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Appendix D

Site Management Plan





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Site Management Plan

Frontier Chemical Site Niagara Falls, New York

Prepared for: Frontier Chemical Royal Avenue Site PRP Group (an unincorporated association)

CRA Infrastructure & Engineering

285 Delaware Avenue, Suite 500 Buffalo, New York 14202



April 2014 • 047392 (16)

CERTIFICATION

I, Robert G. Adams, am currently a registered professional engineer licensed by the State of New York. I certify that the Remedial Action was implemented and that construction activities were completed in substantial conformance with the Department-approved Remedial Design Report.

I certify that the data submitted to the Department with this Site Management Plan demonstrates that the remediation requirements set forth in the Remedial Design Report and in applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established for the remedy.

I certify that use restrictions, Institutional Controls, Engineering Controls, and/or any operation and maintenance requirements applicable to the Site are contained in an environmental easement created and recorded pursuant to ECL 71-3605 and that affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

I certify that this Site Management Plan provides for the continual and proper operation, maintenance, and monitoring of Engineering Controls employed at the Site, including the proper maintenance of remaining monitoring wells, and that such plan has been approved by the Department.

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

I certify that data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Robert G. Adams, of CRA Infrastructure & Engineering, 285 Delaware Avenue, Buffalo NY, am certifying as the Owner's Designated Site Representative and I have been authorized and designated by the site owners to sign this certification for the site.

eit H. alams

Robert G. Adams, P.E. CRA Infrastructure & Engineering, Inc. New York License Number 064918

APRIL 15,2014

Date





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Section 1.0 Introduction and Description of Remedial Program

This Site Management Plan (SMP) is required as an element of the remedial program that was implemented at the Frontier Chemical Site (hereinafter referred to as the "Site") under the New York State Inactive Hazardous Waste Disposal Site Remedial Program administered by the New York State Department of Environmental Conservation (NYSDEC).

1.1 General

The Frontier Chemical Royal Avenue Site PRP Group (the Frontier Group) entered into an Order on Consent (Index #89-0571-00-01) with the NYSDEC to perform additional Site characterization of the conditions at the Site. The Frontier Group consists of the Site owner and numerous parties; some of which are performing parties and some of which are settling parties. The Site is a 9-acre property located in the industrialized area of Niagara Falls, New York. A figure showing the Site location and boundaries is provided on Figure 1.1. The boundaries of the Site are more fully described in the metes and bounds Site description that is part of the Environmental Easement, which is included as Appendix A to this SMP.

Following completion of the additional Site characterization, the Frontier Group worked with the NYSDEC to develop and implement the various components of the Site remedy. The overburden and shallow bedrock groundwater remedy was implemented as specified in the 2006 Record of Decision (ROD). The deep bedrock groundwater, designated as OU2, was investigated and a remedial action consisting of monitored natural attenuation has been determined to be the appropriate remedy and set forth in the OU2 ROD (March 2011). For the source area soil, a remedy consisting of excavation and ex-situ thermal treatment was selected and implemented as the appropriate remedy.

After completion of the remedial work described in the Remedial Design Report (CRA – February 2013), the Remedial Action Objectives were met although some minimal residual contamination remains in place at subsurface locations on the Site, which is hereafter referred to as "residual material." This SMP has been prepared to manage the residual material at the Site until the Environmental Easement is removed in accordance with ECL Article 71, Title 36. All reports associated with the Site can be viewed by contacting the NYSDEC.

This SMP was prepared by CRA Infrastructure and Engineering, Inc. (CRA), on behalf of the Frontier Group, in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that have been put in place following the conclusion of the source area soil remediation which, in conjunction with the Site cap, was the final active component of the approved remedy. The active components of the remedy were completed in January 2014. The ICs and ECs are required by the Environmental Easement for the Site and were recorded by the Site owner on March 26, 2014.



1.2 Purpose

There is residual material that has been left in place following the completion of the Remedial Action. ECs have been incorporated into the Site remedy to ensure ongoing protection of public health and the environment. The Environmental Easement granted to the NYSDEC, and recorded with the Niagara County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site. The ICs place restrictions on Site use, and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Easement. Once approved by the NYSDEC, compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of the applicable procedures required at the Site with regard to the following:

- 1. Implementation and management of all ECs and ICs
- 2. Groundwater monitoring
- 3. Performance of periodic inspections, certification of results, and submittal of Periodic Review Reports

To address these needs, this SMP includes two plans:

- 1. An Engineering and Institutional Control Plan for implementation and management of ECs and ICs
- 2. A Monitoring Plan for implementation of Site Monitoring

An Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems is not required, as no active systems are in place at the Site.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which can constitute grounds for revocation of the Certificate of Completion (COC).
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375.
- The Site Owner should be familiar with the Division of Responsibilities set forth in Appendix I to this SMP.



1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC project manager. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

Section 2.0 Site Background

2.1 Site Location and Description

The Site is located in an industrial area of the City of Niagara Falls, County of Niagara, New York and is identified as Block 1 and Lot 6 on the Niagara County Tax Map (160.09). The Site is an approximately 9-acre area parcel bordered to the north by property identified as owned by Sentry Metals, to the northwest and west by property identified as owned by the Niagara County Industrial Development Agency, to the south by Elkem Metal Company, and to the east by 47th Street, beyond which is an industrial site (Strator). The boundaries of the Site are more fully described in the Metes and Bounds description that is included in the Environmental Easement (see Appendix A).

2.2 Site History

The Site was originally developed in 1906 by ISCO Chemical Company (ISCO) as a caustic-chlorine plant. During World War II, the International Minerals and Chemicals Corporation bought the Site and operated the facility as a caustic soda/potash and chlorine plant. In 1977, the Frontier Chemical Company, which provided permitted hazardous and non-hazardous chemical treatment, moved their operations to the Site from Pendleton, New York. Frontier Chemical expanded its on-Site operations, which included wastewater treatment, fuels blending, and bulking chemicals for off-Site disposal. The Site held a NYSDEC permit.

