PROPOSED RECORD OF DECISION AMENDMENT FRONTIER CHEMICAL - ROYAL AVENUE SITE OPERABLE UNIT 1 – OVER BURDEN SOIL AND GROUNDWATER

City of Niagara Falls / Niagara County / Site No. 932110 February 2012

Prepared by the New York State Department of Environmental Conservation
Division of Environmental Remediation

SECTION 1 PURPOSE AND SUMMARY OF THE PROPOSED RECORD OF DECISION AMENDMENT

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing an amendment to the Record of Decision (ROD) for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the modification to the remedy identified by this Proposed ROD Amendment. The disposal of hazardous wastes at this site, as more fully described in the original ROD and Section 6 of this document, has contaminated various environmental media. The proposed amendment is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This amendment identifies the new information which has lead to this proposed amendment and discusses the reasons for the preferred remedy.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

On March 24, 2006, the New York State Department of Environmental Conservation (Department) signed a Record of Decision (ROD) which selected a remedy to clean up the Frontier Chemical- Royal Ave Site.

The March 2006 Operable Unit 1 (OU1) ROD included components that address the Site features, overburden soil, overburden groundwater and shallow bedrock groundwater. The overburden soil component of the remedy, provided in the March 2006 ROD, selected source area soil excavation, trucking, and off Site treatment/disposal with clean soil backfilling of the excavation as the appropriate methodology.

Through an Order on Consent and Administrative Settlement (Index #89-0571-00-01) entered into between the NYSDEC and the Potentially Responsible Parties Group (PRPs), a series of pre design investigations were performed from 2008 through 2010 in support of the final remedial design. These additional investigations improved the delineation of the source area soil allowing for a more accurate assessment of the Site conditions and features relative to the overburden, shallow bedrock, and deep bedrock groundwater impacts. The additional investigations also enabled further evaluation and understanding of the source area soil. The results of a treatability study performed during the remedial design investigation and subsequent engineering evaluations demonstrated that other remedial alternatives are viable and would be as, or more

effective, more consistent with current sustainability goals, and have significantly less impact on the surrounding area/environment than the remedy for the source area soil selected in the March 2006 ROD.

Based upon this improved understanding of Site conditions, and considering the improvements in various remedial technologies over the past several years (particularly thermal treatment options), a Focused Feasibility Study (FFS) comparing the March 2006 ROD selected remedy with a thermal treatment remedy was submitted in November 2011 for Department review and approval.

The Department is proposing to amend the ROD for OU1of the Frontier Chemical Site. The major changes in the proposed amended remedy include provision for on-site thermal treatment of contaminated source area soil rather than off-site treatment/disposal, as well as the newly identified need for a radiological surface soil scan to identify potential radiological soil "hot spots" that may interfere with the performance of the On-site thermal treatment system along with a radiological scanning protocol intended to identify radiological active material prior to thermal treatment. The proposed amended remedy will also allow the backfill of excavated areas with treated soils and clarification relative to the environmental easement and site management plan. Excavated soil that exceeds radiological background levels for the area will be transported off-site for disposal in a permitted disposal facility. Unexcavated soil that exceeds radiological background levels for the area can remain on site.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on this proposed amendment. This is an opportunity for public participation in the remedy selection process. The information here is a summary of what can be found in greater detail in reports that have been placed in the Administrative Record for the site. The public is encouraged to review the reports and documents, which are available at the following repositories:

Earl Brydges Memorial Library
1425 Main Street
Niagara Falls, NY 14304
Hours: Mon, Tues, Wed: 9am-9pm
Thurs: 9am-6pm; Fri, Sat: 9am-5pm

NYSDEC Region 9 Offices
Contact: Michael Hinton, Project Manager
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7220
Hours: Mon. - Fri. 8:30am - 4:45pm

A public comment period has been set for February 13, 2012 to March 13, 2012 to provide an opportunity for you to comment on these proposed changes. A public meeting is scheduled for February 28, 2012 at Earl Brydges Memorial Library Auditorium beginning at 6:30 PM.

At the meeting, a description of the original ROD and the circumstances that have led to proposed changes in the ROD will be presented. After the presentation, a question and answer period will be held, during which you can submit verbal or written comments on the proposal. We encourage you to review this summary and attend the meeting.

Written comments may also be sent to:

Michael Hinton, Project Manager
NYS Dept. of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7220
region9@gw.dec.state.ny.us

Comments will be summarized and responses provided in a Responsiveness Summary.

