.

13.7.3 Bi-Weekly O&M Visits

Pending verification of adequate system performance as described in Section 13.7.2, bi-weekly system O&M visits will be conducted to verify the system is operating as expected. Full details of the bi-weekly O&M procedures will be outlined in the O&M plan included in the SMP discussed in Section 13.8. At a minimum, the bi-weekly O&M visit will include the following:

- A depth to water reading will be collected at the pumping well and recorded.
- A down well pump found to be malfunctioning will be pulled and cleaned and/or repaired and returned to service. After pumping is resumed, the water level in the pumping well will be monitored to ensure maximum drawdown in achieved.
- The condition of bedrock monitoring wells, the pumping well vault, system piping, fittings, and remedial system enclosure will be evaluated and recorded.
- The pressure differential across the particulate filters and the GAC units will be recorded. The particulate filters will be changed if excessive pressure differentials indicate clogged filters.
- The totalizer reading will be recorded.
- Any routine equipment maintenance per manufacture specifications will be completed.
- Once a month, a system performance monitoring sample will be collected before the secondary GAC unit to monitor for carbon breakthrough in the primary GAC unit. The sample will be sent for laboratory analysis for TCL VOCs by USEPA method 8260 and PCBs using USEPA method 8082.
- System effluent discharge sampling will be conducted as required by the BSA sewer discharge permit.
- Results of the system samples will be used to modify system operation and to determine appropriate timing of carbon change-outs.
- A carbon change-out will be conducted if warranted.
- Waste disposal activities will be conducted if warranted.
- Any other tasks needed to ensure proper and compliant system operation

Deficiencies identified during bi-weekly bedrock GWP&C O&M visits will be corrected as soon as possible, typically within 30 days of discovery. If any deficiency requires temporary shut-down of the system for more than three (3) days, NYSDEC will be notified of the deficiency requiring the shut-down and an anticipated schedule for system repair and start-up.

13.8 Institutional and Engineering Controls

Following completion of the RA activities the following Institutional and Engineering Controls (IC/ECs) will be in place or implemented:

- The cover system described in Sections 13.2 and 13.3 will serve as a long term (longer than five [5] years) EC for the site.
- The security fence currently encompassing the site will serve as a long term EC for the site.
- The vapor mitigation system described in Sections 13.4 and 13.5 will serve as a long term EC for the site.
- The bedrock GWP&C system described in Section 13.6 and 13.7 will serve as a long term EC for the site.
- An environmental easement has been prepared that restricts site use to commercial/industrial use only and prohibits the use of groundwater at the site.
- A Site Management Plan (SMP) will be prepared in accordance with Section 6.2 of NYSDEC DER-10 (Ref 4) which will include the following components:
    - An institutional and engineering control plan detailing the steps and media-specific requirements necessary to assure the institutional and/or engineering controls remain in place and effective, identification of items to be evaluated for the IC/EC certification, identification of areas of the site where contamination remains to be managed by the SMP, an excavation plan for managing site excavations and a site-specific HASP and CAMP.
    - A monitoring plan describing the measures for monitoring the performance and effectiveness of the bedrock GWP&C and vapor mitigation systems.
    - An O&M plan describing the physical components of the bedrock GWP&C and vapor mitigations systems. The O&M plan will include procedures for start-up, operation, monitoring, optimization and maintenance of remedial systems.

14.0 REMEDIAL ACTION WORK PLAN SUPPORT DOCUMENTS

All work conducted during implementation of the RAP discussed in Section 13 will be conducted in accordance with the support documents discussed below.

14.1 Health and Safety Plan (HASP)

A Site specific Health and Safety Plan (“HASP”) has been prepared in accordance with 40 CFR 300.150 of the NCP and 29CFR1910.120 for the proposed RAP activities. A copy of the HASP is included as **Appendix H**. The HASP will be enforced by AFI and any AFI subcontractors engaged in RI/IRM field activities in accordance with the requirements of 29 CFR1910.120. The HASP covers on-site investigation and interim remedial activities. Subcontractors will be required to develop and implement a HASP as or more stringent an AFI’s HASP. Health and safety activities will be monitored throughout implementation of the RAP. A member of the field team will be designated to serve as the on-site Health and Safety Officer throughout the field program. This person will report directly to the Project Manager and the Corporate Health and Safety Coordinator. The HASP will be subject to revision as necessary, based on new information that is discovered during the field work. The HASP also includes a contingency plan that addresses potential site-specific emergencies.

14.2 Community Air Monitoring Plan (CAMP)

The HASP also includes a Community Air Monitoring Plan (CAMP) that describes required particulate and vapor monitoring to protect the neighboring community during intrusive site activities. The CAMP is included as **Appendix I**. The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by NYSDOH and NYSDEC. Accordingly it follows procedures and practices outlined under NYSDOH’s *Generic Community Air Monitoring Plan* (dated December 2002) and NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4031, *Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites*.

14.3 Quality Assurance Project Plan (QAPP)

There is no documentation and/or confirmatory sampling planned for the implementation of the RAP, therefore, a QAPP is not included as part of this submittal.

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15.0 SCHEDULE

Concurrent to NYSDEC and NYSDOH review and approval of the recommended remedial alternative set forth in Section 12.0, the RAP presented in Section 13 and subsequent receipt of the decision document (DD) detailing the approved remedial alternative for the Site issued by NYSDEC, AFI is prepared to proceed according to the following schedule:

Deliverable/Action	**Anticipated Deadline**
Implement RAP	June 2015
Begin remedial system operation	July 2015
Submit draft SMP for review	August 1, 2015
Submit draft FER for review	September 15, 2015
Final approval of SMP	October 1, 2015
Final approval of FER	November 15, 2015
Issuance of Certificate of Completion	by December 31, 2015

16.0 REFERENCES

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6. ABB Environmental Services. *Preliminary Site Assessment Report Volume I ENRX, Inc. formerly Voelker Analysis, City of Buffalo, New York Site No. 915150.* August 1995.

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10. United States Department of Agriculture (USDA). *Soil Conservation Service Website*. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

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12. Erie County, New York. *Internet Mapping Service*. N.p., n.d. Web. http://gis2.erie.gov/GC/ErieCountyNY/

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