In 1985, Frontier Chemical and a sister company, BLT Services, Inc., became wholly owned subsidiaries of Environmental Services Associates, Inc. (ESA). In February 1990, ROE Consolidated Holdings assumed operational control of ESA, which had operational control of the Site. The current Site owner is 5335 River Road, Inc.

The facility ceased operations in December 1992. In 1995, the NYSDEC listed the Site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. A Class 2 site is a site where the NYSDEC has determined that hazardous waste presents a significant threat to the public health or the environment and action is required. Beginning in 1999, most of the Site's buildings were demolished to grade. The remainder of the buildings were demolished in 2012. The Site remains a vacant industrial property and is secured with a perimeter fence.



Contaminants of concern at the Site include various volatile organic compounds (such as trichlorobenzene, dichlorobenzene, chlorobenzene, tetrachloroethene, trichloroethene, acetone, benzene, chlorotoluene, toluene, etc.), and various semivolatile organics (such as phenol, dichlorophenol, etc.). Impacted media include soil, overburden groundwater, and bedrock groundwater. Overburden and upper bedrock groundwater contaminant migration has been limited by the presence of the bedrock tunnels on the east (the New Road Tunnel under 47th Street) and south sides (the Falls Street Tunnel under Royal Avenue) of the Site. The Site's groundwater remedies are already in place. A source area soil remediation was implemented in 2013/2014 in accordance with the Remedial Design Report and has reduced the estimated mass of volatile organic compounds remaining on the Site by more than 95 percent.

2.3 Geologic Conditions

2.3.1 Site Geology

The surface of the Site is mostly covered by either asphalt or concrete. Up to 2 feet of fill material (generally gravel with some cinders, glass, wood, slag, bricks, etc.) overlies an overburden mostly comprised of a silty-clay, with some discontinuous seams of silty sand and clay. The total depth of the overburden is 14 to 17 feet.

The bedrock immediately beneath the overburden is Lockport Dolomite. Distinct horizontal fracture systems have been characterized in the bedrock during the remedial investigations and have identified the following water-bearing zones:

- i. The A-Zone is identified as the fracture system consisting of the upper 3 to 5 feet of weathered bedrock
- ii. The B-Zone is identified as the fracture system approximately 8 to 10 feet below the A-Zone
- iii. The C-Zone is identified as the fracture system approximately 20 feet below the B-Zone
- iv. The D-Zone is identified as the fracture system approximately 49 to 63 feet below the top of bedrock
- v. The E-Zone is identified as the fracture system approximately 70 to 92 feet below the top of bedrock

2.3.2 Hydrogeology

2.3.2.1 Regional Hydrogeology

Regionally, bedrock groundwater is recharged by water from the upper Niagara River (above the Falls), transmitted through fractures in the rock, and flows to the lower Niagara River (at the gorge



downstream from the Falls). There are two man-made structures which exert a significant influence on the flow of bedrock groundwater in the region: the New York Power Authority Conduits (Power Conduits) and the Falls Street Tunnel (FST). These structures and their effects on regional groundwater are described below.

NYPA Power Conduits

The Power Conduits are two parallel reinforced concrete lined tunnels which were excavated by open cut methods and installed within the bedrock to convey upper Niagara River water to the Robert Moses power generating station in Lewiston, New York. They are each approximately 65 feet high by 46 feet wide and run 4 miles in length in a south (river intake end) to north (power plant location) direction. The conduits pass approximately 1,100 feet to the west of the Site.

The Power Conduits were constructed with a series of continuous drains along the outside of the concrete walls and floors. These drains are connected to the inside of the conduits at two locations and were designed to regulate the bedrock groundwater height around the exterior of the conduits. Given the length and depth of the Power Conduits, the drain systems intersect and influence a significant portion of the upper bedrock groundwater in the Niagara Falls area. The drain systems essentially create a preferential pathway for upper bedrock groundwater, and the result is a groundwater "sink" along the length of the conduits. It has been estimated that the influence of the conduits on the bedrock groundwater flow regime extends approximately 3,000 to 4,000 feet to the east and west of the Power Conduits' alignment.

The Power Conduits pass under the unlined bedrock FST (described in detail below) on Royal Avenue. A significant amount of bedrock groundwater transmitted along the Power Conduit drain system flows upward and into the FST at this crossing. A 2003 estimate performed on behalf of New York Power Authority calculated infiltration of approximately 6.5 million gallons of bedrock groundwater per day into the FST from the Power Conduit drain system.

Falls Street Tunnel

The FST is a bedrock sewer tunnel that passes along the south side of the Site. It runs east to west for approximately 3.5 miles from 56th Street to the Niagara Gorge. The FST is approximately 7 feet wide by 6 feet high (in the vicinity of the Site on Royal Avenue) and it intersects the Site B-Zone bedrock fracture system. The FST has drop shafts constructed at all major street intersections. These drop shafts are brick lined within the overburden and unlined within the bedrock.

In 2012, the segment of the FST that overlies the Power Conduits was sealed and removed from service to attempt to eliminate the above noted infiltration. The segment that was sealed includes most of the



length of the FST along the Frontier Site (the portion west of Regulator 8). Only the 150 foot section of the FST between Regulator 8 and 47th Street is still active along the south side of the Frontier Site.

Other Local Sewers

In the immediate vicinity of the Site, there are several sewers that either influence Site hydrogeology or play a role in the collection and flow of local groundwater and storm water. As discussed above, the FST is a major sewer which runs under Royal Avenue along the south side of the Site. Running parallel, and also located beneath Royal Avenue just south of the FST, is the South Side Interceptor (SSI). In addition, the New Road Tunnel runs along the eastern side of the Site under 47th Street. The SSI and the New Road Tunnel (47th Street Tunnel) are described in detail below.

