Former ALCO Site
Brownfield Cleanup Project

City of Schenectady
Schenectady County, New York

Parcel C
Remedial Design Report (RDR)

New York State
Brownfield Cleanup Program
Site No. C447044

December 2015

Barton & Loguidice

Former ALCO Site
Brownfield Cleanup Project

City of Schenectady

Parcel C
Remedial Design Report
Site No. C447044

December 2015

Prepared For:

Maxon ALCO Holdings, LLC
540 Broadway
Albany, New York 12207

Prepared By:

Barton & Loguidice, Inc.
Engineers • Environmental Scientists • Planners • Landscape Architects
10 Airline Drive, Suite 200
Albany, New York 12205

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

Scott D. Nostrand, P.E.

Table of Contents

Table of Contents – Continued

Figures

Appendices

1.0 Introduction

Maxon ALCO Holdings, LLC (MAH) entered into Brownfield Cleanup Agreements (BCA) through the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP) for the property located at 301 Nott Street in Schenectady, New York, identified as the ALCO Site (Property or Site) and historically known as the Nott Street Industrial Park (Park). In 2010, after purchasing the property, the Volunteer (Maxon-ALCO Holdings) divided the Property into three parcels: Parcel A, Parcel B and Parcel C (Site Nos. C447042, C447043, and C447044,) and each Parcel was deemed eligible for the BCP and subject to separate BCAs. In November of 2013, MAH proposed the reconfiguration of Parcels B and C to NYSDEC to more efficiently proceed with potential Interim Remedial Measures and redevelopment planning; the proposed reconfiguration was approved by NYSDEC in the first half of 2014.

The purpose of the BCP is to encourage voluntary remediation of brownfield sites for reuse and development. This includes conducting a complete characterization of the Site by performing a Remedial Investigation (RI). The primary objective of the RI is to identify environmental concerns and to provide the basis for evaluating remedial alternatives, if necessary. The RI was completed in the first half of 2012, and the RI Report (prepared by CHA) was submitted to NYSDEC in August 2012. Though a separate Work Plan was prepared for each Parcel, the Remedial Investigation (RI) Report covered the entire Site since remedial decision making will include activities that involve multiple parcels on the ALCO Site.

Specifically, the objectives of the RI were to:

- Supplement the historic investigations that have been conducted on the Site,
- Further identify source(s) of contamination,
- Define the nature and extent of that contamination,
- Assess the impact of contamination on public health or the environment, and
- Provide information for the development and selection of a remedial work plan across all parcels (A, B, and C) that make up the Alco property.

The RI Report also provided a qualitative human health exposure assessment. An exposure pathway is complete when all five elements of an exposure pathway are documented; a potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway is not documented.

The results of the exposure assessment indicated that there is currently one complete potential exposure pathway.

- Potential exposure of current tenants of Buildings 306 and 330 to VOCs in indoor air through inhalation.

The following potential exposure pathways were identified:

- Exposure of future on-Site workers, residents, site occupants to soil, groundwater, soil vapor or LNAPL that may be contaminated with VOCs, SVOCs, and/or metals during future intrusive activities at the Site. Routes of exposure to future on-Site workers could include inhalation, ingestion, dermal contact, eye contact, and puncture/injection.
- Exposure to groundwater that may be contaminated with VOCs, SVOCs, and/or metals if groundwater wells are installed and used for drinking water, etc.

By letter dated December 14, 2012, NYSDEC provided comments on the RI Report; general comments were provided for site-wide issues, and comments specific to each parcel were also provided. The comment letter indicated that no further investigation was required for a majority of the areas/issues that were addressed by the RI. Finally, the comment letter requested additional data collection activities to follow-up on and/or reserve some specified issues to finalize the RI.

In January 2013 Barton & Loguidice prepared a Supplemental Remedial Investigation Work Plan (SRI-WP) to provide the procedures for conducting the requested follow-up work. In follow-up discussions with the NYSDEC, there was concurrence that the design investigation tasks proposed in the Remedial Work Plan (RWP) should be combined with the requested follow-up RI work, as the tasks were 1) similar in nature, and 2) needed to be performed prior to the Remedial Design (RD). The tasks performed during the Supplemental Remedial Investigation are summarized below:

Tasks Requested in the NYSDEC 12/14/12 Letter and Follow-up Discussion:

- Follow-up investigation on the geophysical investigation in identified areas;
- Soil Vapor Intrusion investigation in the identified buildings;
- Installation of three monitoring wells between Buildings 306-320;
- Inspection of Buildings 308 Trench;
- Borings in the MW-36 Area (AOC 1A).

Tasks Proposed in the Remedial Work Plan (RWP):

- Chlorinated Solvent Plume Source Investigation (AOC 2);
- Chlorinated Solvent Plume Delineation (monitoring wells) (AOC 2);
- Monitoring well in the MW-45 Area (AOC 1B).

The SRI activities included the installation of soil borings, monitoring wells, soil vapor monitoring points, and test pits along with the collected of subsurface soil, soil vapor, and groundwater to further characterize the site. The planned scope of SRI activities consisted of the following:

- Installation of three monitoring wells between Buildings 306-320 screening the water table and the collection of groundwater samples for VOCs analysis.
- Installation of three monitoring wells screening the water table near MW-45 to determine the approximate extent of previously documented LNAPL at this location.
- Installation of 12-15 Geoprobe borings around MW-36 to assess the extent of previously documented LNAPL at this location.
- Advancement of approximately 30 membrane interface probe (MIP) borings near SV-C9 and MW-19 to determine the source of the previously documented chlorinated solvent plume.
- Collect subsurface soil samples from the MIP borings for VOCs analysis.
- Installation of four monitoring wells to delineate the chlorinated solvent plume and determine an effective means for mitigation.
- Collection of groundwater samples from the four newly installed chlorinated solvent plume delineation wells along with seven existing plume delineation wells to be analyzed for VOCs.
- Installation of test pits around Ground Penetrating Radar (GPR) area 2, 6, and 8 as a follow-up to the geophysical survey performed during the 2012 Remedial Investigation by CHA.
- Installation of six subsurface soil vapor points in Buildings 300, 306, and 330.
- Inspection and confirmation of filling of the former Building 308 trench system.

The Supplemental RI activities were completed during the period from May through August 2013. Field activities were conducted in general accordance with NYSDEC protocols (including DER-10), the Remedial Action Work Plan (Kleinfelder, Inc., 2010), and the Supplemental Remedial Investigation Work Plan (Barton & Loguidice, P.C., 2013). Deviations from these plans are summarized below.

- Due to the presence of a thick concrete slab in the area surrounding SV-C9 and MW-19 the MIP could not be advanced. Instead, a Geoprobe was utilized to advance the MacroCore and a photoionization detector (PID) and field Gas Chromatograph (GC) were used to screen select samples in the field before submitting to the lab for analysis.
- Monitoring well MW-50 was sampled during the RI and was scheduled for re-sampling, but could not be located and was not sampled.
- The NYSDEC and NYSDOH indicated in a phone call on 5/31/13 that soil vapor samples were not required in Building 300 due to extensive mold in the basement and the

building's current unoccupied status. SVI sampling will be required if the building is to be occupied.

Under contemplated future land use, the objective of the selected remedial alternative would be to prevent exposure to contaminated soil, groundwater, and soil vapor.

The Alternatives Analysis Report (AAR) is the next step in the BCP process; the AAR was prepared by Barton & Loguidice, Inc., and was attached to the Remedial Work Plan (RWP) as Appendix A. As part of the AAR, three areas of concern (AOCs) were identified based on the findings of the RI and the Exposure Assessment:

1. Historic aged Free-phase petroleum on the water table around monitoring well MW-36 and MW-45 (AOCs 1A and 1B) and existing underground storage tanks (USTs) that were not properly closed (AOC 1C);
2. A chlorinated solvent plume in a narrow area of the eastern portion of the Site that extends from the vicinity of MW-19 toward the Mohawk River (AOC 2); and
3. Soil impacts from polynuclear aromatic hydrocarbons (PAHs) (AOC 3).

The AAR presents an evaluation of remedial alternatives to eliminate or mitigate potential threats to public health and the environment at the former ALCO site, to support the selection of the preferred remedy.

1.1 Purpose of Report

This Remedial Design Report presents the design for implementing the remedy identified in the AAR. The alternatives are based upon the findings presented in the August 2012 RI Report. This Remedial Design has been prepared in accordance with DER-10, 6 NYCRR Part 375, and the Brownfield Cleanup Program Guidelines.

1.1.1 Report Organization

This report is organized into four major sections (including this introduction section), with appropriate subsections within each division. Tables, figures and sheets are located following the text, prior to the appendices in the back of the document.

1.2 Site Background

1.2.1 Site Description

The Schenectady Locomotive Engine Manufactory initially developed a portion of the existing Park in 1849. In 1851, the company changed its name to Schenectady Locomotive Works (Works) and continued to develop the Site. In 1901, the Works merged with several other companies to form the American Locomotive Company (ALCO). ALCO operated the Site until 1969. Schenectady Industrial Corporation (SIC) purchased the Park in 1971, with General Electric Company (GE) occupying the Park from 1971 to 1985. Small industrial, manufacturing and fabrication companies have occupied various buildings within the Park since 1985, when occupancy of buildings was returned to SIC.

During April 1992, Coyne Textile Services (CTS), with operations on Front Street, adjacent to the ALCO Site, had a fuel oil release that partially leaked into the municipal storm drain sewer system which flows under the Site, discharging to the Mohawk River at the College Creek Outfall. During inspection of this release, the NYSDEC reportedly observed petroleum seeping from riprap along the bank of the Mohawk River adjacent to Buildings 320 and 324. The NYSDEC requested that a subsurface investigation be performed onshore adjacent to the petroleum seep areas. Following this release, Schenectady Industrial Corporation (SIC) entered into an Order on Consent (OC), (Index No. R4-1338-92-05), with the NYSDEC .

In 1992, SIC performed a subsurface investigation that included advancing a series of five hand-excavated test pits, (TP-A1 through TP-E1), along the riverbank. Soil analytical results indicated total petroleum hydrocarbon (TPH) concentrations up to 12,000 parts per million (ppm). Following these results, two deep soil borings and five shallow soil borings were advanced adjacent to the test pits. The five shallow soil borings were completed at groundwater monitoring wells. Free-phase petroleum was found in two wells and the free-phase petroleum in one well was found to contain trace levels of polychlorinated biphenyls (PCBs). Groundwater analytical results indicated TPH concentrations ranging from 4.6 ppm to 32,200 ppm. Volatile organic compound (VOC) concentrations were detected.

Historically there have been many environmental investigations completed at the former ALCO Site since the initial investigation in 1992. These investigations, some of which were conducted in conjunction with NYSDEC oversight, have taken place across the ALCO-Maxon Site, which has been separated into Parcels A, B and C. In addition to the environmental investigations conducted throughout the former ALCO Industrial property, underground storage tank (UST) removals and remedial activities have been completed on the ALCO-Maxon Site parcels.

Due to the historic industrial impacts identified on the ALCO Site and subsequent to the execution of a BCA, three Remedial Investigation Work Plans (one for each parcel) were prepared by Kleinfelder, Inc. (KLF) and submitted to NYSDEC on May 24, 2010. The Work Plan outlined the procedures and protocols that were to be utilized to conduct a full-scale remedial investigation that would provide the necessary field data to further delineate the nature and extent of contamination at the subject Site. The Work Plan was prepared to conform to the Draft DER-10 *Technical Guidance for Site Investigation and Remediation* issued by the Division of Environmental Remediation (December 2002). The RI Work Plans for Parcels B and C were subsequently approved by the NYSDEC on June 23, 2011. One of the comments received by the NYSDEC was a request for sampling of both the riverbank and Mohawk River sediments adjacent to the Site. Following the submission of a Work Plan Addendum on January 10, 2012, the RI Work Plan for Parcel A was approved by the NYSDEC on January 23, 2012.

1.2.2 Remedial Investigation Findings

1.2.2.1 Geology/Hydrogeology

The Site is underlain by a unit of fill that is present across much of the Site, varying from a minimum depth of 2 feet to a maximum depth observed during the RI of 12.4 feet. In general, the fill material consists of reworked soil (e.g., silt, sand, gravel, and clay) with lesser amounts of brick, concrete, ash/cinders, slag, metal, wood/organics, and glass. In locations where the fill

unit is generally thinner, a fine to coarse grained sand unit of limited thickness is present beneath the fill. Based on the groundwater contours, it is apparent that groundwater flow across the majority of the subject Site is to the North towards the Mohawk River. The horizontal hydraulic gradient from south to north across the Site (i.e., from MW-19 to MW-25D) is approximately 0.006 ft/ft.

1.2.2.2 Surface Soil

The analytical results from this RI indicate that there are no VOC or PCB impacts to surface soil at the Site. These results are generally consistent with results from previous investigations. There are relatively widespread SVOC detections in surface soils at concentrations below Part 375 SCOs, and only limited areas that exceed Part 375 SCOs. The presence of certain VOC and SVOC Tentatively Identified Compounds (TICs) suggest that degradation/breakdown of historic aged petroleum has and/or is occurring across the Site. Lastly, there are limited, isolated areas of arsenic, lead, and/or mercury that slightly exceed Part 375 SCOs; these locations (sample location RB-6 on Parcel A and sample locations SS-A3 and SS-B3 on Parcel B) were identified in the NYSDEC letter of 12/14/12 and will be subject to individual removal actions described in the approved IRM work plan.