The Department may modify the proposed amendment or select another of the alternatives presented based on new information or public comments. Therefore, the public is encouraged to review and comment on the proposed amendment identified herein. Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Frontier Chemical Royal Avenue site is approximately 9 acres in size and is located at the northwestern corner of Royal Avenue and 47th Street in the City of Niagara Falls.

Site Features: The majority of the buildings on the site have been demolished, although some smaller buildings and structures remain. The site is completely fenced and the majority of the surface of the site is covered by either concrete or blacktop. Several large areas of demolition debris piles also occupy areas on the surface of the site. A residential neighborhood is present approximately ½ mile west of the site. The Frontier Chemical site is in a heavily industrialized area of Niagara Falls. Numerous other inactive hazardous waste sites are within 1 mile of the site. These include several Occidental Chemical waste and plant sites, as well as DuPont Chemical, Olin Chemical, and the Solvent Chemical sites. The Niagara River is located approximately 3/4 mile south of the site.

Current Zoning/Use(s): The site is currently zoned for industrial use.

Historic Uses: The Frontier Chemical Waste Process Corporation operated a permitted waste treatment, storage, and disposal (TSD) facility at the Royal Avenue Site from 1974 to December 1992. While operating, this facility treated or stored approximately 25,000 tons of chemical wastes per year. Figure 2 shows the TSD facility layout in 2001. Several major spills were documented during Site operations, and in December 1992, following documented releases of hazardous waste from numerous drums, the Site was ordered closed by the NYSDEC.

Several investigations of the Site were performed between 1981-1990. These investigations were primarily focused on identifying areas of groundwater contamination, and were required under terms of the facility's operating permit. In 1992, the bankruptcy of the company's management firm ended the company's preliminary plans to implement corrective actions to address the identified groundwater contamination.

The facility closed in December 1992, and an emergency removal action was initiated by the US Environment Protection Agency (EPA) to remove the stored hazardous wastes from the Site. During 1993-1994, under a voluntary agreement with the EPA, a group of PRPs removed over 4,000 drums of waste from the Site. In a subsequent agreement with the EPA, a second removal was conducted by the PRPs during 1994-1995 which resulted in the removal of wastes from the 45 storage tanks on the property.

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 hazardous waste presents a significant threat to the public health or environment and action is required.

In January 2001 the Site was referred to NYSDEC for action using the State Superfund.

Operable Units: The site was divided into two operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, thereat of release or exposure pathway resulting from the site contamination.

Operable Unit (OU) No. 1 consists of the overburden soil, as well as overburden and upper (defined as the A-zone and B-zone) bedrock groundwater. Operable Unit No. 2 is the deep (defined as the C-zone and deeper) bedrock groundwater.

Site Geology and Hydrogeology:

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 cinder, glass, wood, slag, bricks, etc.) over lies 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 during the RI. The upper 35 feet of bedrock has been characterized as follows: the A-zone is identified as the fracture system consisting of the upper several feet of weathered bedrock; the B-zone is identified as the fracture system approximately 8-1 0 feet below the A-zone; and the C-zone is identified as the fracture system approximately 20 feet below the B-zone. While no previous Frontier Chemical investigations have targeted bedrock beneath the C-zone, numerous deeper bedrock fracture systems have been confirmed and described at other locations within the region. The bedrock A-zone, B-zone, and C-zone are described in greater detail in the Site Hydrogeology discussion. Regionally,

bedrock groundwater is recharged by water from the upper Niagara River (above the Falls), transmitted through fractures in the rock, and discharged 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 (NYPA) conduits and the Falls Street Tunnel.

Hydrogeology:
Depth to groundwater within the overburden ranges from about 2 to 10 feet below ground surface. There is a horizontal overburden groundwater gradient to 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.

Within the upper 35 feet of bedrock, 3 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 C-zone is a fracture system approximately 20 feet below the B-zone. Although the C-zone has not been fully characterized, a slight upward vertical groundwater gradient has been calculated from the C-zone to the B-zone. The bedrock between the three defined horizontal fracture zones contains some vertical fractures which provide some groundwater communication between the zones.

The FST and the New Road Tunnel run along the south and east sides of the site, respectively. As both of these tunnels intersect the bedrock B-zone fracture system, site bedrock groundwater from the B-zone directly infiltrates into these tunnels. This infiltration in turn promotes a downward groundwater gradient from the site overburden and upper weathered bedrock into the B-zone. The construction of the drop shafts to the FST also promotes overburden groundwater drainage to the bedrock. The influence of these tunnels may also impart an upward groundwater gradient from the lower C-zone fracture system toward the B-zone.