South Side Interceptor

The FST was originally constructed as a combined storm and sanitary sewer. However, most of the waters from the area to the east of 47th Street were diverted after 1972, when the concrete lined SSI was constructed. The SSI is located slightly south of the FST and runs from the intersection of 47th Street and Royal Avenue to its discharge point at the Niagara Falls wastewater treatment plant (WWTP). The SSI sewer serves various industrial waste dischargers with connections between its origin and its termination at the WWTP. Regulating dams, constructed in the FST just west of 47th Street (Regulator 8 adjacent to the Site) and at 38th Street (about 1/2 mile to the west) historically diverted dry weather and low FST flows to the SSI. High water flows within the FST (such as those accompanying significant storm events) historically resulted in an "overtopping" of the diversion dams, and allowed water to continue along the FST to the west instead of being diverted to the SSI. However, the closure of the section of the FST adjacent to the FST is now full of water and no longer allows for infiltration of groundwater.

47th Street Tunnel

The 47th Street Tunnel is an unlined bedrock sewer tunnel that passes along the eastern side of the Site. It runs from north to south under 47th Street, and connects into the FST at Royal Avenue. The 47th Street Tunnel is approximately 6 feet wide by 5 feet high, and like the FST, the tunnel intersects the B-Zone bedrock fracture system.

2.3.2.2 Site Hydrogeology

Depth to groundwater within the overburden ranges from about 2 to 10 feet below the ground surface. However, the groundwater in the overburden exists only as a perched water zone with the majority of the overburden being in a dewatered state due to the presence of the FST and the 47th Street Tunnel.



There was a horizontal overburden groundwater gradient in the perched zone toward the southeast, with a localized overburden 'sink' (inwardly directed groundwater depression) in the south-central portion of the Site. A downward vertical groundwater gradient exists between the overburden and the top of the bedrock. Information obtained during the 2008 and 2010 investigations found that a considerable portion of the overburden on the Site is in a dewatered state with minimal groundwater present. The soil remediation project of 2013/2014 confirmed the dewatered condition of the overburden.

Within the upper 35 feet of bedrock, three distinct horizontal fracture zones have been identified. The A-Zone consists of the highly weathered upper 3 to 5 feet of bedrock. The B-Zone is a fracture system which is up to 2 feet thick and is located approximately 8 to 10 feet below the A-Zone. A downward vertical groundwater gradient exists from the A-Zone to the B-Zone. The A and B-Zones are designated as the shallow bedrock groundwater regime and are within the capture zone of the unlined sewer system. The historical effect of the FST as an upper bedrock groundwater interceptor has been well documented in numerous hydrogeologic studies of the area. The location, depth, and hydraulic influence of the tunnels have effectively intercepted Site overburden and upper bedrock groundwater and have prevented it from migrating beyond the Royal Avenue and 47th Street Tunnel alignments. For this reason, this naturally-occurring remedy was selected as the appropriate remedy for the shallow groundwater in the 2006 ROD. With the closure of a portion of the FST, the groundwater flow beneath the Frontier Site has changed to a more easterly flow from the former southeasterly direction. The groundwater from beneath the Frontier Site is still expected to be captured by the 47th Street Tunnel and the remaining open section of the FST.

The C-Zone is a fracture system approximately 20 feet below the B-Zone. The data available prior to the 2008 investigation showed that there is a slight upward vertical groundwater gradient from the C-Zone to the B-Zone. The additional investigations performed by the Frontier Group in 2008 through 2010 confirmed that an upward gradient exists between the C-Zone and the B-Zone. The investigations also identified that there is an upward gradient from the D-Zone (49 to 63 feet below top of rock) to the C-Zone and also from the E-Zone (70 to 92 feet below top of rock) to the D-Zone. These upward gradients which extend all the way from the E-Zone up to the B-Zone have protected the deep bedrock groundwater from chemical releases from the Site. Since there is no significant threat to human health or the environment associated with the deep bedrock groundwater (the C-Zone and deeper), and natural attenuation is addressing the chemicals present in the deep bedrock groundwater, the DEC approved Focused Feasibility Study performed to evaluate remedial alternatives for the deep bedrock groundwater selected monitored natural attenuation with institutional controls as the appropriate remedy.



2.4 Summary of Remedial Investigation Findings

Previous chemical characterization of subsurface soils (unsaturated and saturated) and groundwater has been presented in the Supplemental Remedial Investigation Report (Ecology & Environment – November 2002) and was updated with the data collected by the Frontier Group, which was reported in the Remedial Pre-Design Investigation Report (CRA September 2010).

The following provides a brief summary of the investigation findings.

2.4.1 Soil

2.4.1.1 Surface Soil

The majority of the industrial zoned Site is currently covered with either concrete or asphalt pavement. These surfaces are clean and pose no chemical contact exposure potential for Site visitors or workers. The small remaining areas of the Site's surface are soil–covered. Chemical sampling of these surface areas has shown minimal chemical presence. Consequently, there is minimal risk of exposure to Site chemicals anywhere on the surface of the Site. The 2013/2014 source area soil remediation further reduced the possibility of exposure to surface soil chemicals by placing a one foot layer of clean crushed concrete or quarried stone over all soil-exposed surfaces on the Site.

2.4.1.2 Subsurface Soil

Volatile organic compound (VOC) contamination was detectable in overburden soils in the central and south-central portions of the Site. The primary VOCs include monochlorotoluene, various chlorobenzene compounds, tetrachloroethene, trichloroethene, and toluene. In some areas, non-aqueous phase liquids (NAPL) were suspected, resulting in elevated VOC concentrations. The 2006 ROD specified that soils with elevated VOC concentrations be remediated. The soils with elevated VOC concentrations are designated as source area soil. The delineation of source area soil extends beyond the vertical and horizontal limits of the soil that exceeds the cleanup criteria in 6 NYCRR Part 375-6 that was promulgated after the ROD was issued. Although the 6 NYCRR Part 375-6 criteria would require considerably less soil to be defined as source area soil requiring remediation, the NYSDEC and Frontier Group have established the horizontal and vertical delineation of the source area soil to constitute the remediation area identified through the NYSDEC-approved Remedial Pre-Design Investigation report (CRA, September 2010). This delineation is consistent with the remedial objectives of the 2006 ROD. All of the source area soil was excavated and treated during the 2013/2014 soil remediation project. During the remediation, it was also determined that there was no NAPL present on the Site.