1.2.2.3 Subsurface Soil

Analytical results for samples collected from the upper fill/sand unit suggest that there are no significant VOC impacts and only limited SVOC impacts to unsaturated soils. Within the unsaturated zone, the area of highest SVOC concentrations is present in the area just west of Building 308, the area located just south of Building 320, beneath the slab of Building 320, and the area between Buildings 316 and 332.

Based on the analytical results for soil samples that were collected from test pits as part of the current RI and from previous investigations, there is no evidence of any PCB or metal impacts to subsurface soils across the Site.

1.2.2.4 Groundwater

The results obtained during this RI confirm the detection of a historic chlorinated solvent plume, which appears to originate upgradient from or in the vicinity of MW-19 and extends over 1,200 feet in length towards the Mohawk River. The plume appears to be relatively narrow and is well-delineated to the east, south and west. The depth of the plume is relatively shallow (~20 feet bgs) in the vicinity of monitoring well MW-19 and temporary monitoring well TMW-19C and deepens to approximately 50 to 70 feet bgs along the length of the plume. The data confirms that natural degradation is occurring based on the presence of PCE and TCE breakdown products.

The only other areas with impacts to groundwater are those with relatively localized SVOC (PAH) detections that are generally associated with former UST areas or free product recovery areas. However, a comparison of analytical results from this and from previous investigations suggests that contaminant concentrations have generally decreased, with few exceptions. The presence of TICs in most wells across the Site, consisting primarily of petroleum-related

compounds, suggest that degradation/breakdown of historic, aged petroleum has occurred in groundwater across the Site.

1.2.2.5 Soil Vapor Summary

The most apparent impacts to subsurface vapor are present at the southern edge of the Site located just north of Erie Boulevard. The subsurface in this area is primarily impacted by chlorinated VOCs that appear to be related to the underlying chlorinated solvent groundwater plume. Chlorinated VOC impacts extend to the north/northeast and generally follow the direction of the groundwater plume. There are also chlorinated VOC impacts to subsurface soil vapor in a limited area between Buildings 346 and 324 and in the southwestern-most portion of the Site between Buildings 306 and 308. There are various but minor impacts to subsurface soil vapor from petroleum-related compounds; however, the detections do not appear to indicate the presence of any significant petroleum source for soil vapor contamination.

1.2.2.6 Riverbank Soil Summary

The analytical results from this RI indicate that there are no VOC or PCB impacts to soils on the bank of the Mohawk River that runs parallel to the Site, generally consistent with results from previous investigations. Impacts from SVOCs to the riverbank of the Mohawk River associated with the Site are generally limited to areas where historic operations took place, in the immediate vicinity of Buildings 326, 324 and 322.

Based on the results obtained during this RI and the previous remedial measures undertaken, minor detections of inorganics (mainly iron, arsenic, mercury and lead) in riverbank soils appear to also be limited to the western portion of the riverbank that runs parallel to the Site (west of College Creek Outfall). The eastern portion of the riverbank has only limited detections of metals (arsenic and lead) slightly above Part 375 SCOs in the area north of Building 346.

1.2.2.7 River Sediment Summary

Collectively, the RI noted detectable concentrations of contaminants present in Mohawk River sediments both adjacent to the Site and upstream from the Site. The data indicate that an up-gradient source of chlorinated VOCs impacted up-gradient river sediments, but the impacts are relatively localized. There do not appear to be any VOC impacts to sediment immediately adjacent to the site. SVOC impacts are most evident upstream and adjacent to the western-most portion of the site (i.e. in the Building 320 area to the east) and suggest that, in addition to limited contribution from the Site itself, an up-gradient SVOC source is, or was, also present. There are no PCB impacts to the river sediments. The results also indicate that sediments both adjacent to the Site and upstream from the Site have detectable concentrations of metals. It does not appear that the Site is causing significant adverse inorganic impacts to river sediments.

1.2.3 Supplemental Remedial Investigation Findings

The additional activities implemented as part of the SRI provided further delineation and identification of historic industrial conditions at the former industrial property. The data gathered was consistent with prior site investigation information.

1.2.3.1 Parcel C

- Follow-up on the geophysical study Area 8 identified two underground storage tanks that had been used for petroleum products. The tanks did not appear to have been abandoned or backfilled.
- SVI results in Buildings 306 and 330 detected contaminants both in sub-slab soil vapor and in ambient air above guidance concentrations, but there was not a large degree of correlation between the contaminants detected in sub-slab versus ambient air samples.
- LNAPL was detected in one of the ten boring locations around to MW-36; the one location where LNAPL was detected was roughly five feet from MW-36.

1.2.3.2 Site-Wide Groundwater Quality

- Monitoring wells installed on Parcels A, B and C provided further delineation of the chlorinated solvent plume, which migrates across the three parcels along the established groundwater flow gradient.
- The source area for the chlorinated solvent plume was identified and delineated in an area of Parcel C around soil vapor point SV-C9.

1.2.4 Current and Intended Use

The City of Schenectady adopted its new Zoning Ordinance (Chapter 264) on March 24, 2008. The ALCO Site is zoned C-3 Waterfront Development District. The purpose of the C-3 district is to provide unique opportunities for the development and maintenance of water-oriented uses within certain areas of the City adjacent to the Mohawk River. The C-3 District permits certain recreational, open space, business, and residential uses which will generally benefit from and enhance the unique aesthetic, recreational, and environmental qualities of the waterfront areas.

The former industrial site is serviced by municipal water and sewer and currently has commercial tenants on a limited portion of the property along Front Street and is otherwise unoccupied with the vacant structures being demolished in 2011. The intended future use of Parcel C is restricted-residential.

2.0 Description of Selected Remedy

2.1 Remedy Selection

The remedial goal is to evaluate options and select a remedial program to provide for appropriate redevelopment of the Site and to eliminate or mitigate threats to public health and the environment that, upon implementation, will allow the NYSDEC to issue a Certificate of Completion for the 3 BCP parcels and to lead to the redevelopment and reuse of the parcels. This AAR indentified three (3) areas of concern (AOC) based on the findings of the RI Report:

1. Historic Free-phase petroleum product on the water table around monitoring well MW-36 and MW-45 (AOCs 1A and 1B) and existing underground storage tanks (USTs) that were not properly closed (AOC 1C);
2. The chlorinated solvent plume that extends from the vicinity of MW-19 to the Mohawk River (AOC 2); and
3. Soil impacts from polynuclear aromatic hydrocarbons (PAHs) (AOC 3).

As outlined in the Exposure Assessment, the following are complete or potential exposure pathways associated with the recognized AOC:

The results of the exposure assessment indicate that there is currently one complete potential exposure pathway and two future potential exposure pathways:

- Potential exposure of current tenants of Buildings 306 and 330 to VOCs in indoor air through inhalation (AOC 1 and 2).
- Potential exposure of future on-Site workers to soil, groundwater, soil vapor or LNAPL that may be contaminated with VOCs, SVOCs, and/or metals during future intrusive activities at the Site. Routes of exposure to future on-Site workers could include inhalation, ingestion, dermal contact, eye contact, and puncture/injection (AOC 1, 2 and 3).
- Potential exposure to groundwater that may be contaminated with VOCs, SVOCs, and/or metals if groundwater wells are installed and used for drinking water, etc. (AOC 1, 2 and 3).

The final remedial measures for the site must satisfy Remedial Action Objectives (RAOs), which are site-specific statements that convey the goals for minimizing or eliminating substantial risks to public health and the environment.

The following RAOs for the site were identified as a result of the Exposure Assessment in the RI Report:

1. Prevent volatilization of organic constituents from subsurface soils and groundwater (vapor intrusion) in future on-site buildings (AOCs 1 and 2).
2. Prevent ingestion of contaminated groundwater (AOCs 1 and 2).

3. Prevent contact with impacted surficial soils (AOC 3).
4. Develop site management practices to address potential exposure pathways associated with future site work (AOCs 1, 2 and 3).

The AAR recommended Alternative 3 for the final site remedy, which would use a site-wide soil cover to mitigate AOC 3. Alternative 3 also includes measures to remediate groundwater exposure pathways associated with AOCs 1 and 2.

2.2 Description of Selected Remedy

2.2.1 General Description of Selected Remedy

Alternative 3 will use a two-foot thick soil cover (with a geotextile demarcation layer) to address AOC 3; the use of a soil cover is specifically discussed in DER-10 Section 4.1 (f) to mitigate impacted surficial soils and has been used on other parts of the former ALCO site. Clean soils have been stockpiled on the property and can serve as appropriate cover material with the permission of the NYSDEC. Two feet of clean soil cover, due to the restricted residential use of the property, will be applied. Alternative 3 will also employ Institutional Controls to address the remaining potential exposure pathways. The contemplated ICs would include:

A Site Management Plan (SMP) will be prepared which will identify the necessary procedures to be utilized if future site work were conducted within each AOC, including soil vapor mitigation measures. The property owner will be required to submit a periodic certification of the institutional and engineering controls.

2.2.2 Parcel –Specific Remedial Actions

2.2.2.1 Parcel C

Remedial actions specific to Parcel C are listed below:

- Two-foot soil cover
- In-situ treatment and natural attenuation of the chlorinated solvent plume
- In-situ treatment of the source area of the chlorinated solvent plume
- Institutional controls
- Final Engineering Report
- Site Management Plan

3.0 Remedial Design- Parcel C

A remedial design program was implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques were implemented to the extent feasible in the design, implementation, and site management of the remedy per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

3.1 Parcel C

3.1.1 Site-Wide Soil Cover

As discussed earlier, a soil cover (with a geotextile demarcation layer) will be designed to address AOC 3; the use of a soil cover is specifically discussed in DER-10 Section 4.1 (f) to mitigate impacted surficial soils, particularly where soil impacts are low level and widespread. A soil cover has been used on other parts of the former ALCO site (former Big N Plaza and former Ramada Inn sites). Clean soils have been stockpiled on the property and can serve as appropriate cover material with the permission of the NYSDEC. Two feet of clean soil cover, due to restricted residential use of the property, will be applied. The design for the soil cover may also incorporate grading and areas of thicker soil cover to accommodate future site development needs.

The soil cover has been designed such that a demarcation layer, (consisting of orange construction fence, woven geotextile (Appendix B), or other material subsequently approved by NYSDEC)will be placed between site soils and clean fill. Additionally, the soil cover incorporates a minimum of 4 inches of topsoil to promote establishment of vegetation. In areas of the site where less than 2 feet of clean fill is proposed per the site grading plan, site soils will be excavated to a depth of 2 feet and the excavated area will be backfilled with clean soil. This will constitute the required soil cover in areas with that are shown as hatched on the associated site remedial plans. These areas will also receive the standard demarcation layer, which will be

placed at the bottom of the excavation trench and will be brought to grade and tied in to the adjacent demarcation layer. The design for the site-wide soil cover is shown on Figures 1 and 2 and is based on the grading and site plans prepared by Hershberg & Hershberg (provided in Appendix A of this report).

3.1.2 Chlorinated Solvent Plume

A source area for the chlorinated solvent plume was identified in the SRI Report. Because of the location and dimensions of the source area (particularly with respect to the City of Schenectady sewers), in-situ remediation (chemical oxidation) will be employed to degrade the contaminant source area and higher concentration areas of the plume itself.

In-situ chemical oxidation will also be used to destroy the source area and the higher concentration contaminant areas of the plume itself existing on Parcel C (an area of roughly 150 ft by 150ft. This process entails the injection of a chemical oxidant solution into the subsurface into the contaminated zone, where the chemical oxidant breaks the contaminant down into its constituent components. For a chlorinated compound, the end products are water, carbon dioxide and chloride ion. The chemical is injected at different depths and locations to ensure that the contaminated zone is fully saturated with the oxidant. The oxidant solution is a mixture of the oxidant, an activator complex and water. The residual compounds left over after the reactions are conventional groundwater constituents: iron, carbonate, carbon dioxide, chloride, etc.

Monitored natural attenuation (MNA) will be used to address the lower concentration portions of the plume that exist on Parcel C. MNA has been recognized by USEPA as an effective means of addressing residual groundwater contamination, particularly after application of remedial measures addressing contaminant source areas (USEPA, 1999). From the standpoint of remediating overall contaminant mass, there are often areas in a contaminant plume where active remedial measures provide minimal or no incremental benefit relative to natural processes, such as biodegradation, sorption, dispersion, volatilization and dilution. It should be recognized that MNA is not a "walk away" or "do nothing" remedy; it entails a careful examination of site data to verify that active remedies been applied to the extent feasible and development/implementation of a monitoring program to verify MNA processes are at work and that the residual contamination is no longer a threat to human health and the environment.

The proposed remedial approach employs the same technology for both the saturated and unsaturated zone contamination. The proposed remedial approach entails injecting a liquid chemical oxidant to destroy contaminants in the subsurface in the area of high concentration. RegenOx^{TM} has been selected for this site, as it has desirable characteristics in terms of viscosity and reaction speed that make it well suited for application in both the saturated and unsaturated zones. Manufacturer's literature on RegenOx^{TM} is provided in Appendix B.