The effect of the Falls Street tunnel 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 has effectively intercepted site overburden and upper bedrock groundwater and prevented it from migrating beyond the Royal Avenue and 47th street tunnel alignments. At the Frontier Chemical site, groundwater within the bedrock C-zone and some of the lower bedrock fracture systems are also likely influenced by the NYPA conduit drain system. Site groundwater flow within some of these lower bedrock fracture zones is most likely toward the NYPA conduits. Since significant amounts of conduit water discharges into the Falls Street Tunnel, it appears likely that at least some of the C-zone and lower site bedrock groundwater is discharged to the FST.

Operable Unit (OU) Number 01 is the subject of this document.

A Record of Decision was issued previously for OU 01 in March 2006 and for OU 02 in March 2011.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an

alternative) that restrict(s) the use of the site to commercial use as described in Part 375-1.8(g) are/is being evaluated in addition to an alternative which would allow for restricted use of the site.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

As a result of previous litigation resulting from the drum and tank removal actions, several hundred PRPs have been identified. These PRPs, as well as the current property owner- "5335 River Road, Inc.", may be legally liable for contamination at the site. The PRP group had previously entered into a Consent order to complete a Pre-design investigation for OU1 and a Remedial Investigation for OU2 (Deep groundwater). The Department is currently in negotiations with the PRPs to enter into a similar legal agreement to complete the proposed remedial action which is the subject of this document.

SECTION 6: SITE CONTAMINATION

As described in the original ROD and other documents, many soil samples were collected at the Site to characterize the nature and extent of contamination. The primary contaminants of concern in the soil are volatile organic compounds (VOCs). The main categories of contaminants that exceed their SCGs are VOCs. The primary VOCs and their maximum detected concentrations in the Site soil are listed in Table 1.

TABLE 1
Primary Contaminants of Concern
Source Area Soil
Frontier Chemical Site
Niagara falls, NY

Contaminant of Concern	*Maximum Concentration (mg/kg)*
Monochlorotoulene	11,000
Tetrachloroethene	2,700
Chlorobenzene	950
1,2-dichlorobenzene	23,000
1,3-dichlorobenzene	2,300
1,4-dichlorobenzene	4,600
1,2,4-trichlorobenzene	33,000
1,1-dichloroethane	45
Trichloroethene	150
Toluene	600
Benzene	4,500

Due to the elevated nature of the VOCs identified in the soil during the RI , it was determined that the soil with concentrations of total VOCs greater than 100 ppm constituted source area soil (i.e., soil that would continue to act as a source of significant contamination in the future, if not remediated). Source area soils are shown in Figures 3 through10 for each successive 2-foot interval of the soil horizon, starting with the interval at the ground surface and descending to the bottom interval overlying the bedrock, which is located at a depth of approximately 16 feet below ground surface. The high concentrations of VOCs detected within

overburden soil also suggest that non-aqueous phase liquid (NAPL) may exist within the soil matrix.

6.3: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*.

This human health assessment characterizes exposures that may be presented by site contamination for both Operable Units. Since the site is fenced and covered by asphalt or concrete, people will not come into contact with site-related soil and groundwater contamination unless they dig below the surface. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. The potential for soil vapor intrusion to occur on-site will be evaluated should the site buildings be re-occupied and/or if new construction occurs.

6.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

High concentrations of organic contaminants exist in soil and groundwater. Non-aqueous phase liquids (NAPL) have been found in both the overburden and bedrock groundwater. NAPL has also been detected in the upper bedrock fracture systems. NAPL will continue to act as a source of groundwater contamination.

Contaminants of concern at the site include various volatile organics (such as trichlorobenzene, dichlorobenzene, chlorobenzene, PCE, TCE, acetone, benzene, toluene, etc.), and various semi-volatile organics (such as chlorotoluene, phenol, dichlorophenol, etc.) Impacted media include soils, overburden and bedrock groundwater. Overburden and upper bedrock groundwater contaminant migration has been limited by the presence of the unlined 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.

From groundwater data collected at the site from varying depths it appears that the highest levels of groundwater contamination is generally located in the soil and upper bedrock zones to be addressed in this ROD. Contaminants levels in deeper zones were as much as a 1,000 times lower than in this shallow zone. In addition, there appears to be an upward gradient of groundwater flow from the lower zones to the upper zones that also inhibits migration of the contaminants off-site.

During the course of work on the adjacent Norampac facility, elevated levels of radiation was detected in slag fill used on the site. The slag, that is believed to have been generated at the former Electromet facility, was used as fill in numerous locations around the Niagara Falls area. While radiation levels are not elevated enough to be a health concern requiring remediation, controls are necessary to regulate off-site disposal and processing through the thermal treatment unit.