Radiologically impacted fill materials unrelated to former permitted storage or treatment activities have been identified to be present on the Site.



2.4.2 Groundwater

Various VOCs that are detectable in the overburden soil are also present in the overburden groundwater. Due to the influence of the adjacent unlined bedrock tunnels on the overburden groundwater (drawing it downward into the fractured bedrock aquifer), some constituents migrated downward into the fractured bedrock. As described in Section 2.3.2.1, the location and influence of the FST and 47th Street tunnel have effectively intercepted the lateral movement of overburden and upper bedrock groundwater and prevented it from migrating off Site beyond the FST and 47th Street tunnel alignments.

As noted in the ROD, although the nearby tunnels provide an effective groundwater control system for the Site, achievement of groundwater standards on the former TSDF within a reasonable time frame is considered technically impracticable. The ROD also provided that control of the impacted groundwater within the shallow zones at the Site was adequately addressed by the containment provided by the tunnels. This remedy has been adopted and now operates under a Significant Industrial User Permit that was issued by the Niagara Falls Water Board to the Frontier Group.

Section 3.0 Engineering and Institutional Control Plan

Since some minimally impacted soil, groundwater, and soil vapor remain detectable beneath the Site, ECs and ICs are appropriate to protect human health and the environment into the future. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all ECs/ICs at the Site. The EC/IC Plan is one component of the SMP and is subject to revision through consultation with the NYSDEC, as appropriate.

3.1 Purpose

This plan provides:

- A description of all ECs/ICs on the Site
- The basic implementation and intended role of each EC/IC
- A description of the key components of the ICs set forth in the Environmental Easement
- A description of the features to be evaluated during each required inspection and periodic review
- A description of plans and procedures to be followed for implementation of ECs/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site
- Any other provisions necessary to identify or establish methods for implementing the ECs/ICs required by the Site remedy, as determined by the NYSDEC



3.2 Engineering Control Systems

The ROD requires that the Site surface either be covered with the existing asphalt or concrete surface or 1 foot of clean fill material. At the completion of excavation activities associated with the source area soil remediation that was completed in 2014, the cover system was made compliant with the ROD. The existing undisturbed asphalt and concrete-covered areas were allowed to remain "as is". All previously existing soil cover areas and the area disturbed due to the excavation of the source area soil were covered with clean fill material. Since the expected near future use of the industrial zoned Site will be as a parking/staging area, recycled concrete and hard demolition material from the Site remediation project were used as part of the 1 foot of clean surface material that was placed over all previously existing and post-excavation soil cover areas. The recycled concrete/demolition material was crushed to 2-inch-minus prior to placement and compacted in place. The remainder of the 1 foot of clean cover was completed using imported crushed stone from a quarry.

Figure 3.1 shows the final surface coverings following the soil remediation project. An updated version of this figure must be included in the subsequent Periodic Review Reports (Section 6.3) confirming that the protective cover remains in place.

3.3 Institutional Controls

A series of ICs is required by the ROD to:

- 1. Implement, maintain, and monitor EC systems
- 2. Prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination
- 3. Limit the use and development of the Site to industrial uses only

Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this Site Management Plan. The ICs that are to be implemented are as follows:

- Compliance with the Environmental Easement and this SMP by the Grantor (Site owner) and the Grantor's successors and assigns
- All ECs must be operated and maintained as specified in this SMP
- All ECs on the Controlled Property must be inspected at a frequency and in the manner defined in this SMP
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP



• Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in the manner defined in this SMP

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of ICs in the form of Site restrictions. Adherence to these ICs is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The industrial zoned property may only be used for industrial use provided that the long-term ECs and ICs included in this SMP are employed
- The property may not be used for a higher level of use, such as unrestricted, restricted residential, or commercial use without additional evaluation (including possible additional remediation) and amendment of the Environmental Easement, as approved by the NYSDEC
- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP
- The use of the groundwater underlying the property as a source of potable or process water is prohibited without treatment rendering it safe for the intended use as determined by the NYSDEC, NYSDOH, or Niagara County Health Department
- The potential for vapor intrusion must be evaluated for any building developed on the Site in the future and any potential impacts that are identified must be monitored or managed through implementation of appropriate vapor mitigation measures
- Vegetable gardens and farming on the property are prohibited
- The Site owner will submit to NYSDEC a written statement that certifies, under penalty of perjury, that:
 - 1. Controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC.
 - 2. Nothing has occurred that impairs the ability of the controls to protect public health and the environment or that constitutes a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

3.4 Excavation Work Plan

The NYSDEC approved soil remediation project that was completed in 2013/2014 resulted in the treatment of more than 95 percent of the VOCs previously present on the Site based upon the data



collected during the NYSDEC approved remedial investigations. Although areas of the industrial Site have historic fill materials left in place under the Site cover (including some that are unassociated with operations at the Site – TENORM), this historic fill and any potential residuals impacts will be addressed through the filing of the Environmental Easement and through the implementation of the Site Management Plan and specifically this Post-Remedial Action Excavation Work Plan (EWP). The conditions that remain below the Site cover consist of the following:

a. Within the Soil Remedy's Excavation Area

- i) Non-source area soil that contains total VOC concentrations of less than 100 parts per million (ppm)
- ii) Source area soil that contains total VOC concentrations averaging 0.34 ppm
- iii) 608 cubic yards of TENORM material within the designated backfill area, enveloped in orange filter fabric.

The areal and horizontal boundaries of the storage areas containing these materials are presented on Figures 3.2 through 3.5.

b. Outside the boundaries of the Soil Remedy's Excavation Area

- i) Non-source area soil that contains total VOC concentrations of less than 100 ppm
- ii) TENORM from historic fill

The concentrations of VOCs in the soil outside the boundaries of the 2013/2014 soil remedy's excavation area are presented in Appendix B. These analytical data are from the boreholes completed during the Remedial Investigation and Pre-Design Investigations. A figure showing the location of these boreholes is also included in Appendix B.