3.1.2.1 First Injection Event

Prior to the first injection event, a notification letter will be sent to USEPA under the Underground Injection Control (UIC) Program; NYSDEC will receive a copy of this notification. The targeted injection zone is shown on Figure 3, and shown in conceptual cross

section on Figure 4. A Geoprobe will be used to advance 1-inch diameter rods, through which the RegenOx™ will be injected into the subsurface. The rods will be advanced to the bottom of the targeted vertical zone and RegenOx™ injected on one-foot increments as the rods are withdrawn (bottom-up method). An expendable tip will be placed on the lead rod; the tip is disconnected as the rods are withdrawn and RegenOx™ is injected out the bottom of the lead rod. A grout pump will be used to inject RegenOx™ through the rods into the targeted zone.

RegenOx™ will be injected from immediately beneath the existing slab/pavement to a depth of roughly 35 feet on a grid pattern of roughly fifteen foot spacings (approximately 64 injection points). The anticipated rate of RegenOx™ injection is roughly 11 pounds per vertical foot (roughly 385 pounds per point); this will result in the injection of roughly 25,000 pounds of RegenOx™ in this area.

3.1.2.2 Performance Monitoring

It is anticipated that it will be necessary to conduct additional injections of RegenOx™, as described in the following section. To determine the effectiveness of the injection events, performance monitoring will be conducted for roughly two months between injection events. The performance monitoring program will consist of collection of groundwater samples for laboratory analysis of VOCs, monitoring of field parameters, and monitoring of soil gas.

Testing and subsequent monitoring (described in a following section) of the RegenOx™ injection will be accomplished using existing monitoring wells, a new piezometer and new soil vapor implants. The new piezometer will be constructed of 1-inch diameter PVC screen and casing installed in a borehole created by advancing 1.5-inch diameter Geoprobe rods. The piezometer will be installed to a depth of 40 feet with 35 feet of screen. Natural formation collapse will be allowed around the well screen, and the piezometer will be sealed at surface with bentonite pellets. Vapor implants will be installed at depths of 2.5 to 3 feet below grade in boreholes created by advancing 1-inch diameter Geoprobe rods; the vapor implants will be comprised of a stainless steel screen (5/8" diameter x 6" length) connected to the surface with polyethylene tubing. The proposed location of the new piezometer is shown on Figure 3.

Performance testing during the RegenOx™ injection will be conducted in two ways.

Measurement of total VOCs in soil gas will be made by testing the vapor implants prior to RegenOx™ injection and at regular intervals using a photoionization detector (PID).

Samples will be collected from wells MW-19, MW-46, and the new piezometer prior to the start of the injection program, and will be submitted for laboratory analysis of VOCs by USEPA Method 8260. Follow-up ground-water sampling will be conducted roughly 4 weeks and 8 weeks after the completion of injection work and will include wells MW-19, MW-46, and the new piezometer. The ALCO-Maxon Site – Parcel C Site Management Plan will address the monitoring frequency going forward.

Soil vapor will be monitored in the soil vapor implants on a biweekly basis during each performance monitoring period using a PID. Measurement of total VOCs in soil gas will be made by testing the vapor implants prior to RegenOx™ injection and at regular intervals using a photoionization detector (PID). The measurements collected prior to injection work will provide

the baseline. The data collected during the performance monitoring program will be used to guide subsequent injection and monitoring events.

3.1.2.3 Additional RegenOx™ Injections

We anticipate that there will be a need for at least one subsequent rounds of RegenOx™ injection. The scope of the additional injection events and the location of the injection points will be dictated largely by the results of the performance monitoring program. A letter report will be provided to NYSDEC prior to each subsequent injection event; the report will provide the prior performance monitoring data and provide the design and rationale for the upcoming injection event.

4.0 Remedial Action Implementation

4.1 Specific Remedial Action Implementation

Remedial actions specific to Parcel C are listed below:

- Two-foot soil cover
- In-situ treatment and natural attenuation of the chlorinated solvent plume
- In-situ treatment of the source area of the chlorinated solvent plume
- Institutional controls
- Final Engineering Report
- Site Management Plan

4.2 Stormwater Management

A Stormwater Pollution Prevention Plan (SWPPP) has already been prepared for the site for the stockpiling of clean soils for the soil cover, and is incorporated here by reference. The SWPPP will be updated as needed to address the movement and placement of the stockpiled soils and the creation of the clean soil cover.

4.3 Institutional Controls

As defined in DER-10, an institutional control (IC) "means any non-physical means of enforcing a restriction on the use of real property that limits human or environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness and/or integrity of site management activities at or pertaining to a site". Because of the intended future use of the site, it has been anticipated that ICs will be a part of the remedial program for site soils and for future redevelopment of the properties.
The contemplated ICs for the site are expected to cover the following issues:

- A requirement that a clean soil cover of a minimum thickness of two feet, due to the actual restricted-residential use, be maintained on the site.
- Notification to be filed with the property deed that residually-impacted soils are present below the clean soil cover.
- A requirement that any excavation below the clean soil layer entail 1) 10 day prior notification to NYSDEC and NYSDOH, 2) notification to contractors of the potential hazard (contractor personnel may be subject to 29 CFR 1910.120 – HAZWOPER), and 3) restoration of the clean soil layer Development of a Flood Hazard Mitigation Plan to comply with Chapter157 –Flood Hazard Control of the City of Schenectady Code, as the ALCO site lies within FEMA mapped Zones A-16 and B.
- A prohibition on the use of all groundwater on the property without NYSDEC and NYSDOH approval.

4.4 Reporting

4.4.1 Schedule and Progress Reports

A Remedial Action Schedule will be prepared and submitted to NYSDEC once the remedial design work has been completed and approved. Per DER-10 Section 5.7, the Remedial Action Schedule will include:

- Dates for submission of deliverables
- Timeframes for contractor procurement
- Timeframes for review of deliverables by NYSDEC
- Timeframes for application/issuance of permits, if needed
- Timelines for developing access agreements or easements
- Timelines for the preparation of the Site Management Plan and the Final Engineering Report

The Remedial Action Schedule will be updated periodically to reflect progress and/or changes in the Remedial Action Implementation Program. Also per DER-10 Section 5.7, a monthly progress report will be prepared and submitted to NYSDEC during the Remedial Action Implementation phase. The progress report will contain the following, at a minimum:

- Project progress and significant activities
- Pending/planned significant activities in the next two months
- Updated project schedule
- Discussion of project problems and/or delays
- Proposed corrective actions, if needed
- Additional pertinent information

4.4.2 Final Engineering Report

Per DER-10 Section 5.8, a Final Engineering Report will be prepared following completion of the Remedial Action activities and will contain:

- Signature page, stamped by a licensed NYS Professional Engineer
- A description of the remedy, as constructed
- A summary of the remedial actions completed
- Listing of the remedial action objectives
- Supporting tables and figures
- Detailed description of remedial action compliance
- As-built drawings

- Identification of institutional controls and environmental easements
- Appropriate supporting figures for groundwater remediation

4.5 Site Management Plan

A Site Management Plan will be prepared, which will include the following:

a. An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: As described in a previous section.

Engineering Controls: The soil cover previously described.

This plan includes, but may not be limited to:

- An Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- Descriptions of the provisions of the environmental easement including any land use, {and/or} groundwater {and/or} surface water use restrictions;
- A provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- Provisions for the management and inspection of the identified engineering controls;
- Maintaining site access controls and Department notification; and
- The steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- Monitoring of groundwater to assess the performance and effectiveness of the remedy;
- A schedule of monitoring and frequency of submittals to the Department; and
- Monitoring for vapor intrusion for any buildings developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

5.0 References

Barton & Loguidice 2011. Stormwater Pollution Prevention Plan, Former ALCO Site.

CHA, August 2012. Remedial Investigation Report, ALCO-Maxon Sites, Parcels A,B&C.

Hershberg & Hershberg, 2014. ALCO Site Development Plans

Kleinfelder, Inc., September 2010. Remedial Investigation Work Plan, Parcel A of the ALCO-Maxon Site.

Kleinfelder, Inc., September 2010. Remedial Investigation Work Plan, Parcel B of the ALCO-Maxon Site.

Kleinfelder, Inc., September 2010. Remedial Investigation Work Plan, Parcel C of the ALCO-Maxon Site.

New York State Department of Environmental Conservation, May 2010. DER-10 / Technical Guidance for Site Investigation and Remediation. DEC Program Policy, Office of Remediation and Materials Management.

New York State Department of Environmental Conservation, December 2006. 6 NYCRR PART 375, Environmental Remediation Programs, Subparts 375-1 to 375- 4 & 375-6. Division of Environmental Remediation.

New York State Department of Environmental Conservation, May 2004. Draft Brownfield Cleanup Program Guide. Division of Environmental Remediation.

New York State Department of Environmental Conservation, 1997. Environmental Restoration Projects, Program ID No. DER-97-4058. Division of Environmental Remediation, Bureau of Program Management.

New York State Department of Environmental Conservation, 1998. "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations', Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. Reissued June 1998.

New York State Department of Health, 2006. "Guidance for Evaluating Soil Vapor Intrusion in the State of New York."

United States Environmental Protection Agency, 1994. "Radon Prevention in the Design and Construction of Schools and Other Large Buildings."

United States Environmental Protection Agency, April 1999. "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites", OSWER Directive 9200.4-17P.

Wiedemeir, et al, 1999. "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water". USEPA-NRML. EPA/600/R-98/128.

Figure 1

Soil Cap Site Plan

NOTES:

1. HATCHED AREAS SHALL BE SUBJECT TO THE DETAIL ON THIS SHEET, TO ENSURE A MINIMUM DEPTH OF 2 FEET OF CLEAN SOIL COVER TO PROVIDE AN ADEQUATE SOIL CAP SYSTEM.

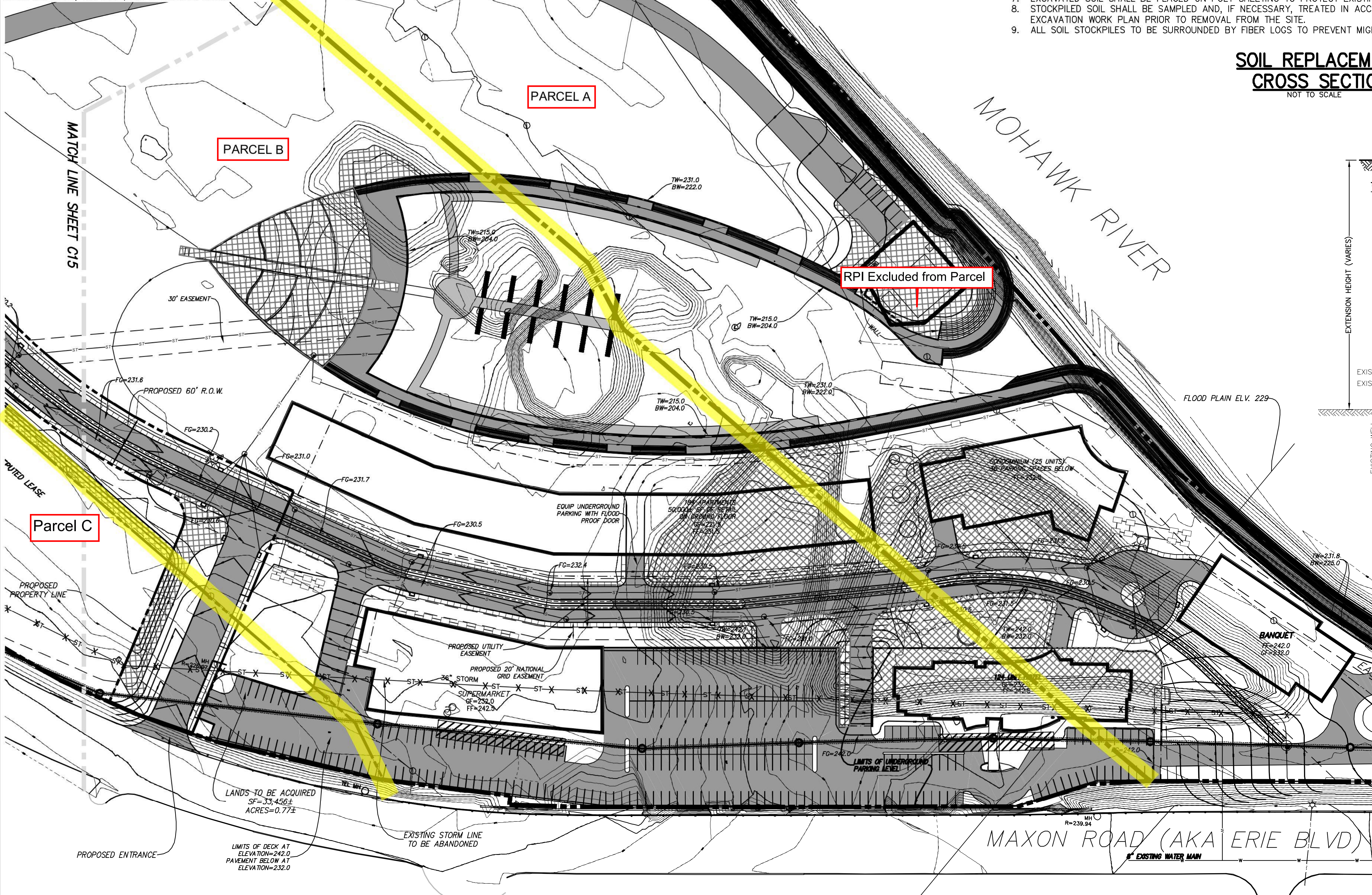
2. AREAS OF THE SITE NOT HATCHED SHALL NOT BE SUBJECT TO THE DETAIL ON THIS SHEET, BUT SHALL ENSURE A MINIMUM OF 2 FEET OF CLEAN FILL PLACED OVER EXISTING GRADE.