SECTION 7: SUMMARY OF ORIGINAL REMEDY AND PROPOSED AMENDMENT

7.1: Original Remedy

The remedy selected in the 2006 ROD was the removal and treatment of soil contaminant "source areas" with groundwater control and treatment. The components of the original remedy are as follows:

- A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program
- Removal of existing Site buildings, above grade structures, and demolition debris from the Site
- Excavation, trucking, and off-site treatment/disposal of contaminated source area soil (generally defined as soils with total VOCs and monochlorotoluene > 100ppm)
- The backfill of soil removal areas with clean soil or other suitable material
- Completion of a clean soil or asphalt pavement cover over areas of the Site which do not have concrete or asphalt pavement
- Improved storm water collection with permitted discharge to the Niagara Fall Water Board
- Site groundwater controlled/treated in one of two ways: either an agreement with the Niagara Fall Water Board for use of Water Board utilities to provide Site groundwater control/treatment; or, a groundwater control/treatment system constructed on-site, with permitted discharge of effluent to the Water Board's sewer system. (An agreement has been put in place with the Niagara Falls Water Board to accept and treat the groundwater.)
- Development of a Site management plan to address residual contamination and any use restrictions
- Imposition of an institutional control in the form of an environment easement
- Periodic certification of the institutional and engineering controls
- Operation of components of the remedy until remedial objectives have been achieved, or until a NYSDEC/NYSDOH determination that continued operation is not feasible
- A long-term groundwater monitoring program to evaluate the effectiveness of the cover and groundwater control/treatment system

7.2: New Information

At the time the Feasibility Study (FS) was conducted for the Site (2003-2004), there were no promulgated regulatory soil cleanup standards. As a result, the 2004 FS relied upon NYSDEC TAGM 4046, the applicable New York State administrative guidance document that provided soil cleanup guidance values at the time. The 2006 ROD issued for the Site is consistent with the administrative guidance provided in NYSDEC TAGM 4046. The ROD specified that source area soil exceeding 100 parts per million (ppm) of the total sum of VOCs (including monochlorotoluene) be removed and treated/disposed off Site. In December 2006, subsequent to issuance of the ROD, New York State promulgated 6 NYCRR Part 375-6 which provides regulatory soil cleanup standards and criteria. The standards and criteria promulgated in

6 NYCRR Part 375-6 are more comprehensive and take into account the protection of public health for a number of site uses as well as protection of groundwater and ecological resources.

This remedy is also more consistent with the Department's new Green Remediation policy and the green remediation and sustainability guidance in DER 31 issued in August 2010. Which calls for reducing green house gas emissions and encouraging low carbon technologies through reduced truck traffic to and from the offsite disposal facility, conserving landfill space for future use, significantly reducing the amount of backfill (soil, stone etc) required to be imported to the site and providing for the complete destruction of the contaminants instead of just relocation to another disposal facility. It is also possible that low levels of radiation exist on the site that needs to be screened prior to the implantation of any remedial alternative for the site

The evaluation process in the 2004 FS provided the primary technical/engineering basis for NYSDEC's selection of excavation, trucking, and off-site treatment/disposal as the soil remedy. Given the success of on-site treatment technologies in a number of applications since the FS was conducted and the improved characterization of the nature and extent of the contamination developed subsequent to the 2006 ROD, remedial alternatives were re-evaluated in the Focused Feasibility Study conducted in 2008-2010. Specifically, the evaluation in the FFS focused on an alternative means of addressing the source area soil.

1. The 2006 ROD selected remedy consisting of excavation, trucking, and off-site treatment/disposal ; and
2. The proposed amended remedy of excavation and on-site thermal treatment of source area soils with disposal on-site of treated soils.

7.3: Proposed Changes

The proposed modification being evaluated is excavation and on-site thermal treatment of the source area soil which is proposed to replace excavation, trucking, and offsite disposal.

SECTION 8: EVALUATION OF PROPOSED CHANGES

8.1: Remedial Goals

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the Site through the proper application of scientific and engineering principals.

The remediation goals stated for this Site in 2006 are to eliminate, reduce, or control to the extent practicable:

- Exposure of persons at or around the Site to contaminants in soil, groundwater, or air;
- The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards;
- The release of VOC vapors from soils or groundwater that may create exceedances of groundwater

quality standards

- The off-site migration of contaminants within the overburden groundwater and within the bedrock groundwater zones of concern

Further, the 2006 remediation goals for the Site included attaining to the extent practicable:

- Ambient groundwater quality standards and
- NYSDEC TAGM 4046 Recommended Soil Cleanup Objectives

The standards and criteria promulgated in 6 NYCRR Part 375-6 have superseded the guidance values in NYSDEC TAGM 4046. The planned soil remediation is compliant with the intent of the 2006 ROD and also incorporates factors associated with the promulgated regulations for soil cleanup.