The Site was remediated to a condition that allows for future restricted use of the Site as industrial. Any future intrusive work that will penetrate the clean cover or cap, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing cover system, will be performed in compliance with the EWP that is attached as Appendix C to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the Health and Safety Plan (HASP) prepared for the Site. The HASP is attached as Appendix D. The HASP is compliant with current DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State, and local regulations. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP will be updated and re-submitted with the notification provided in Section 1.0 of the EWP. Any intrusive construction work will be performed in compliance with the EWP and HASP and will be reported upon in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 6).

It is noted that radiologically impacted historic fill material was identified to be present on the Site and therefore any intrusive work must be performed in accordance with the radiological safety plans and



material management plans that are specified in the HASP. The radiologically impacted historic fill material has been identified as Technically Enhanced Naturally Occurring Radioactive Material (TENORM) associated with historic production of phosphorus slag unrelated to the Site. The slag is reportedly derived from the processing of phosphorus ores from the Western New York area and contains elements of radioactive uranium, thorium, and radium and their progeny. This material is unassociated with operations at the Site but was encountered on the Site as historic fill. Some of the material was encountered and removed during the soil remediation and some remains on Site in a designated area or, possibly, in undisturbed portions of the Site.

The Site owner and any associated parties preparing to perform future work on the Site are responsible for compliance with this SMP and the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation water, control of runoff from open excavations and surface contamination areas, and for structures that may be affected by excavations (such as building foundations and footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the ECs described in this SMP.

For any intrusive work that is to be performed in the 2013/2014 excavation area, the following provides the specifics of the manner in which the excavation was backfilled. The soil and material was placed back into the excavation in the following sequence. An orange filter fabric was placed over the exposed slopes of the excavation and over the exposed bottom surfaces of the excavation that had reached the limits of the source area soil. The purpose of the orange filter fabric was to act as a demarcation feature for future reference so that the limits of the excavation would be identifiable in the field. Filter fabric was not placed over the exposed bedrock surface. Once the filter fabric was in place, the deepest portion of the excavation was backfilled with non-source area soil. In some areas, the rock material that had been separated from the source area soil was blended into the backfill layer of non-source area soil as the backfilling progressed. Upon completion of the placement of the non-source area soil in a specific area, this material was also covered with an orange filter fabric for demarcation purposes. The remainder of the excavation, to within 1 foot of the surrounding concrete and asphalt surfaces, was backfilled with the treated source area soil. The final foot of the excavation was backfilled with either the crushed concrete/asphalt that had been excavated from the Site, the crushed select demolition debris, or with imported guarried stone. The guarried stone was new material provided from the Lafarge pit in Niagara Falls, New York. A total of 5,480 tons (3,300 cubic yards) of quarried stone was imported to supplement the volume of crushed concrete, asphalt, and demolition debris necessary to complete the 1 foot of clean cover over all of the exposed soil cover areas. This included some areas that were outside the limits of the soil remediation excavation but had soil covers that were required to be covered with 1 foot of clean material as well. The elevations of the base of the final excavation, the top of the backfill layer of non-source area soil, the elevation of the top of the backfill layer of source area soil, and the final top of the crushed concrete/asphalt/ demolition debris/imported stone are presented on Figures 3.2, 3.3, 3.4, and 3.5, respectively.



The TENORM that was excavated during the soil remediation but not shipped off Site for disposal (608 cubic yards) was placed in the separate on-Site disposal area that was approved by the NYSDEC. The location of the TENORM disposal area is shown on Figure 3.6. The TENORM was placed on top of a layer of non-source area soil and covered with a layer of treated source area soil. The entire TENORM deposit was enveloped in orange filter fabric for demarcation purposes. As required, the top of the TENORM deposit is set more than 4 feet below the ground surface to minimize the potential for future contact. Based on the radiological surveys that were performed prior to the implementation of the soil remedy, there may be some additional areas on the Site where TENORM is present. Copies of the radiological surveys performed prior to the implementation of the soil remedy are provided in Appendix E.

Two cross sections of the excavation area and the backfilling sequence are provided on Figure 3.7. The locations of the cross sections are shown on Figure 3.8.

3.5 Soil Vapor Intrusion Evaluation

The potential for soil vapor intrusion (SVI) into Site structures may exist due to the presence of soils with remaining VOC concentrations. Prior to the construction of any enclosed structure on the Site and for which the potential for SVI has been confirmed, a SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York." Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

In the event that SVI sample data are collected, it will be forwarded to the NYSDEC, along with a recommendation for follow-up action, such as mitigation. SVI data will also be transmitted to the Site owner within 30 days of validation.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report.



3.6 Inspections and Notifications

3.6.1 Inspections

Inspections of all remedial components installed at the Site will be conducted by the Site owner at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive Site-wide inspection will be conducted annually, or as may be specified in the future in agreement with the NYSDEC. The inspections will determine and document the following:

- Whether ECs continue to perform as designed
- If the ECs continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the Environmental Easement
- Achievement of remedial performance criteria
- Sampling and analysis of appropriate media during monitoring events
- If Site records are complete and up to date
- Changes, or needed changes, to the remedial or monitoring system

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 4.0). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 6.0).

3.6.2 Notifications

Notifications will be submitted by the Site owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the Remedial Action Order on Consent, 6NYCRR Part 375, and/or Environmental Conservation Law
- 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan
- Notice within 48 hours of any damage or defect to the foundations or structures that reduces or has the potential to reduce the effectiveness of other ECs and likewise any action to be taken to mitigate the damage or defect
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public



• Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Remedial Action Order on Consent, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing.
- The Site Owner should refer to applicable provisions of 6 NYCRR Part 375 with regard to necessary notifications to the NYSDEC for change of use activities, including change of ownership.

3.7 Contingency Plan

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. In the event of any environmentally-related situation or unplanned occurrence requiring assistance, the Site owner or Site owner's representative should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. These emergency contact lists must be maintained in an easily accessible location at the Site.