3. BUILDINGS MAY REQUIRE ADDITIONAL ATTENTION TO SOIL VAPOR MITIGATION, AND WILL BE ANALYZED UPON FINAL SITE PLANNING. EACH BUILDING WILL BE REVIEWED FOR POTENTIAL FOR SOIL VAPOR INTRUSION AND A MITIGATION PLAN WILL BE SUBMITTED TO THE NYSDEC AND NYSDOH FOR REVIEW AND APPROVAL AS NECESSARY.

4. EXISTING AND PROPOSED ASPHALT AND CONCRETE SHALL BE CONSIDERED ADEQUATE SOIL COVER TO SERVE AS A SOIL CAP SYSTEM, AND IS NOT SUBJECT TO THE SOIL CAP DETAILS ON THIS SHEET.

5. EXCAVATION OF CONTAMINATED SOIL SHALL ADHERE TO THE APPROVED "EXCAVATION WORK PLAN" DATED MAY, 2014.

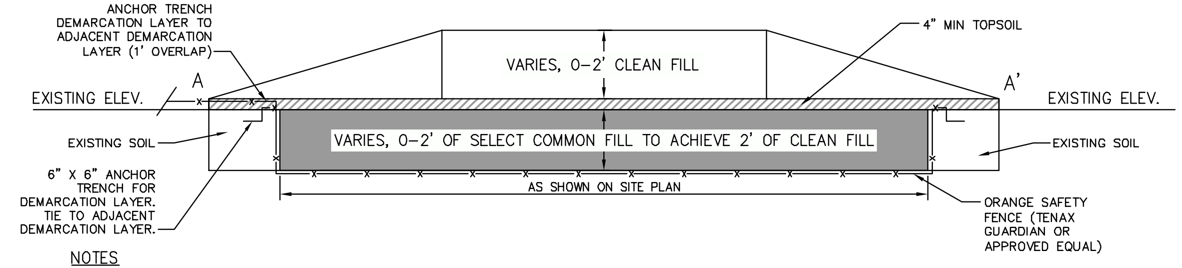
6. ON ALL UNHATCHED AREAS, DEMARCATION LAYER CONSISTING OF SNOW FENCE TO BE INSTALLED PRIOR TO INSTALLING ADDITIONAL SOIL AS SHOWN. ENSURE A MINIMUM OF 2' OF CLEAN FILL OVER THE DEMARCATION LAYER. DEMARCATION LAYER SHALL FOLLOW DETAIL, THIS SHEET. SEE DETAIL, THIS SHEET, FOR ALL HATCHED AREAS.



LEGEND

- PAVED AREAS
- AREA REQUIRING SUBSOIL REPLACEMENT

60' 0 60' 120'
1"=60'

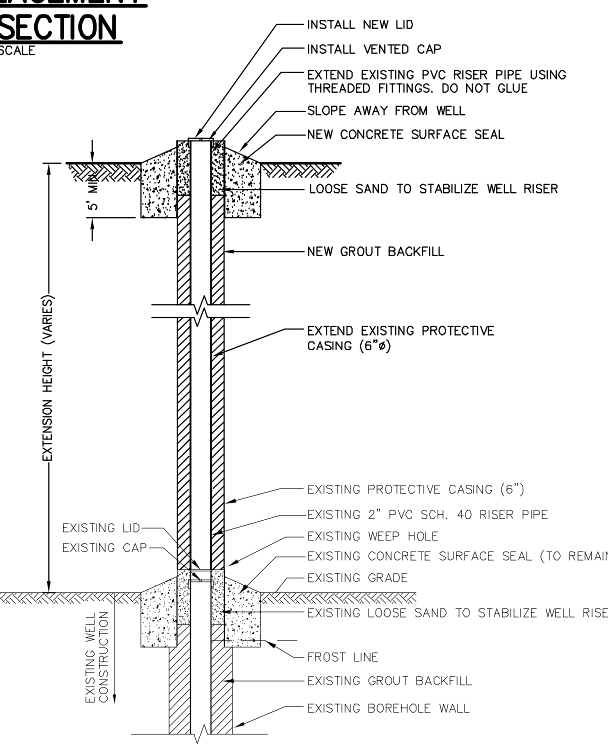


NOTES

1. EXISTING ASPHALT AND CONCRETE TO BE REMOVED FROM SITE PRIOR TO PLACEMENT AND GRADING OF SOIL COVER.
2. DEMARCATION LAYER CONSISTING OF SNOW FENCE, OR APPROVED GEOTEXTILE, TO BE INSTALLED COVERING THE SITE PRIOR TO PLACEMENT AND GRADING OF SOIL COVER.
3. SAFETY FENCE, OR GEOTEXTILE, TO BE PLACED VERTICALLY, FROM TOP TO BOTTOM OF SLOPE, IF APPLICABLE.
4. ADJACENT FENCE PANELS TO BE SECURED BY TYING WITH PLASTIC TIES, GEOTEXTILE TO BE OVERLAPPED.
5. SAFETY FENCE, OR GEOTEXTILE, TO BE ANCHORED AT HIGHEST POINT, IF APPLICABLE, IN 6" BY 6" TRENCH PRIOR TO SOIL PLACEMENT.
6. INSTALL AND MACHINE TAMP SOIL IN 4" LIFTS.
7. EXCAVATED SOIL SHALL BE PLACED ON POLY SHEETING TO PROTECT EXISTING SOILS FROM CONTAMINATION.
8. STOCKPILED SOIL SHALL BE SAMPLED AND, IF NECESSARY, TREATED IN ACCORDANCE WITH THE SPECIFICATIONS AND SITE-SPECIFIC EXCAVATION WORK PLAN PRIOR TO REMOVAL FROM THE SITE.
9. ALL SOIL STOCKPILES TO BE SURROUNDED BY FIBER LOGS TO PREVENT MIGRATION OF SOILS

SOIL REPLACEMENT CROSS SECTION

NOT TO SCALE



TYP. MONITORING WELL EXTENSION DETAIL

NOT TO SCALE

NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

COMPLETED CONSTRUCTION

Significant Construction Changes Are Shown

By ______ Date ______

Ck'd ______ Date ______

REVISIONS

GALESI GROUP
MAXON ALCO HOLDINGS, LLC
REMEDIAL DESIGN

SOIL CAP SITE PLAN
Parcel C, C447044

CITY OF SCHENECTADY — SCHENECTADY COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date: DECEMBER 2015

Scale: 1"=60'

Sheet Number: 1

File Number: 1368.001.001

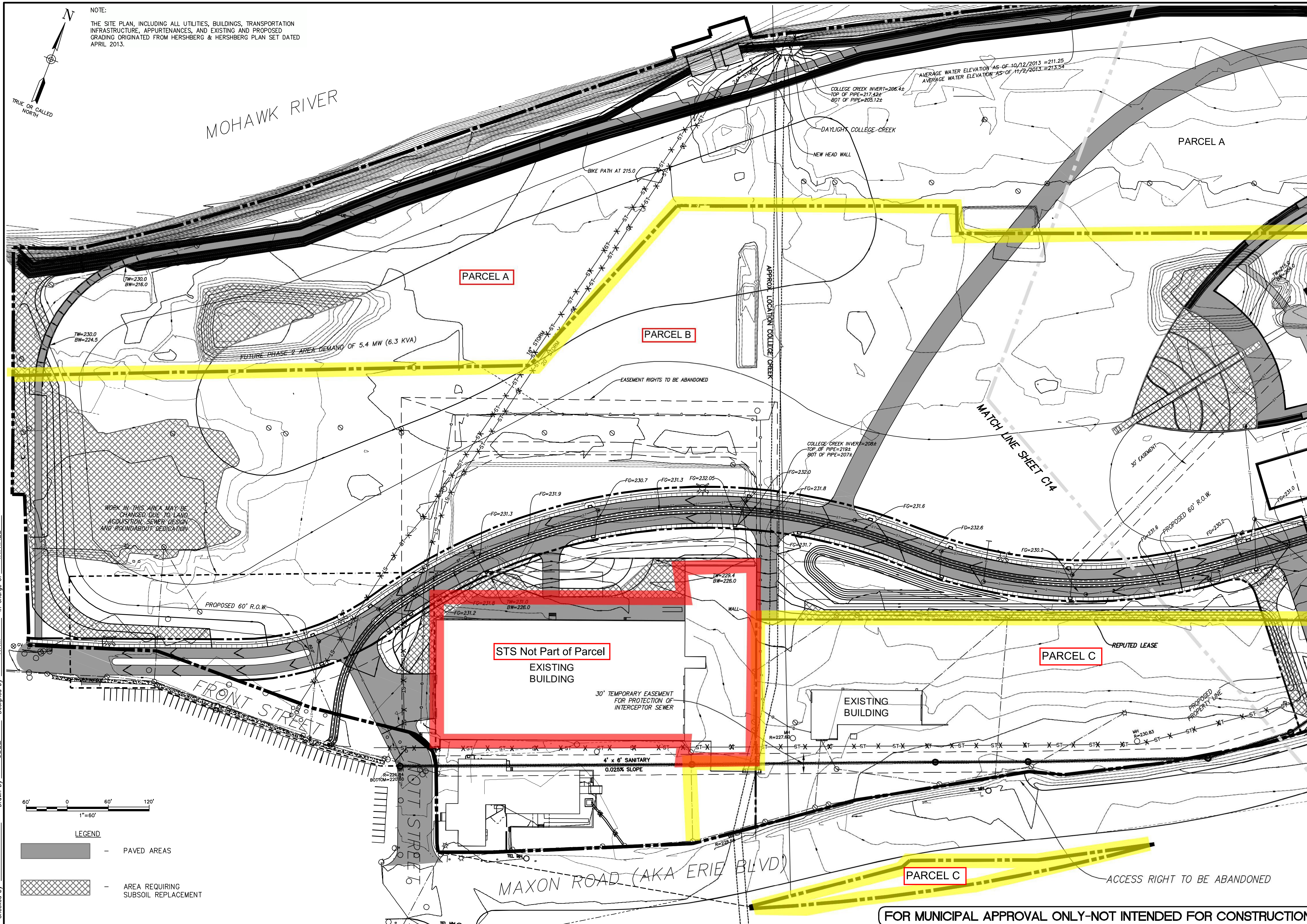
Plotted: Dec 15, 2015 – 4:16PM SYR By: jdh

Drawn by JGS2 Designed by NRM In charge of Checked by INITIALS

FOR MUNICIPAL APPROVAL ONLY-NOT INTENDED FOR CONSTRUCTION

Figure 2

Soil Cap Site Plan



NOTE:
THE SITE PLAN, INCLUDING ALL UTILITIES, BUILDINGS, TRANSPORTATION INFRASTRUCTURE, APPURTENANCES, AND EXISTING AND PROPOSED GRADING ORIGINATED FROM HERSHBERG & HERSHBERG PLAN SET DATED APRIL 2013.
N
TRUE OR CALLED NORTH
MOHAWK RIVER
PARCEL A
PARCEL A
PARCEL B
PARCEL C
PARCEL C
STS Not Part of Parcel
EXISTING BUILDING
EXISTING BUILDING
APPROX. LOCATION COLLEGE CREEK
MATCH LINE SHEET C14
DAYLIGHT COLLEGE CREEK
NEW HEAD WALL
BIKE PATH AT 215.0
FUTURE PHASE 2 AREA DEMAND OF 5.4 MW (6.3 KVA)
EASEMENT RIGHTS TO BE ABANDONED
WORK IN THIS AREA MAY BE CHANGED DUE TO LAND ACQUISITION, SEWER DESIGN AND ROUNDABOUT DEDICATION
PROPOSED 60' R.O.W.
PROPOSED 60' R.O.W.
30' EASEMENT
30' TEMPORARY EASEMENT FOR PROTECTION OF INTERCEPTOR SEWER
REPUTED LEASE
PROPOSED PROPERTY LINE
4' x 6' SANITARY
0.025% SLOPE
FRONT STREET
NOTT STREET
MAXON ROAD (AKA ERIE BLVD)
ACCESS RIGHT TO BE ABANDONED
60' 0 60' 120'
1"=60'
LEGEND
– PAVED AREAS
– AREA REQUIRING SUBSOIL REPLACEMENT

FOR MUNICIPAL APPROVAL ONLY-NOT INTENDED FOR CONSTRUCTION

COMPLETED CONSTRUCTION

Significant Construction Changes Are Shown

By ______ Date ______
Ck'd ______ Date ______

REVISIONS

GALESI GROUP
MAXON ALCO HOLDINGS, LLC
REMEDIAL DESIGN

SOIL CAP SITE PLAN
Parcel C, C447044

CITY OF SCHENECTADY SCHENECTADY COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date: DECEMBER 2015

Scale: 1"=60'