8.2: Evaluation Criteria

The criteria used to compare the remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each criterion, a brief description is provided. A detailed discussion of the evaluation criteria and comparative analysis for the 2006 ROD is contained in the original FS and in the FFS for this ROD amendment.

The remedial alternatives evaluated are:

i) Alternative 1, Excavation, Trucking, and Offsite Treatment/Disposal
ii) Alternative 2, Excavation and On-Site Thermal Treatment

The first two evaluation criteria are called threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The two alternatives are protective of human health and the environment. Both provide protection because source area soil would be treated or removed and the site would be covered with soil, buildings and/or pavement. Once the source area soil has been excavated and disposed or treated, Alternatives 1 and 2 also offer protection of the environment since the primary contaminant source for the groundwater will have been eliminated. In addition, institutional controls will prevent risks due to residual soil and groundwater contamination.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

Both Alternatives 1 and 2 would achieve SCGs to the same extent since the same areas and volumes of

contamination would be addressed. However, Alternative 2 is superior relative the DEC guidance related to green remediation and sustainability, as discussed in the evaluation of the balancing criteria.

The next seven "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternatives 1 and 2 involve intrusive work which could cause releases of contamination during remedial activities. VOC emissions may be difficult to control during excavation activities in both alternatives and could result in potential impact on workers and the surrounding community. Since Alternative 2 includes the extra component of on-site treatment of the source area soil, it would pose a slightly greater potential for impact to on-site workers and the immediate surrounding community than Alternative 1. However, Alternative 1 involves trucking of the contaminated soil on public streets and highways. As a result, Alternative 1 has greater short term impacts due to the increase in greenhouse gas emissions, energy consumption, dust, noise, and substantial truck traffic (with its inherent additional risk for accidents and injury). Alternatives 1 and 2 can be completed in the same general timeframe of approximately 5 to 7 months.

Further, since the soil taken to the off-site facility is not treated prior to transportation and placement of the soil, there is an outstanding environmental risk (exposure and possible releases from the receiving facility) associated with Alternative 1 that is eliminated by the treatment offered under Alternative 2.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Alternatives 1 and 2 would provide comparable long-term effectiveness at the site because both address the same areas and volume of material and use the same institutional controls. However Alternative 2 has a greater degree of long term permanence since all the soil is treated, rather than a significant portion being land filled and this material required to be monitored. Alternative 2 also meets the goals of the Department's Green remediation requirements through the reduction of the burning of fossil fuels since off-site trucking will be limited. The permanence associated with waste generation will also be increased since the contaminants are being destroyed (Alt 2) instead of just moved to another location (Alt 1).

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternatives 1 and 2 provide for reduction of toxicity, mobility, and volume of Site contaminants through treatment and to a lesser degree through disposal of the source area soil. Alternative 1 does not treat as much of the soil as Alternative 2 since it places a large portion of the source area soil into an off-site controlled facility. Since Alternative 2 results in treatment of all of the source area soil, it results in a significantly greater reduction in toxicity, mobility, and volume and therefore is ranked higher than Alternative 1.

6. Implementability. The technical feasibility and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

Alternatives 1 and 2 are technically implementable (with readily available methods, equipment, materials, and services) and administratively implementable. Alternative 1 requires that many arrangements and procedures need to be followed in removal and disposal/treatment of the source area soil. Alternative 2 is more difficult to implement because of issues associated with on-site treatment.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The estimated cost to implement Alternative 1 is $10,892,000 and for Alternative 2 is $$7,870,000. There are minimal ongoing operation and maintenance costs associated with the soil remediation which would be associated with the institutional controls applied to the site.. The majority of long term costs are associated with the collection treatment and monitoring of the groundwater system which has not changed from what was agreed to in the original 2006 ROD.

8. Land Use. The remedial alternatives evaluation also needs to consider the value that is returned to the land as a result of the remediation preformed.

Both Alternatives 1 and 2 address the source area soil thereby improving the quality of the soil on the Site and making it easier to develop the Site for commercial or industrial purposes. The degree of Site improvement under Alternatives 1 and 2 are the same and therefore they are ranked the same.

This final criterion is considered a modifying criterion and is considered after evaluating those above. It is focused upon after public comments on the proposed ROD amendment have been received.