Organization/Name	Title/Location	Telephone
Medical, Fire, and Police		911
Niagara Falls Memorial Medical Center	621 Tenth Street Niagara Falls, NY	716-278-4000
One Call Center (3-day notice required for utility markout)		800-272-4480
Poison Control Center		800-222-1222
Pollution Toxic Chemical Oil Spills		800-424-8802
NYSDEC Spills Hotline		800-457-7362
NYSDEC	Regional Remediation Engineer/Buffalo Office	716-851-7220
OWNER	5335 River Road, Inc. Joe Williams	813-610-0169



Organization/Name	Title/Location	Telephone
Frontier Group	Webster Szanyi LLP 1400 Liberty Building Buffalo, NY 14202 Nelson Perel	716-842-2800
Frontier Group's Consultant	CRA Infrastructure & Engineering 285 Delaware Ave, Suite 500 Buffalo, NY 14202 Jim Kay	716-856-2142

In the case of an emergency, the Niagara Falls Memorial Medical Center is the nearest health facility to the Site. The hospital is located at 621 Tenth Street, Niagara Falls, New York, a distance of approximately 2.4 miles (8 minutes).

From the Site, proceed west down Royal Avenue for 0.6 miles. Turn right onto Hyde Park Boulevard and travel north for 0.5 miles. Turn left onto Walnut Avenue and travel west for 1.3 miles. The hospital is on the right at the corner of Walnut Avenue and Tenth Street.

Section 4.0 Site Monitoring Plan

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site, the soil cover system, and the affected Site media identified below. Monitoring of other ECs is described in Chapter 5: Operation, Monitoring, and Maintenance Plan. This Monitoring Plan may only be revised with the approval of NYSDEC.

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

4.1 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of groundwater
- Assessing compliance with applicable NYSDEC standards, criteria, and guidance, particularly ambient groundwater standards
- Assessing achievement of the remedial performance criteria



- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment
- Preparing the necessary reports for the various monitoring activities

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocols, and frequency
- Information on all designed monitoring systems (e.g., well logs) (See Appendix F)
- Analytical sampling program requirements
- Reporting requirements
- Quality Assurance/Quality Control (QA/QC) requirements
- Inspection and maintenance requirements for monitoring wells
- Monitoring well decommissioning procedures
- Annual Site inspection and periodic certification

Semi-annual monitoring of the performance of the remedy and overall reduction in contamination on Site will be conducted in conjunction with the monitoring required by the Significant Industrial User Permit #72 (groundwater discharge permit – See Appendix G) issued by the Niagara Falls Water Board. Trends in contaminant levels in groundwater will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Monitoring programs are outlined in detail in Sections 4.2 through 4.4 below.

4.2 Asphalt/Concrete Cover System Monitoring

The cover system at the Site is designed solely to prevent contact between Site visitors/workers and the residual material in the Site soil. The asphalt and concrete cover systems are intended to be generally low-maintenance covers. Assessment of the severity of deterioration or damage to asphalt pavement or concrete is subjective, and inspection personnel must use professional judgment in assessing what type and extent of deterioration/damage warrants repair or maintenance. As a guideline, areas of asphalt pavement or concrete will be repaired when the pavement is deteriorated/damaged to the extent that a significant amount of underlying soil or sub-base material is exuded from beneath the pavement. As a minimum, soil exposed beneath the asphalt or concrete over an area greater than 1 square foot would require repair of the asphalt or concrete.



Deteriorated asphalt pavement will be evaluated, and repaired using cold mix asphalt for areas less than 4 square feet, or hot mix asphalt and/or liquid bituminous material for larger areas. Concrete surfaces, will be repaired using one or more appropriate methods selected based on the type and extent of concrete deterioration or damage. Such methods may include:

- Patching with cold mix asphalt (for areas less than 4 square feet)
- Patching with hot mix asphalt or bituminous material
- Saw cutting and removing the damaged concrete and replacement with new concrete
- Use of low-slump concrete
- Replacement using one foot of clean quarried stone or crushed demolition material

For cases where concrete material is used to make the repairs, the use of reinforcing mesh or re-bar and bonding agents may be used.

4.3 Soil Cover System Monitoring

At the conclusion of the source area soil remediation, the remaining soil-covered areas were covered with 1 foot of crushed concrete, asphalt, or demolition material, or imported quarried stone. From time to time, it may be necessary to place a top skiff of new stone, crushed concrete/asphalt/demolition material to restore the surface, suitable with the intended use.

In the event that a soil cover is placed over some of the Site at a later date, the following procedures will be used. Assessment of the severity of deterioration or damage to the soil cover system is subjective, and inspection personnel must use professional judgment in assessing what type and extent of deterioration/damage warrants repair or maintenance. As a guideline, the soil cover system will be repaired if an area of the 1-foot cover soil layer is eroded or otherwise disturbed to a depth of 1 foot. Repair will consist of placement of clean soil material over the area to restore the cover thickness to 1 foot.

4.4 Groundwater Monitoring

4.4.1 Groundwater Quality Monitoring

Groundwater quality monitoring will be performed to assess the performance of the remedy. The remedy includes both a shallow groundwater component and a deep bedrock groundwater component. The requirements for the shallow groundwater sampling are provided in the terms of the Significant Industrial User Permit #72 that was issued for the Site by the Niagara Falls Water Board (and as may be updated from time to time). The purpose of the sampling is to quantify the volume and quality of the groundwater that infiltrates the FST and the 47th Street Tunnel that provide the containment of Site



groundwater. The network of monitoring wells included in the monitoring program already exists along the downgradient boundaries of the Site. The program consists of:

- Monitoring wells that were installed as part of the remedial investigation of the Site.
- Four monitoring wells in the A-Zone bedrock for groundwater quality (Figure 4.1). The wells are located along Royal Avenue to monitor groundwater discharge to the FST.
- Four monitoring wells in the B-Zone bedrock for groundwater quality (Figure 4.2). The downgradient wells are located along Royal Avenue and 47th Street to monitor groundwater discharge to the FST and 47th Street Tunnel, respectively.