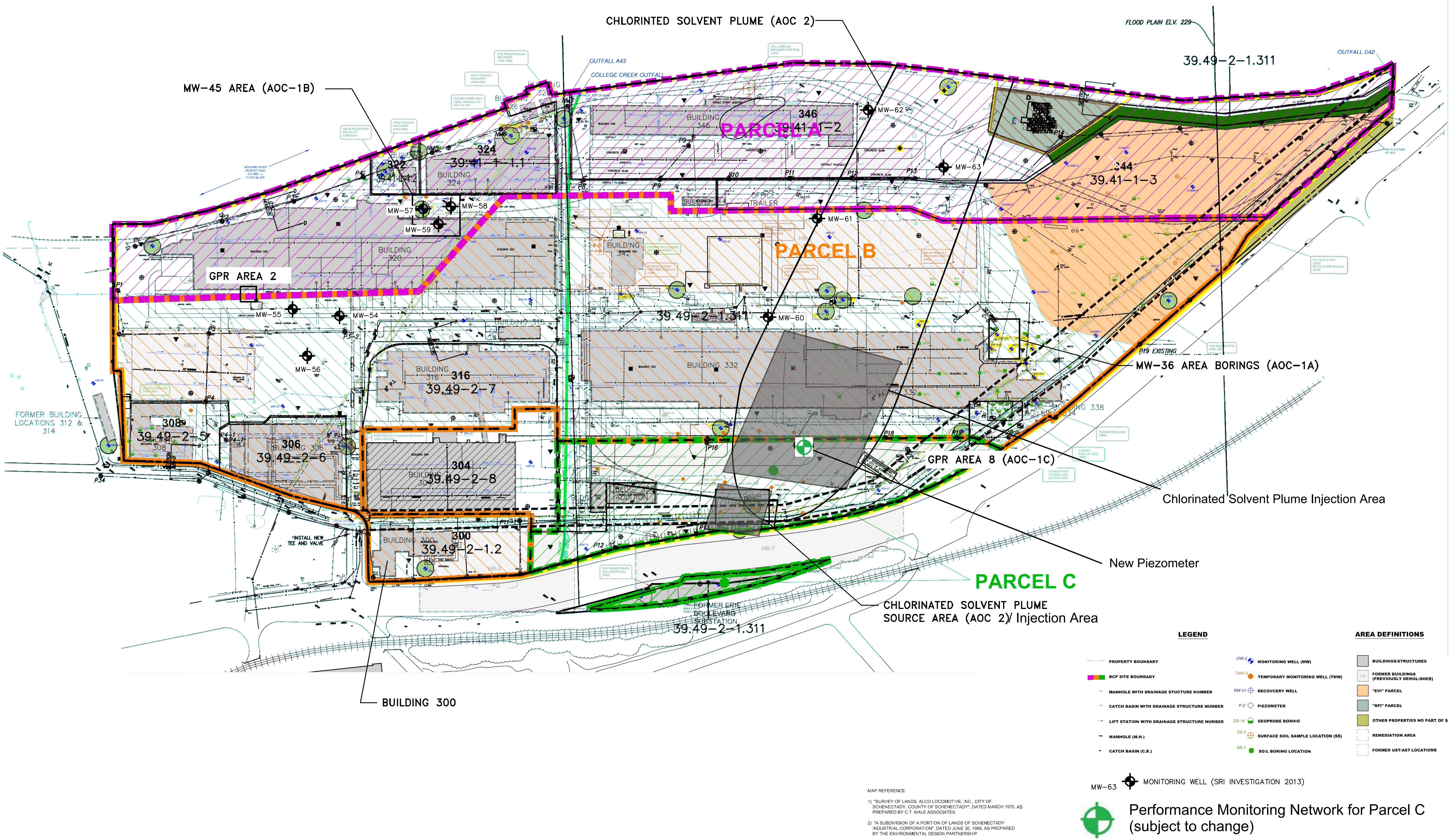
Sheet Number: 2

File Number: 1368.001.001

Plotted: Dec 15, 2015 – 4:15PM By: jdh
Drawn by: SYR Designed by: JGS2 In charge of: NRM Checked by: INITIALS

Figure 3

Locations of Chemical Oxidant Injection Areas


CHLORINTED SOLVENT PLUME (AOC 2)
MW-45 AREA (AOC-1B)
FLOOD PLAIN ELV. 229
OUTFALL A43
COLLEGE CREEK OUTFALL
OUTFALL D42
39.49-2-1.311
PARCEL A
PARCEL B
PARCEL C
346
324
344
39.41-1-3
322
GPR AREA 2
MW-62
MW-63
MW-61
MW-57
MW-58
MW-59
MW-55
MW-54
MW-56
MW-60
BUILDING 346
BUILDING 324
BUILDING 320
BUILDING 342
BUILDING 316
BUILDING 332
BUILDING 338
BUILDING 304
BUILDING 300
OFFICE TRAILER
316
39.49-2-7
308
39.49-2-5
306
39.49-2-6
304
39.49-2-8
300
39.49-2-1.2
FORMER BUILDING LOCATIONS 312 & 314
MW-36 AREA BORINGS (AOC-1A)
GPR AREA 8 (AOC-1C)
Chlorinated Solvent Plume Injection Area
New Piezometer
CHLORINATED SOLVENT PLUME SOURCE AREA (AOC 2)/ Injection Area
FORMER ERIE BOULEVARD SUBSTATION
39.49-2-1.311
"INSTALL NEW TEE AND VALVE
BUILDING 300
LEGEND
PROPERTY BOUNDARY
BCP SITE BOUNDARY
MANHOLE WITH DRAINAGE STUCTURE NUMBER
CATCH BASIN WITH DRAINAGE STRUCTURE NUMBER
LIFT STATION WITH DRAINAGE STRUCTURE NUMBER
MANHOLE (M.H.)
CATCH BASIN (C.B.)
MONITORING WELL (MW)
TEMPORARY MONITORING WELL (TMW)
RECOVERY WELL
PIEZOMETER
GEOPROBE BORING
SURFACE SOIL SAMPLE LOCATION (SS)
SOIL BORING LOCATION
AREA DEFINITIONS
BUILDINGS/STRUCTURES
FORMER BUILDINGS (PREVIOUSLY DEMOLISHED)
"EVI" PARCEL
"RPI" PARCEL
OTHER PROPERTIES NOT PART OF S
REMEDIATION AREA
FORMER UST/AST LOCATIONS
MW-63 MONITORING WELL (SRI INVESTIGATION 2013)
Performance Monitoring Network for Parcel C (subject to change)

MAP REFERENCE:

1) "SURVEY OF LANDS, ALCO LOCOMOTIVE, INC., CITY OF SCHENECTADY, COUNTY OF SCHENECTADY", DATED MARCH 1970, AS PREPARED BY C.T. MALE ASSOCIATES.

2) "A SUBDIVISION OF A PORTION OF LANDS OF SCHENECTADY INDUSTRIAL CORPORATION", DATED JUNE 30, 1988, AS PREPARED BY THE ENVIRONMENTAL DESIGN PARTNERSHIP.

3) "SITE PLAN, PROPOSED C & D RECYCLING FACILITY, NOTT STREET INDUSTRIAL PARK", DATED FEBRUARY 1995, AS PREPARED BY INGALLS SMART ASSOCIATES.

SOURCE:

1) ABD ENGINEERS AND SURVEYORS FEBRUARY 1988, REVISED NOVEMBER 1999.

2) HISTORIC BUILDING (HB) LOCATIONS BASED ON A "FUEL OIL PIPING" PLAN, PREPARED FOR AMERICAN LOCOMOTIVE CO., REVISED AUGUST 22,195.

Barton & Loguidice, D.P.C.

MAXON ALCO HOLDINGS, LLC
REMEDIAL DESIGN

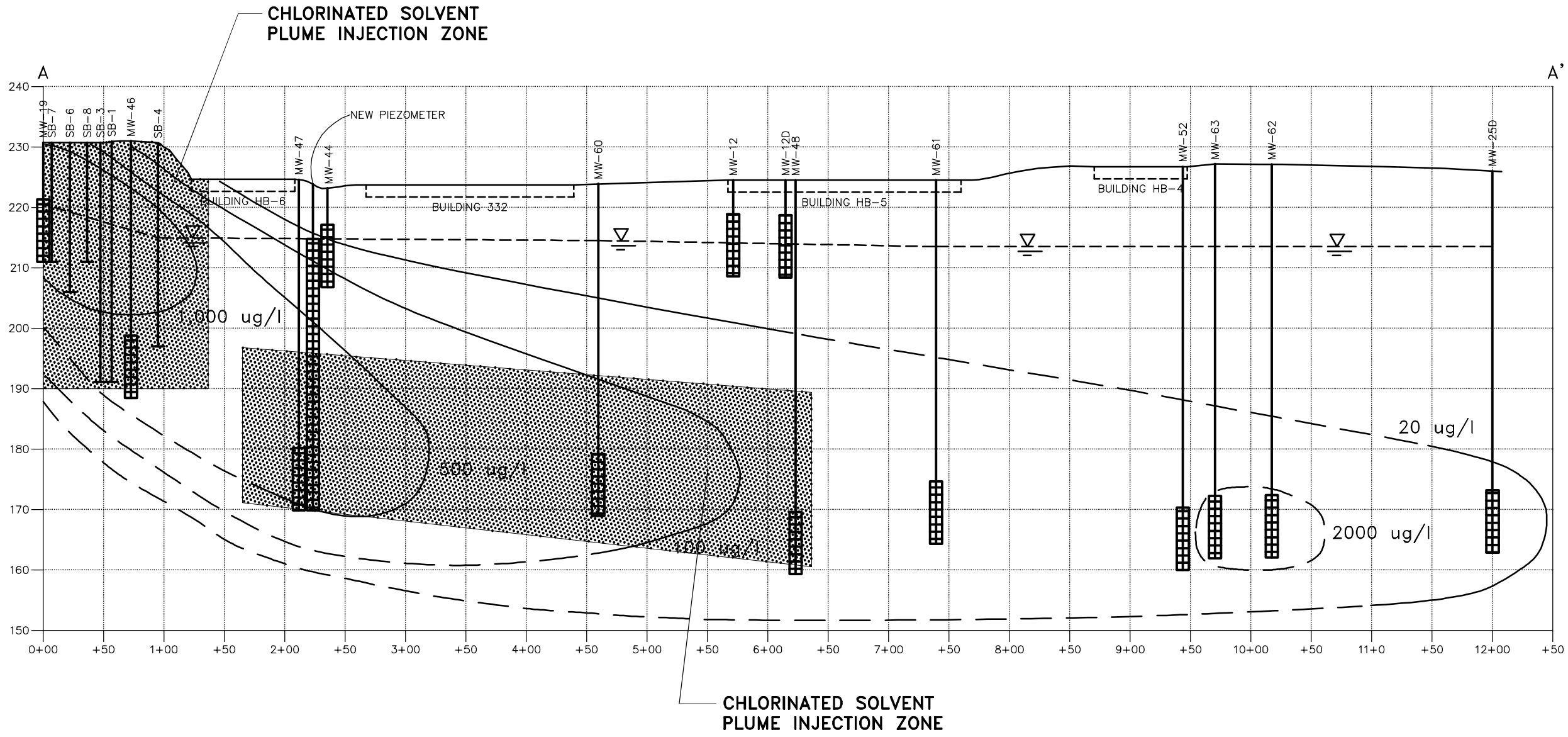
Location of Chemical Oxidant Injection Areas

CITY OF SCHENECTADY, NEW YORK

Figure 3
Project No. 1368.001.001
Date 11/23/2015

Figure 4

Chemical Oxidant Injection Zones

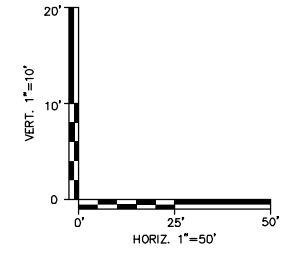


LEGEND:

- WATER TABLE
- MONITORING WELL
- SOIL BORING

NOTES:

1. DASHED WHERE INFERRED
2. WELLS/BORINGS ARE PROJECTED ONTO CROSS SECTION LINES
3. WATER LEVELS COLLECTED DURING JUNE 2013 SAMPLING EVENT.
4. TOTAL CHLORINATED VOCs (TCVOC) OF GROUND WATER PRESENTED IN ug/l (PPB).
5. TCVOCs OF SOIL PRESENTED IN mk/kg.