9. Community Acceptance. Concerns of the community regarding the proposed changes are evaluated. A

responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the final remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 9: PROPOSED CHANGES

The Department is proposing to amend the ROD OU1 for the Overburden Soil & Groundwater remediation at the Frontier Chemical - Royal Ave. Site.

The revise remedy of the Thermal destruction of the contaminants was chosen for the following reasons:

- It provides the same protectiveness as excavation and off-site disposal by removing contaminants from the site,
- It provides similar short term effectiveness since both remedies requires control of VOC emissions during excavation and will require the similar time to implement and complete.
- It provides greater long term permanence since contaminants are being destroyed instead of just transferred to another location such as a landfill,
- It has a smaller environmental and public safety footprint than off-site disposal since there will less trucking required which in turn reduces consumption of fuel, reduces emissions from transport vehicles, and reduces risks associated with vehicle traffic on public streets and highways, It also conserves permitted landfill storage space since treated soil will be placed back into the excavation from which it came and reduces the need for clean soil and related trucking from an off-site since treated soil will be used as the backfill material, and
- This alternative cost is significantly less.

The estimated present worth cost to carry out the amended OU 1 remedy is $7,870,000. The estimated present worth to complete the original remedy was $10,892,000. The cost to construct the amended remedy is estimated to be $7,100,000 and the estimated average annual cost for 30 years to perform long term operation, maintenance and monitoring responsibilities is $50,000 per year.

The elements of the proposed amended remedy listed below are identified as unchanged, modified or new when compared to the original 2006 ROD:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. To maximize the net environmental benefit, Green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including;
    - using renewable energy sources
    - reducing green house gas emissions
    - encouraging low carbon technologies
    - foster green and healthy communities
    - conserve natural resources
    - increase recycling and reuse of clean materials
    - preserve open space and working landscapes

- utilize native species and discourage invasive species establishment during restoration
- promote recreational use of natural resources [new]

2. Removal of existing Site buildings, above grade structures, and demolition debris from the Site. [unchanged]

3. Excavation and on-site thermal treatment of contaminated source area soil (generally defined as soil with total VOC and monochlorotoluene > 100ppm). The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. Collection of appropriate soil confirmation samples to document removal of the source area.[modified]

4. Performance of a radiological surface soil scan to identify potential radiological soil "hot spots" that may interfere with the performance of the on-site thermal treatment system along with a radiological scanning protocol intended to identify radiological active material prior to thermal treatment. [new]

5. The backfill of soil removal areas with the soil originally removed from the excavation and the treated soil or other suitable material. [modified]

6. A site cover will be required to allow commercial/industrial use of the site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where the soil cover is required, it will be a minimum of one foot of soil for areas of commercial development meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for commercial use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d); [modified]

7. Site groundwater will be controlled/treated through the use of the existing municipal combined sewer infrastructure in agreement with the Niagara Falls Water Board.[unchanged]

8. Imposition of an institutional control in the form of an environmental easement for the property that:

   (a) requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).;

   (b) land use is subject to local zoning laws, the remedy allows the use and development of the controlled property for commercial and industrial uses;

   (c) restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH, County DOH, or City Authority;

   (d) prohibits agricultural or vegetable gardens on the controlled property; and

(e) requires compliance with the Department approved Site Management Plan; [modified]

8. A Site Management Plan is required, which includes the following:

(a) an Institutional Control Plan that identifies all use restrictions for the site and details the steps and media-specific requirements necessary to assure the institutional controls remain in place and effective. This plan includes, but may not be limited to:

(i) an ExcavatonPlan for the western portion of the site which details the provisions for management of future excavations in areas of remaining contamination;

(ii) descriptions of the provisions of the environmental easement for the western portion of the site including any land use restrictions;

(iii) evaluate the potential for vapor intrusion for any buildings constructed on the site, including provisions for mitigation of any impacts;

(iv) maintaining site access controls and Department notification; and

(v) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

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

(i) monitoring of groundwater to assess the performance and effectiveness of the remedy;

(ii) a schedule of monitoring and frequency of submittals to the Department;

(iii) monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed in item (a) above.

(c) an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to: {include all that apply as appropriate}

(i) compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;

(ii) maintaining site access controls and Department notification; and

(iii) providing the Department access to the site and O&M records. [modified]

SECTION 10: NEXT STEPS

As described above, there will be a public meeting and comment period on the proposed changes to the selected remedy. At the close of the comment period, the Department will evaluate the comments received and prepare a responsiveness summary which will be made available to the public. A notice describing the Department's final decision will be sent to all persons on the site mailing list.