The wells are listed in Table 4.1. Figures 4.1 and 4.2 show the locations of the monitoring wells included. The wells are to be sampled on a semi-annual basis, as specified in the Permit. Copies of the well construction details for those wells to be included in the groundwater quality monitoring program are provided in Appendix F. The monitoring wells will be sampled for the Site-specific contaminants of concern listed as specified in the Permit (see Table 4.2) and in accordance with EPA Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures.

In addition to the sampling required for the Significant Industrial User Permit, groundwater samples will also be collected from the C-Zone beneath the Site as part of the monitored natural attenuation remedy selected for the deep bedrock groundwater. Three monitoring wells in the C-Zone bedrock (see Figure 4.3) will be monitored for groundwater quality to assess the improvement in bedrock groundwater quality over time. These wells will be sampled on an annual basis for 5 years. Thereafter, a determination will be made as to the need for and frequency of future sampling. The samples will be analyzed for VOCs.

The noted sampling frequencies may be modified with the approval of the NYSDEC and/or the Niagara Falls Water Board, as applicable. The SMP will be modified to reflect changes in sampling plans approved by the NYSDEC and the Niagara Falls Water Board.

Deliverables for the groundwater monitoring program are specified in Section 6.3.

4.4.2 Hydraulic Monitoring

In conjunction with the groundwater quality monitoring described above, all available monitoring wells shown on Figures 4.1 through 4.3 will be hydraulically monitored to assess groundwater flow conditions in and between bedrock Zones A, B, and C. Water level measurements will be collected on the same frequency as the groundwater quality monitoring program and groundwater flow diagrams will be updated to evaluate the flow conditions at the Site.



4.5 Groundwater Sampling Protocol

All monitoring well sampling activities will be recorded in a field log and the groundwater sampling form presented in Appendix H. Other observations (e.g., well integrity, etc.) will be noted on the well sampling form. The completed well sampling forms will be provided with the Periodic Review Report discussed in Section 6.3.

4.5.1 Well Gauging

Prior to groundwater sampling, each monitoring well listed in Table 4.1 will be gauged using a groundwater probe. The depth of each well and the depth to groundwater will be measured from the top of the well casing. If observed, the presence of NAPL will be noted. The available water volume and gauging data will be recorded on the groundwater sampling form.

During well gauging, the monitoring well will be inspected for structural damage to the well cap, seal, protective pad and visible portion of the well casing. The presence and condition of plugs and locks will also be noted. Well maintenance and/or repairs will be completed as necessary and to the extent practicable. Any structural damage or repairs will be noted on the Site inspection form provided in Appendix I.

4.5.2 Groundwater Purging and Sampling

Monitoring wells will be purged and sampled using low-flow purging (LFP) techniques in accordance with the USEPA's *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*. LFP results in minimal drawdown during well purging, so less purging is required before formation water is removed, as well as less agitation and mobilization of sediments compared to traditional sampling techniques.

An adjustable rate, submersible pump (e.g., bladder, centrifugal, peristaltic), constructed of stainless steel or Teflon, is used for LFP. The pump is positioned in the well so that the pump intake is set at the mid-point of the well screen, or a minimum of 2 feet above the bottom of the well or accumulated sediment level.

During LFP, the pumping rate should be between 100 and 500 milliliters per minute (mL/min). Groundwater levels are measured during purging to maintain a maximum 0.4 feet of drawdown.

Field parameters including pH, temperature, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity should be monitored and recorded at 5-minute intervals during LFP. The measurement of these field parameters is used to evaluate if stabilization of the purged groundwater has occurred prior to the collection of groundwater samples. Groundwater stabilization is



considered achieved when three consecutive readings for each of the field parameters, taken at 5-minute intervals, are within the following limits:

- pH ±0.1 pH units of the average value of the three readings
- temperature $\pm 2^{\circ}F$ of the average value of the three readings
- conductivity ±3 percent of the average value of the three readings
- ORP ±10 millivolts (mV) of the average value of the three readings
- DO ±10 percent of the average value of the three readings
- turbidity ±10 percent of the average value of the three readings, or a final value of less than 50 NTU

Field parameters are measured using a flow-through cell apparatus. At the start of LFP, the purge water is visually inspected for clarity prior to connecting to the flow-through cell. If the purge water is turbid, LFP continues until the purge water is visually less turbid prior to connecting to the flow-through cell. All meters must be calibrated daily in accordance with the manufacturer's instructions, and a calibration record maintained in the field notes.

4.5.3 Groundwater Sampling Parameters

Groundwater samples will be collected at the specified frequencies from each well within the monitoring well network. Collected groundwater samples will be analyzed for the parameters listed in Table 4.2. Analytical methods, holding times, and quality assurance/quality control (QA/QC) requirements are presented in the Site-specific Quality Assurance Project Plan (QAPP) provided as Appendix J.

4.6 Monitoring Well Repairs, Replacement and Decommissioning

The monitoring well network will be inspected annually as part of the monitoring program. If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's



"Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable (but are still required to provide necessary information) will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

4.7 Monitoring Quality Assurance/Quality Control

All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (Appendix J).

4.8 Monitoring Reporting Requirements

Forms and any other information generated during regular monitoring events and inspections will be kept on file on Site or at the Site owner's office. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be subject to approval by NYSDEC and submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

All monitoring results will be reported to NYSDEC on a periodic basis in the Periodic Review Report. The report will include, at a minimum:

- Date of sampling event
- Description of the activities performed
- Type of samples collected (i.e., groundwater)
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format)
- Any observations, conclusions, or recommendations
- A determination as to whether groundwater conditions have changed since the last reporting event

Section 5.0 Operation and Maintenance Plan

The Site remedy does not rely on any mechanical systems. Therefore, the operation and maintenance of such components is not needed for this SMP.



Section 6.0 Inspections, Reporting, and Certifications

6.1 Site Inspections

6.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in Section 4 Monitoring Plan of this SMP. At a minimum, a Site-wide inspection will be conducted annually. Appendix K provides a listing of the groups responsible for the various tasks under the SMP.