Barton & Loguidice, P.C.
Engineers-Environmental Scientists-Planners-Landscape Designers

MAXON ALCO HOLDINGS, LLC
REMEDIAL DESIGN REPORT

CHEMICAL OXIDANT INJECTION ZONES

CITY OF SCHENECTADY, NEW YORK

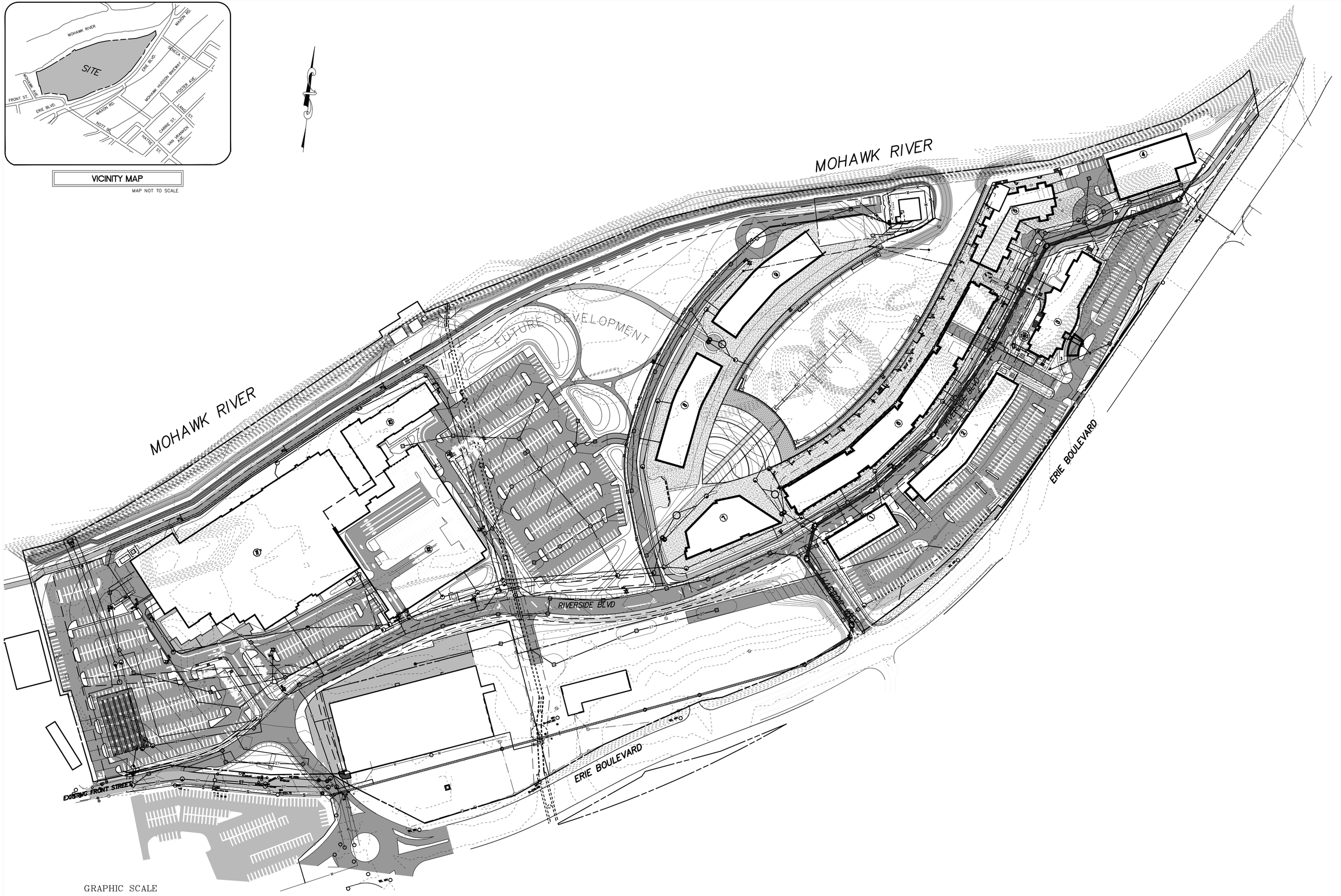
Figure 4
Project No. 1368.001.001
Date 12/15/2015

Appendix A

Hershberg & Hershberg Site Development Plans

VICINITY MAP

MAP NOT TO SCALE



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

FOR MUNICIPAL APPROVAL ONLY-NOT INTENDED FOR CONSTRUCTION

HERSHBERG & HERSHBERG
Consulting Engineers and Land Surveyors
18 Locust Street
Albany, New York 12203

STATE OF NEW YORK
DANIEL R. HERSHBERG
LICENSED PROFESSIONAL ENGINEER & LAND SURVEYOR
044228

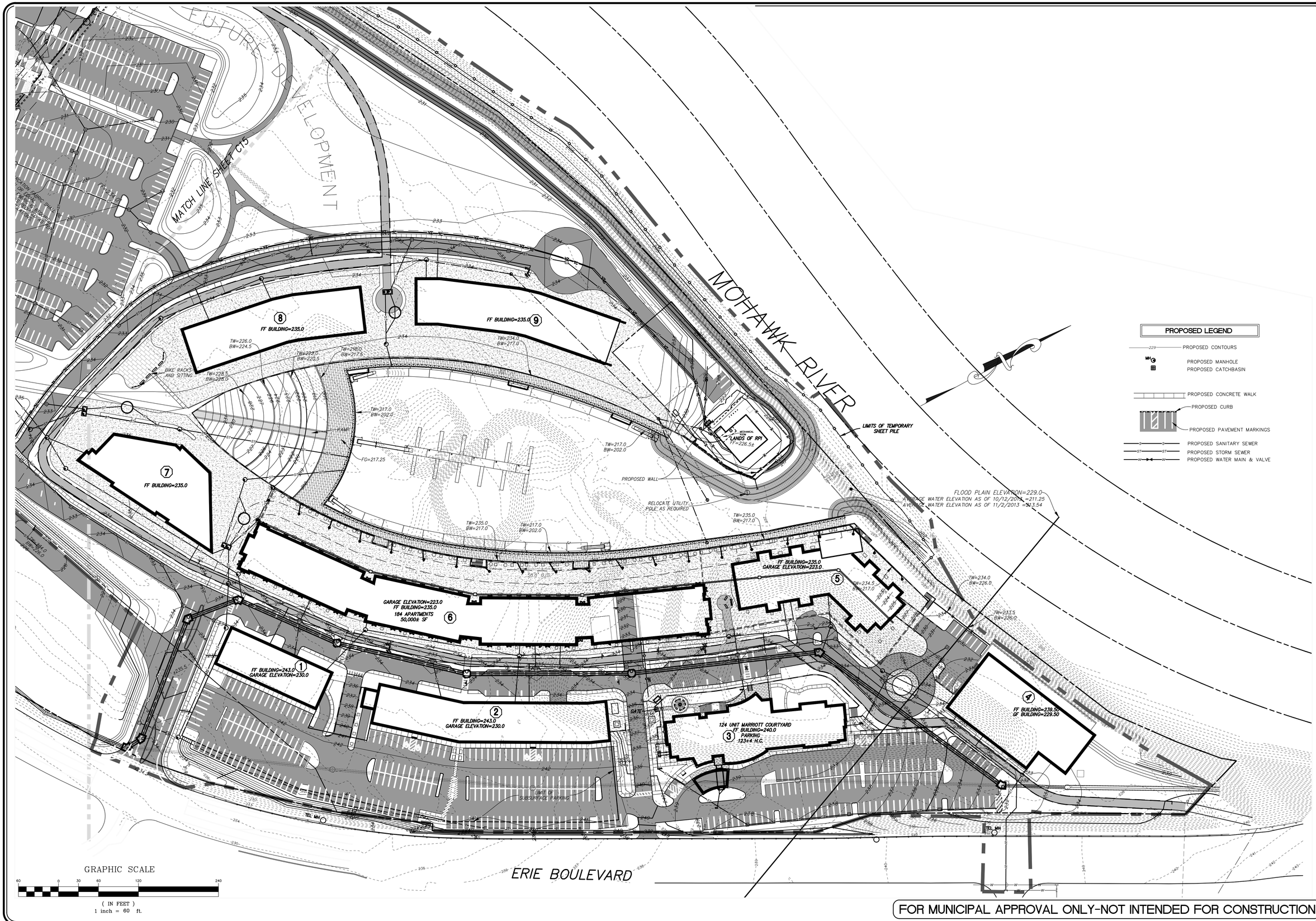
REMARKS	DATE
ALL PARCELS UPDATED	7-2-2015
GENERAL REVISIONS	8-3-2015

REVISIONS

MOHAWK HARBOR OF SCHENECTADY, NEW YORK

FILE: 120158-1.dwg | SCALE: 1"=100' | BY: SMcC | CHK: DRH | DATE: 4/17/2013 | 2012-0158-1

SP-A



GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)

1 inch = 60 ft.

FOR MUNICIPAL APPROVAL ONLY-NOT INTENDED FOR CONSTRUCTION

HERSHBERG & HERSHBERG

Consulting Engineers and Land Surveyors

18 Locust Street
Albany, New York 12203

STATE OF NEW YORK
DANIEL R. HERSHBERG
044228
PROFESSIONAL ENGINEER & LAND SURVEYOR

REVISIONS		DATE
PRELIMINARY SUBMISSIONS	3-30-2015	
PRELIMINARY SUBMISSIONS	4-2-2015	
SUBMISSION UPDATE	4-14-2015	
GENERAL PLAN REVISIONS	4-20-2015	
GENERAL PLAN REVISIONS	7-1-2015	
GENERAL UPDATE	7-13-2015	

GRADING PLAN A FOR
ALCO REDEVELOPMENT SITE
OF SCHENECTADY, NEW YORK

FILE: 120159-1.dwg | SCALE: 1"=60' | BY: SMcC | CHK: DRH | DATE: 4/17/2013 | 2012-0159-1

C14

PROPOSED LEGEND
PROPOSED CONTOURS
PROPOSED MANHOLE
PROPOSED CATCHBASIN
PROPOSED CONCRETE WALK
PROPOSED CURB
PROPOSED PAVEMENT MARKINGS
PROPOSED SANITARY SEWER
PROPOSED STORM SEWER
PROPOSED WATER MAIN & VALVE
UTILITIES WERE IMPORTED FROM PLANS BY BOHLER ENGINEERING
MOHAWK RIVER
FLOOD PLAIN ELEVATION=230.0'
AVERAGE WATER ELEVATION AS OF 10/12/2013 =211.25
AVERAGE WATER ELEVATION AS OF 11/2/2013 =213.54
LIMITS OF TEMPORARY SHEET PILE
LOOKOUTS
DAYLIGHT COLLEGE CREEK
FUTURE DEVELOPMENT
MATCH LINE SHEET C14
FF=233.5
FF=234.0
FF BUILDING=235.0
BIKE RACKS AND SEATING
EXISTING BUILDING
EXISTING BUILDING
REMOVE BUILDING
END CONCRETE WALL
COLLEGE CREEK ACCESS
ERIE BOULEVARD
FRONT STREET
TEL MH
12" NEW VALVE
NEW 12"x12"x12" TEE
EXISTING 12" WATER MAIN (APPROXIMATE LOCATION)
GRAPHIC SCALE
(IN FEET)
1 inch = 60 ft.

FOR MUNICIPAL APPROVAL ONLY-NOT INTENDED FOR CONSTRUCTION

HERSHBERG & HERSHBERG
Consulting Engineers and Land Surveyors
18 Locust Street
Albany, New York 12203

ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, IS ILLEGAL

STATE OF NEW YORK — DANIEL R. HERSHBERG — LICENSED PROFESSIONAL ENGINEER & LAND SURVEYOR — 044226

REVISIONS

REMARKS	DATE
STRUCTURES REVISIONS	1-30-2015
PRELIMINARY SUBMISSIONS	3-30-2015
PRELIMINARY SUBMISSIONS	4-2-2015
SUBMISSION UPDATE	4-14-2015
GENERAL PLAN REVISIONS	4-20-2015
GENERAL UPDATE	7-13-2015

GRADING PLAN B FOR ALCO REDEVELOPMENT SITE OF SCHENECTADY, NEW YORK

FILE: 120158-1.dwg | SCALE: 1"=60' | BY: SMcC | CHK: DRH | DATE: 4/17/2013 | 2012-0158-1

C15

Appendix B

WINFAB 200W Data Sheet

WINFAB INDUSTRIAL FABRICS

PRODUCT DATA SHEET

WINFAB 200W

SEPARATION STABILIZATION

WINFAB 200W is manufactured using high tenacity polypropylene yarns that are woven to form a dimensionally stable network, which allows the yarns to maintain their relative position.
WINFAB 200W resists ultraviolet deterioration, rotting, and biological degradation and is inert to commonly encountered soil chemicals.