If you have questions or need additional information you may contact any of the following:

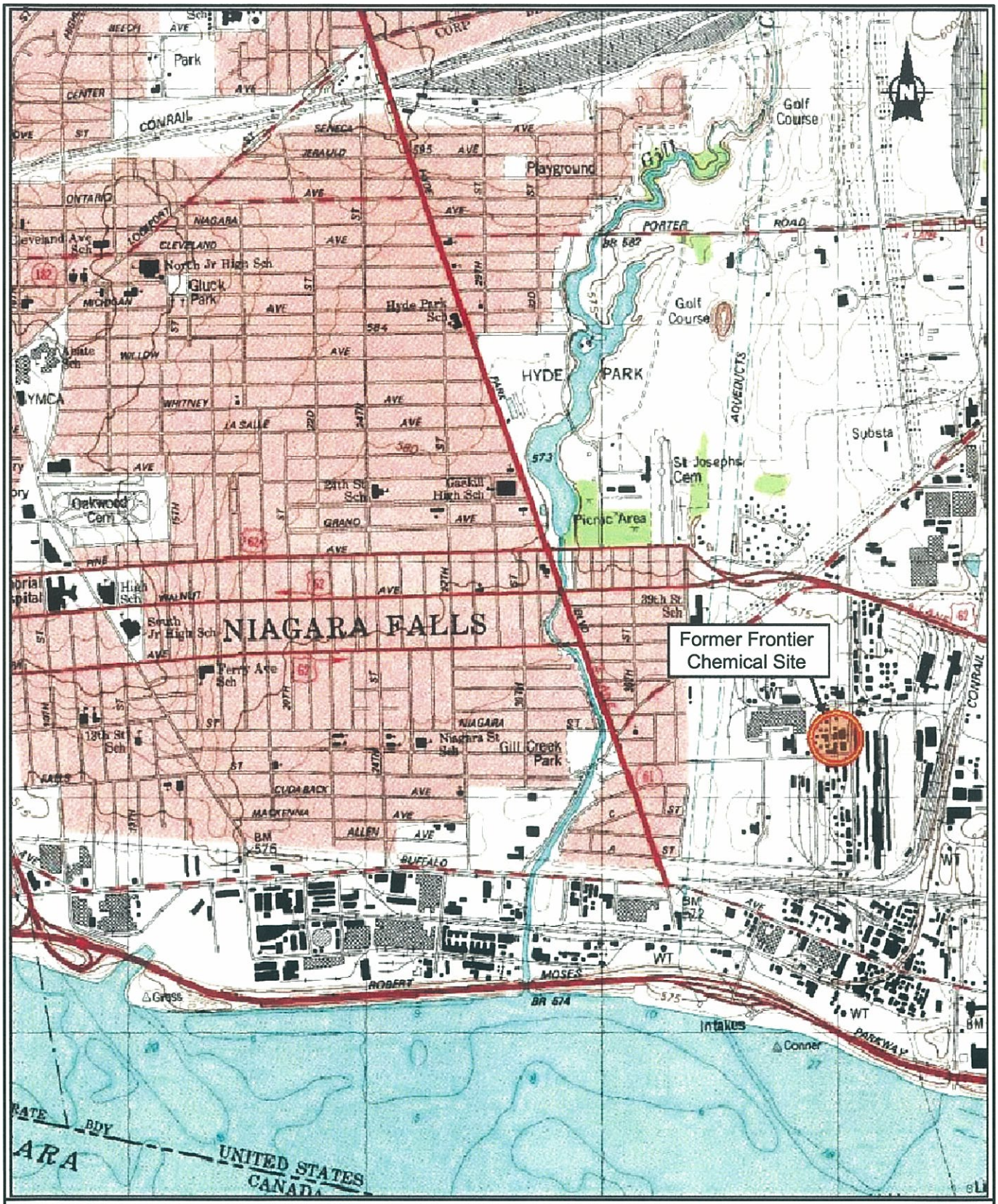
General Site Related Questions, Contact

Michael Hinton
Project Manager
NYSDEC
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7220
region9@gw.dec.state.ny.us

Megan Gollwitzer
Citizen Participation Spec.
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7201
region9@gw.dec.state.ny.us

For Health Related Questions, Contact:

Matt Forcucci, Public Health
Specialist III
NYSDOH
584 Delaware Avenue
Buffalo, NY 14202
(716) 847-4501
beei@health.state.ny.us