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

6.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

All inspections and monitoring events will be recorded on the general Site-wide inspection form contained in Appendix I. This form is subject to NYSDEC revision.

All applicable inspection forms and other records, including all media sampling data, generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

6.1.3 Evaluation of Records and Reporting

The results of the inspection and Site monitoring data will be evaluated as part of the EC/IC certification to confirm that the:

- ECs/ICs are in place, are performing properly, and remain effective
- The Monitoring Plan is being implemented
- Site is being maintained in an appropriate condition
- Site monitoring wells are being maintained
- Site management activities are being conducted
- The Site remedy continues to be protective of public health and the environment and is performing as designed in the Remedial Design Report and Final Engineering Report



6.2 Certification of Engineering and Institutional Controls

After the annual inspection, a Professional Engineer licensed to practice in New York State or the Site Owner will prepare the following certification, consistent with the then current NYS Site Management Periodic Review Report format:

For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
- The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control;
- Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
- Use of the Site is compliant with the environmental easement;
- The engineering control systems are performing as designed and are effective;
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program; and
- The information presented in this report is accurate and complete.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] for the Site.

The signed certification will be included in the Periodic Review Report described below.

6.3 Periodic Review Report

A Periodic Review Report will be submitted to the NYSDEC every year, beginning eighteen months after the Certificate of Completion is issued. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in Appendix A (Metes and Bounds). The report will be prepared in accordance with NYSDEC



DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual Site inspections.
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format.
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format.
- A Site evaluation, which includes the following:
 - The compliance of the remedy with the requirements of the Site-specific ROD
 - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored
 - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan
 - The overall performance and effectiveness of the remedy

The Periodic Review Report will be submitted, in hard-copy format (or electronic if requested), to the NYSDEC Region 9 Office.

6.4 Corrective Measures Plan

If any component of the remedy selected in the Record of Decision is found to have failed, or if the periodic certification cannot be provided due to the failure of an EC or IC, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.





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figure 1.1 SITE MAP SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*





47392-00(016)GN-WA002 APR 22/2014

figure 3.1 FINAL SITE COVER SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*



<u>LEGEND</u>

PROPERTY LINE



MONITORING WELL/BOREHOLE LOCATION

PREVIOUS UNPAVED AREAS (NOW CAPPED WITH 1 ft. CLEAN MATERIAL)

CONCRETE/ ASPHALT AREAS

EXCAVATION AREA FROM SOIL REMEDY (NOW CAPPED WITH 1 ft. CLEAN MATERIAL)



47392-00(016)GN-WA010 APR 22/2014

figure 3.2 FINAL EXCAVATED AREA CONTOURS SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*



LEGEND



PROPERTY LINE



EXCAVATION AREA AND CONTOURS



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47392-00(016)GN-WA012 APR 22/2014





47392-00(016)GN-WA013 APR 22/2014

figure 3.5 TOP OF CRUSHED CONCRETE/IMPORTED STONE CONTOURS SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*



LEGEND



PROPERTY LINE

PREVIOUS UNPAVED AREAS (NOW CAPPED WITH 1 ft. CLEAN MATERIAL)

CONCRETE/ ASPHALT AREAS

EXCAVATION AREA FROM SOIL REMEDY (NOW CAPPED WITH 1 ft. CLEAN MATERIAL)



47392-00(016)GN-WA014 APR 22/2014

figure 3.6 TENORM BACKFILL AREA SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*



LEGEND PROPERTY LINE



47392-00(016)GN-WA015 APR 22/2014



47392-00(016)GN-WA016 APR 22/2014

figure 3.8 CROSS-SECTION LOCATION SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*



<u>LEGEND</u>



PROPERTY LINE



EXCAVATION AREA AND CONTOURS



47392-00(016)GN-WA003 APR 22/2014

A-ZONE MONITORING WELL LOCATION (HYDRAULIC MONITORING ONLY)

GROUNDWATER ELEVATION (ft. AMSL) (OCTOBER 13, 2010)

- GROUNDWATER CONTOUR (ft. AMSL)

PROPOSED GROUNDWATER QUALITY/ HYDRAULIC MONITORING LOCATION

GROUNDWATER FLOW DIRECTION

figure 4.1

SITE MANAGEMENT PLAN Frontier Chemical Site - Niagara Falls, New York



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SITE MANAGEMENT PLAN Frontier Chemical Site - Niagara Falls, New York

B-ZONE MONITORING WELL LOCATION (HYDRAULIC MONITORING ONLY)

GROUNDWATER ELEVATION (ft. AMSL) (OCTOBER 13, 2010)

GROUNDWATER CONTOUR (ft. AMSL)

PROPOSED GROUNDWATER QUALITY/ HYDRAULIC MONITORING LOCATION

GROUNDWATER FLOW DIRECTION

figure 4.2



47392-00(016)GN-WA009 APR 22/2014

PROPOSED GROUNDWATER MONITORING LOCATIONS - ZONE C SITE MANAGEMENT PLAN *Frontier Chemical Site - Niagara Falls, New York*



LEGEND

MW1C-08

PROPOSED GROUNDWATER QUALITY/ HYDRAULIC MONITORING LOCATION

figure 4.3

TABLE 4.1

GROUNDWATER MONITORING NETWORK FRONTIER CHEMICAL SITE NIAGARA FALLS, NEW YORK

Zone A Wells	Zone B Wells	Zone C Wells
BH87-3A	MW-13	MW1C-08
MW01-9A	BH87-3B	MW2C-08
MW88-13A	MW-9	MW3C-08
BH87-28	MW-12	

TABLE 4.2

SITE-SPECIFIC GROUNDWATER QUALITY PARAMETERS FRONTIER CHEMICAL SITE NIAGARA FALLS, NEW YORK

Parameters

Volatile Organic Compounds 1,1-Dichloroethane 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene Acetone Benzene Chlorobenzene cis-1,2-Dichloroethene Tetrachloroethene Toluene Trichloroethene Vinyl Chloride Monochlorotoluene

- Inorganics
- Arsenic Iron Potassium Sodium Total Phenol