PROPERTY	TEST METHOD	MARV English	MARV Metric
Tensile Strength (Grab)	ASTM D-4632	200 x 200 lbs	890 x 890 N
Elongation	ASTM D-4632	15%	15%
CBR Puncture	ASTM D-6241	700 lbs	3114 N
Trapezoidal Tear	ASTM D-4533	75 x 75 lbs	330 x 330 N
UV Resistance (500 hrs)	ASTM D-4355	70%	70%
Apparent Opening Size (AOS)*	ASTM D-4751	40 US Std. Sieve	0.425 mm
Permittivity	ASTM D-4491	0.05 sec^{-1}	0.05 sec^{-1}
Water Flow Rate	ASTM D-4491	5 gpm/ft^2	204 lpm/m^2

***Maximum Average Roll Valve**

Notes:
- Mullen Burst ASTM D-3786 has been removed. It is not recognized by ASTM D-35 on Geosynthetics.
- Puncture ASTM D-4833 has been removed. It is not recognized by AASHTO M288 and has been replaced with CBR Puncture ASTM D-6241

PROPERTY	Typical English	Typical Metric
Roll Dimensions	12.5 x 432 ft 15 x 360 ft 17.5 x 309 ft	3.81 x 131.7 m 4.6 x 109.7 m 5.3 x 94.2 m
Roll Area	600 yd^2	502 m^2

Willacoochee Industrial Fabrics, Inc.
PO Box 599 • 769 West Main Street • Willacoochee, GA 31650
Ph: (912) 534-5757 • Fax: (912) 534-5533

GMA Geosynthetic Materials Association

Appendix C

RegenOx™ Product Information

REGENESIS

Advanced Technologies for Contaminated Site Remediation

RANGE OF TREATABLE CONTAMINANTS

	ISCO			Aerobic Bio	Anaerobic Bio				ISCR
RANGE OF TREATABLE CONTAMINANTS	RegenOx®	PetroCleanze®	PersulfOx®	ORC® Advanced	3-D Microemulsion®	HRC®	HRC-X®	BDI® Plus	CRS®
BTEX									
Benzene	✓	✓	✓	✓					
Toluene	✓	✓	✓	✓					
Ethylbenzene	✓	✓	✓	✓					
Xylene	✓	✓	✓	✓					
Petroleum Hydrocarbons									
Gasoline Range Organics (GRO) (C_6-C_{10-12})	✓	✓	✓	✓					
Diesel Range Organics (DRO) (C_{8-12}-C_{24-28})	✓	✓	✓	✓					
Oil Range Organics (ORO) (C_{22-32})	✓	✓	✓	✓					
Creosote (coal tar)	✓	✓	✓	✓					
Oxygenates									
Methyl tert-butyl ether (MTBE)	✓	✓	✓	✓					
Tert-butyl alcohol (TBA)	✓	✓	✓	✓					
Chlorinated Solvents									
Tetrachloroethylene (PCE)	✓	✓	✓		✓	✓	✓	✓	✓
Trichloroethene (TCE)	✓	✓	✓		✓	✓	✓	✓	✓
cis-1,2 Dichloroethene (DCE)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vinyl chloride (VC)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tetrachloroethane	✓	✓	✓		✓	✓	✓	✓	✓
Trichloroethane (TCA)	✓	✓	✓		✓	✓	✓	✓	✓
Dichloroethane (DCA)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Carbon tetrachloride	✓	✓	✓		✓	✓	✓		✓
Chloroethane	✓	✓	✓	✓	✓	✓	✓		✓
Chloroform	✓	✓	✓		✓	✓	✓		✓
Chloromethane	✓	✓	✓		✓	✓	✓		✓
Chlorotoluene	✓	✓	✓	✓	✓	✓	✓		✓
Methylene chloride	✓	✓	✓		✓	✓	✓		✓
Dichloropropane	✓	✓	✓		✓	✓	✓		✓
Dichloropropene	✓	✓	✓		✓	✓	✓		✓
Hexachlorobutadiene	✓	✓	✓		✓	✓	✓		✓
Trichloropropane	✓	✓	✓		✓	✓	✓		✓
Bis(2-chloroethyl)ether	✓	✓	✓		✓	✓	✓		✓
Bis(2-chloroethoxy)methane	✓	✓	✓		✓	✓	✓		✓
PAHs									
Acenaphthene	✓	✓	✓	✓					
Acenaphthylene	✓	✓	✓	✓					
Anthracene	✓	✓	✓	✓					
Benzo(a)anthracene	✓	✓	✓	✓					
Benzo(a)pyrene	✓	✓	✓	✓					
Benzo(b)fluoranthene	✓	✓	✓	✓					
Benzo(ghi)perylene	✓	✓	✓	✓					
Bis(2-ethyhexyl)phthalate	✓	✓	✓	✓					
n-butylbenzene	✓	✓	✓	✓					
Chrysene	✓	✓	✓	✓					
Dibenzo(ah)anthracene	✓	✓	✓	✓					
Fluorene	✓	✓	✓	✓					
Naphthalene	✓	✓	✓	✓					
Nitrobenzene	✓	✓	✓	✓					
Phenathrene	✓	✓	✓	✓					
Propylbenzene	✓	✓	✓	✓					
4-iso-propyltoluene	✓	✓	✓	✓					
Pyrene	✓	✓	✓	✓					
Styrene	✓	✓	✓	✓					
Trimethylbenzene	✓	✓	✓	✓					
Chlorobenzenes									
Chlorobenzene	✓	✓	✓	✓					
Dichlorobenzene	✓	✓	✓	✓					
Trichlorobenzene	✓	✓	✓	✓					
Phenols									
Phenol	✓	✓	✓	✓					
4-chloro-3-methyl phenol	✓	✓	✓	✓					
2-chlorophenol	✓	✓	✓	✓					
2,4-dichlorophenol	✓	✓	✓	✓					
2,4-dinitrophenol	✓	✓	✓	✓					
4-nitrophenol	✓	✓	✓	✓					
Pentachlorophenol				✓	✓	✓	✓		✓
Haloalkanes									
Dichlorodifluoromethane (Freon 12)					✓	✓	✓		✓
Trichlorofluoromethane (Freon 11)					✓	✓	✓		✓
Trichlorotrifluoroethane (Freone 113)					✓	✓	✓		✓
Pesticides & Herbacides									
α-Chlordane					✓	✓	✓		✓
Heptachlor Epoxide					✓	✓	✓		✓
Lindane (hexachlorocyclohexane)					✓	✓	✓		✓
DDT, DDD, DDE					✓	✓	✓		✓
Toxaphene					✓	✓	✓		✓
Dieldrin					✓	✓	✓		✓
2,4-D					✓	✓	✓		✓
2,4,5-T					✓	✓	✓		✓
Endrin					✓	✓	✓		✓
Energetics									
TNT	✓	✓	✓		✓	✓	✓		✓
DNT	✓	✓	✓		✓	✓	✓		✓
Nitroglycerine	✓	✓	✓		✓	✓	✓		✓
HMX	✓	✓	✓		✓	✓	✓		✓
RDX	✓	✓	✓		✓	✓	✓		✓
Miscellaneous									
Acetone	✓	✓	✓	✓	✓	✓	✓		
4-methyl-2-pentanone	✓	✓	✓	✓					
Perchlorate					✓	✓	✓		✓
Polychlorinated biphenyls (PCBs)									
Nitrates					✓	✓	✓		✓
Carbon Disulfide (CS2)	✓	✓	✓		✓	✓	✓		
1,4-dioxane			✓		✓	✓	✓		
Heavy Metals									
Chromium (VI)					✓	✓	✓		✓

For additional information or a free application design and cost estimate call 1-949-366-8000 or visit www.regenesis.com

RegenOx®

RegenOx™

CHEMICAL OXIDATION REDEFINED...

RegenOx™ is an advanced in situ chemical oxidation technology designed to treat organic contaminants including high concentration source areas in the saturated and vadose zones*

PRODUCT FEATURES:

- Rapid and sustained oxidation of target compounds
- Easily applied with readily available equipment
- Destroys a broad range of contaminants
- More efficient than other solid oxidants
- Enhances subsequent bioremediation
- Avoids detrimental impacts to groundwater aquifers

RegenOx product application

HOW IT WORKS:

RegenOx maximizes in situ performance using a solid alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. The product is delivered as two parts that are combined and injected into the subsurface using common drilling or direct-push equipment. Once in the subsurface, the combined product produces an effective oxidation reaction comparable to that of Fenton's Reagent without a violent exothermic reaction. RegenOx safely, effectively and rapidly destroys a wide range of contaminants in both soil and groundwater (Table 1).

ACHIEVES RAPID OXIDATION VIA A NUMBER OF MECHANISMS

RegenOx directly oxidizes contaminants while its unique catalytic complex generates a suite of highly charged, oxidative free radicals that are responsible for the rapid destruction of contaminants. The mechanisms by which RegenOx operates are:

- Surface- Mediated Oxidation: (see Figure 1 and description below)
- Direct Oxidation: $C_2Cl_4 + 2\ Na_2CO_3 \bullet 3\ H_2O_2 + 2\ H_2O \longleftrightarrow 2CO_2 + 4\ NaCl + 4\ H_2O + 2\ H_2CO_3$
- Free Radical Oxidation:
  - Perhydroxyl Radical ($HO_2\bullet$)
  - Hydroxyl Radical ($OH\bullet$)
  - Superoxide Radical ($O_2\bullet$)

Figure 1. RegenOx™ Surface-Mediated Oxidation

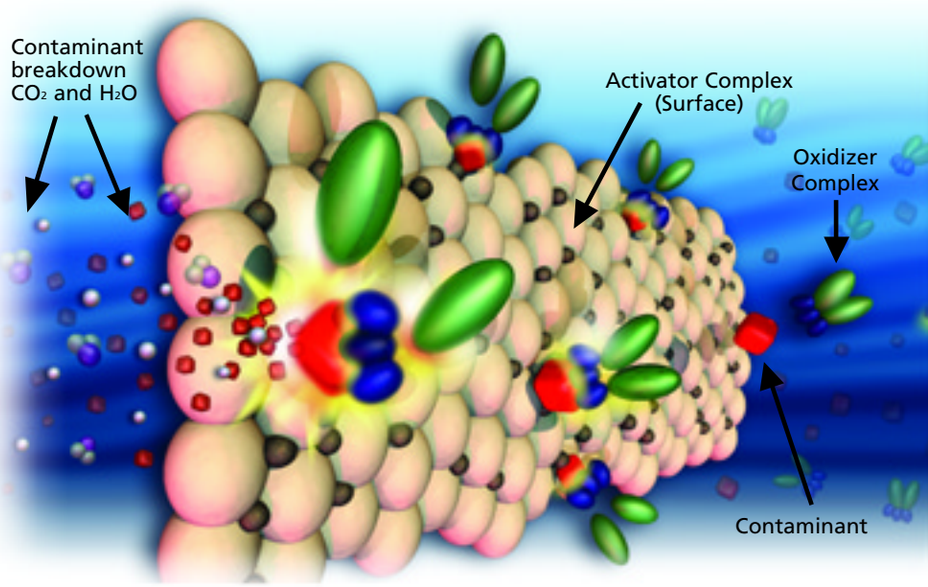


Figure 1. Surface-Mediated Oxidation is responsible for the majority of RegenOx contaminant destruction. This process takes place in two stages. First, the RegenOx activator complex coats the subsurface. Second, the oxidizer complex and contaminant react with the activator complex surface destroying the contaminant.

* Patent applied for

RegenOx™

From Mass Reduction to Bioremediation:

RegenOx™ is an effective and rapid contaminant mass reduction technology. A single injection will remove significant amounts of target contaminants from the subsurface. Strategies employing multiple Regenox injections coupled with follow-on accelerated bioremediation can be used to treat highly contaminated sites to regulatory closure. In fact, RegenOx was designed specifically to allow for a seamless transition to low-cost accelerated bioremediation using any of Regenesis controlled release compounds.

Significant Longevity:

RegenOx has been shown to destroy contaminants for periods of up to one month.

Product Application Made Safe and Easy:

RegenOx produces minimal heat and as with all oxidants proper health and safety procedures must be followed. The necessary safety guidance accompanies all shipments of RegenOx and additional resources are available on request. Through the use of readily available, highly mobile, direct-push equipment and an array of pumps, RegenOx has been designed to be as easy to install as other Regenesis products like ORC® and HRC®.

Effective on a Wide Range of Contaminants:

RegenOx has been rigorously tested in both the laboratory and the field on petroleum hydrocarbons (aliphatics and aromatics), gasoline oxygenates (e.g., MTBE and TAME), polyaromatic hydrocarbons (e.g., naphthalene and phenanthrene) and chlorinated hydrocarbons (e.g., PCE, TCE, TCA).

Oxidant Effectiveness vs. Contaminant Type:

Table 1

Contaminant	RegenOx™	Fenton's Reagent	Permanganate	Persulfate	Activated Persulfate	Ozone
Petroleum Hydrocarbons	**A**	**A**	B	B	B	**A**
Benzene	**A**	**A**	D	B	B	**A**
MTBE	**A**	B	B	C	B	B
Phenols	**A**	**A**	B	C	B	**A**
Chlorinated Ethenes (PCE, TCE, DCE, VC)	**A**	**A**	**A**	B	**A**	**A**
Chlorinated Ethanes (TCA, DCA)	**A**	B	C	D	C	B
Polycyclic Aromatic Hydrocarbons (PAHs)	**A**	**A**	B	B	**A**	**A**
Polychlorinated Biphenyls (PCBs)	B	C	D	D	D	B
Explosives (RDX, HMX)	**A**	**A**	**A**	**A**	**A**	**A**

Based on laboratory kinetic data, thermodynamic calculations, and literature reports.

Oxidant Effectiveness Key:

A = Short half life, low free energy (most energetically favored), most complete
B = Intermediate half life, low free energy, intermediate degree of completion
C = Intermediate half life, intermediate free energy, low degree of completion
D = Long half life, high free energy (least favored), very low degree of completion

REGENESIS
Advanced Technologies for Groundwater Resources
1011 Calle Sombra / San Clemente / California 92673-6244
Tel: 949/366-8000 / Fax: 949/366-8090 / www.regenesis.com

RegenOx® – Part A (Oxidizer Complex)

Material Safety Data Sheet (MSDS)

Last Revised: September 27, 2013

Section 1 – Supplier Information and Material Identification

Supplier:

1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H_2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part A (Oxidizer Complex)
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical	Percentage
15630-89-4	Sodium Percarbonate	60 -100 %
7699-11-6	Silicic Acid	< 1 %
63231-67-4	Silica Gel	< 1 %

Section 3 – Physical Data

Form:	Powder
Color:	White
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA

Section 3 – Physical Data (cont)

Flammability/Flash Point:	NA
Vapor Pressure:	NA
Bulk Density:	0.9 – 1.2 g/cm^3
Solubility:	Min 14.5g/100g water @ 20 ºC
Viscosity:	NA
pH (3% solution):	≈ 10.5
Decomposition Temperature:	Self-accelerating decomposition with oxygen release starts at 50 ºC.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions
Conditions to Avoid/Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances
Hazardous Decomposition Products:	Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.

Section 5 – Regulations

TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	*No*
Unlisted Substance:	*Yes*
SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	No
WHMIS Classification:	C, D2B
Canadian Domestic Substance List:	Appears

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.
	Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.
	Protect from moisture. Do not store near combustible materials. Keep containers well sealed.
	Store separately from reducing materials. Avoid contamination which may lead to decomposition.
Handling:	Avoid contact with eyes, skin and clothing. Use with adequate ventilation.
	Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.
	Label containers and keep them tightly closed when not in use.
	Wash hands thoroughly after handling.

Personal Protective Equipment (PPE)

Engineering Controls:	General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis.
Respiratory Protection:	For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.
Hand Protection:	Wear chemical resistant gloves (neoprene, rubber, or PVC).

Section 6 – Protective Measures, Storage and Handling (cont)

Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
Other:	Eye wash station.
Protection Against Fire & Explosion:	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes slight irritation.
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.
Extinguishing Media:	Water

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **Do Not** induce vomiting.

Section 8 – Measures in Case of Accidents and Fire (cont)

Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water.

Section 9 – Accidental Release Measures

Precautions:	
Cleanup Methods:	Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Section 10 – Information on Toxicology

Toxicity Data	
LD50 Oral (rat):	2,400 mg/kg
LD50 Dermal (rabbit):	Min 2,000 mg/kg
LD50 Inhalation (rat):	Min 4,580 mg/kg

Section 11 – Information on Ecology

Ecology Data	
Ecotoxicological Information:	NA

Section 12 – Disposal Considerations

Waste Disposal Method	
Waste Treatment:	Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.]
UN Number:	1479
Hazard Class:	5.1
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS® Rating	Health – 1 (slight)	Reactivity – 1 (slight)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

RegenOx® – Part B (Activator Complex)

Material Safety Data Sheet (MSDS)

Last Revised: December 9th, 2013

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium silicate solution, silica gel and ferrous sulfate
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part B (Activator Complex)
Product Use:	Used for environmental remediation of contaminated soils and groundwater

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
63231-67-4	Silica Gel
7720-78-7	Ferrous Sulfate
7732-18-5	Water

Section 3 – Physical Data

Form:	Liquid
Color:	Blue/Green
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	NA
Vapor Pressure:	NA

Section 3 – Physical Data (cont)

Specific Gravity	1.39 g/cm^3
Solubility:	Miscible
Viscosity:	NA
pH (3% solution):	11
Hazardous Decomposition Products:	Oxides of carbon and silicon may be formed when heated to decomposition.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions.
Conditions to Avoid:	None.
Incompatibility:	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 5 – Regulations

TSCA Inventory Listed: Yes

CERCLA Hazardous Substance (40 CFR Part 302)

Listed Substance: *No*

Unlisted Substance: *Yes*

SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification

Extremely Hazardous Substance: No

SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know

Hazard Category: Acute

SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance: No

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.
Handling:	Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation. Do not use product if it is brownish-yellow in color.

Personal Protective Equipment (PPE)

Engineering Controls:	General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.
Respiratory Protection:	Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.
Hand Protection:	Wear chemical resistant gloves.
Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.
Other:	
Protection Against Fire & Explosion:	Product is non-explosive and non-combustible.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes irritation. Symptoms include redness, itching and pain.
Ingestion:	May cause irritation to mouth, esophagus, and stomach.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage (small):	Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.
After Spillage/Leakage (large):	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.
Extinguishing Media:	Material is compatible with all extinguishing media.
Further Information:	
First Aid	
Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.

Section 9 – Accidental Release Measures

Precautions:

PPE:	Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).
Environmental Hazards:	Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.
Cleanup Methods:	Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 10 – Information on Toxicology

Toxicity Data

Sodium Silicate:	When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist. The acute oral toxicity of this product has not been tested.
Ferrous Sulfate:	LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:	Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T.	This product is not regulated as a hazardous material so there are no restrictions.

Section 14 – Other Information

HMIS® Rating	Health – 2 (moderate)	Reactivity – 0 (none)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat
	Contact – 1 (slight)	

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

RegenOx® PetroCleanze™

FREES BOUND HYDROCARBONS FOR MORE EFFECTIVE ENHANCED RECOVERY AND CHEMICAL OXIDATION

DESCRIPTION

RegenOx® PetroCleanze™ is a customized formulation of the widely-used RegenOx® *in situ* chemical oxidation technology. The primary function of RegenOx PetroCleanze is to increase the desorption rates of hydrocarbons bound in saturated soil and make them available for more efficient and rapid treatment using enhanced recovery technologies.

FEATURES & BENEFITS

RegenOx PetroCleanze offers the following features and benefits:

- Unique product chemistry proven highly effective on petroleum hydrocarbon contamination
- Detergent like technology moves bound hydrocarbons from the soil into the dissolved phase for better and more efficient recovery via physical/mechanical removal
- Designed to be used in conjunction with physical and/or mechanical recovery systems
- Powerful oxidation reactions equal to that of standard RegenOx oxidize more readily available hydrocarbons
- A two part integrated system comprised of standard RegenOx Part A and PetroCleanze, where the PetroCleanze component stays in-place providing an activation site for multiple applications if and when required.
- Engineered chemistry does not add surfactants but creates them aiding in enhanced hydrocarbon removal
- Avoids problematic carbon loading associated with the use of standard surfactant based technologies
- As part of an integrated site remediation approach RegenOx PetroCleanze reduces mass flux to facilitate risk-based and MNA site closures

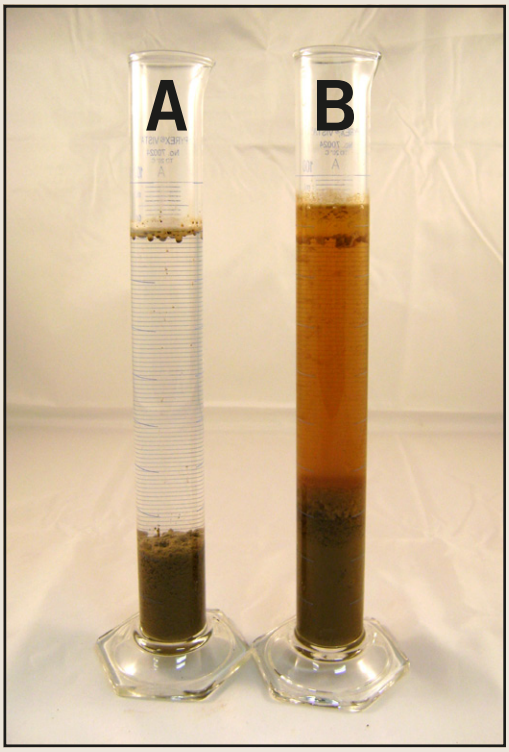


FIGURE 1: Treatment with RegenOx PetroCleanze

A. An untreated soil and hydrocarbon mixture in water

B. RegenOx PetroCleanze treated soil and hydrocarbon mixture with bound hydrocarbon clearly being released into the dissolved phase for removal or treatment

FORM & FUNCTION

The RegenOx PetroCleanze formula is optimized to desorb bound hydrocarbon mass and drive it from the soil matrix into the aqueous phase (Figure 1). Once contaminants are moved into the dissolved phase, other methods such as chemical oxidation using standard RegenOx or enhanced recovery techniques such as dual-phase extraction, vacuum enhanced extraction, pump and treat systems and even enhanced bioremediation using Oxygen Release Compound (ORC®) or Oxygen Release Compound ADVANCED (ORC Advanced®) can be used. In some cases where significant mass removal is required, multiple applications of RegenOx PetroCleanze may be necessary along with multiple extraction events.

REGENESIS
Advanced Technologies for Contaminated Site Remediation

REGENESIS / 1011 Calle Sombra / San Clemente / CA 92673-6244 / USA / T: 949.366.8000 / F: 949.366.8090 / www.regenesis.com

RegenOx® – PetroCleanze™

Material Safety Data Sheet (MSDS)

Last Revised: April 29, 2011

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium silicate solution, sodium hydroxide, sodium tripoly-phosphate and ferrous sulfate.
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® PetroCleanze™ (Activator Complex)
Product Use:	Used for environmental remediation of contaminated soils and groundwater.

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
7720-78-7	Ferrous Sulfate
1310-73-2	Sodium Hydroxide
7758-29-4	Sodium Tripolyphosphate

Section 3 – Physical Data

Form:	Semi Viscous Liquid
Color:	Dark Green to Black
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	NA
Vapor Pressure:	NA

Section 3 – Physical Data (cont)

Density	1.1 – 1.3 g/cm^3
Solubility:	Miscible
pH (3% solution):	13

Section 4 – Hazards Identification

Corrosive:	May cause burns. Harmful by inhalation, in contact with skin and if swallowed. Casues skin and eye irritation. Causes irritation to mouth, esophagus and stomach if swallowed. In case of accident or if you feel unwell, seek medial advice. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. If swallowed, do not induce vomiting, give plenty of water. Never give anything by mouth to an unconscious person. Wear suitable protective clothing, gloves, eye/face protection. Spilled material is very slippery.

Section 5 – Reactivity Data

Stability:	Stable under normal conditions
Conditions to Avoid:	None.
Incompatibility:	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.
Handling:	Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation. Do not use product if it is brownish-yellow in color.

Personal Protective Equipment (PPE)

Engineering Controls:	General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.
Respiratory Protection:	Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.
Hand Protection:	Wear chemical resistant gloves.
Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.
Other:	
Protection Against Fire & Explosion:	Product is non-explosive and non-combustible.

Section 7 – Measures in Case of Accidents and Fire

Spill or Leakage:	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoof from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, nuetralize the contaminated area and flush with large quantites of water.
Extinguishing Media:	Material is compatible with all extinguishing media. The following protective equipment for fire fighters is recommended when this material is present in the area of a fire: chemical googles, body-covering protective clothing, chemical resistant gloves and rubber boots.

First Aid:

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a medical specialist.
Inhalation:	Remove affected person to fresh air. Give artifical respiration if individual is not Breathing. If breathing is difficult, give oxygen. Seek medical attention.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. DO NOT induce vomiting. Seek medical attention.
Skin Contact:	Wash affected areas with soap and a large amount of water. Remove contaminated clothing and shoes.

Section 8 – Accidental Release Measures

Personal Protection:	Wear chemical goggles, body-covering protective clothing, chemical resistant gloves and rubber boats.
Environmental Hazards:	Material sinks when mixed with water. High pH of this material is harmful to aquatic life. Only water will evaporate from a spill of this material.
Small Spill Cleanup:	Mop and neutralize liquid and discharge to sewer in accordance with federal, state and local regulations.
Large Spill Cleanup:	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent run off from entering into storm drains and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, nuetralize the contaminated area and

flush with large quantites of water.

Section 9 – Information on Toxicology

Toxicity Data

Sodium Silicate: When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist.

The acute oral toxicity of this product has not been tested. In a study of rats fed sodium silicate in drinking water for three months, at 200, 600 and 1800 ppm, changes were reported in the blood chemistry of some animals, but no speifec changes to the organs of the animals due to sodium silicate administraton were observed in any of the dosage groups. Another study reported adverse effects to the kidneys of dogs fed sodium silicate in their diet at 2.4g/kg/day for 4 weeks, whereas rats fed the same dosage did not develop any treatment-related effects. Decreased numbers of births and survival to weaning was reported for rats fed sodium silicate in their drinking water at 600 and 1200 ppm.

Ferrous Sulfate: LD50 Oral (rat): 319 mg/kg; not a suspected carcinogen.

Sodium Hydroxide: Irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe. Investigated as a mutagen. Not a known carcinogen. No environmental toxicity found or determined.

Sodium Tripolyphosphate: Harmful if swallowed, inhaled or absorbed through skin. Causes severe irritation. Material is irritating to mucous membranes and upper respiratory tract. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. To the best of our knowledge the chemical, physical and toxicological properties have not

been thoroughly investigated.

Section 10 – Information on Ecology

Ecotoxicological Information:	Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 11 – Regulations

TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	No
Unlisted substance:	Yes
SARA Title III, Sections 302/303 (40 CFR Part 355) Emergency Planning Notification	
Extremely Hazardous Substance:	No
SARA Title III, Sections 311/312 (40 CFR Part 370) Community Right-to-Know	
Acute: Yes	**Chronic: Yes**
SARA Title III, Sections 313 (40 CFR Part 372) Toxic Chemical Release Reporting	
Community Right-to-Know	
Extremely Hazardous Substance:	**No**

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Neutralize and landfill solids in an approved waste facility operated by An authorized contactor in compliance with local regulations.
Package Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

USDOT:	Hazard Class 8 Corrosive Substance
Proper Shipping Name:	Corrosive liquid, basic, inorganic, n.o.s.
UN/NA:	UN3266
Packing Group:	PGIII

Section 14 – Other Information

HMIS Rating:	Health 3, Flammability 0, Reactivity 1, Contact 1.
Label Hazard Warning:	Danger! Corrosive. May be harmful if swallowed. Harmful in inhaled. Causes burns to any area of contact. Reacts with water, acids and other materials.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.