SOURCE: E & E, 2002

figure 1

SITE LOCATION MAP

Frontier Chemical Site - Niagara Falls, New York

47392-00(010)GN-WA001 DEC 9/2011

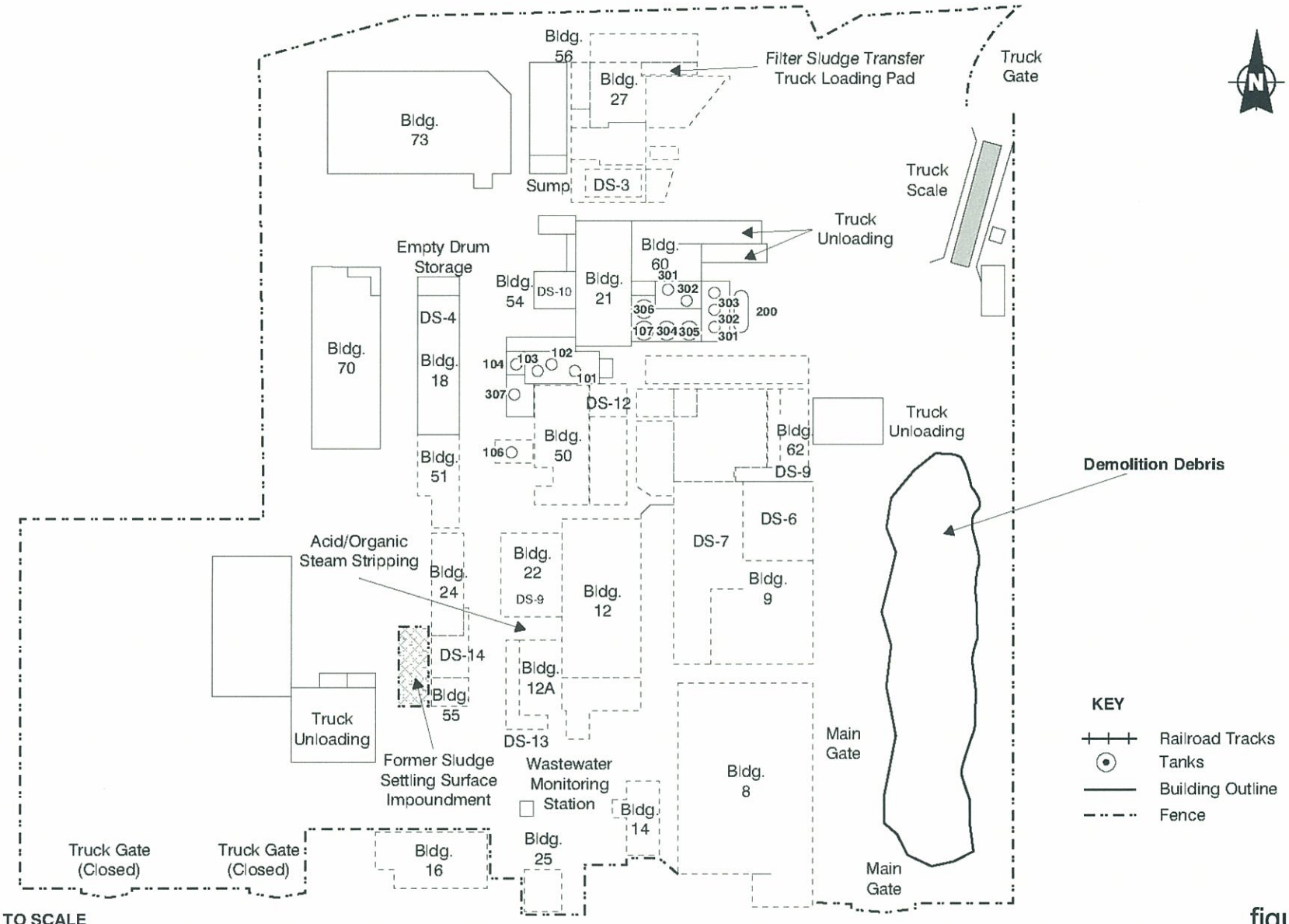


figure 2

2001 SITE MAP

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

47392-00(010)GN-WA002 DEC 9/2011

SOURCE: E & E, 2002

figure 3

SOURCE AREA SOIL
0 TO 2 FT.
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 4

SOURCE AREA SOIL
2 TO 4 FT.
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 5

SOURCE AREA SOIL
4 TO 6 FT.
Frontier Chemical Site - Niagara Falls, New York

47392-00(010)GN-WA005 DEC 9/2011

REPUTED OWNER
NIAGARA JUNCTION RAILWAY COMPANY

REPUTED OWNER
NIAGARA COUNTY INDUSTRIAL DEVELOPMENT AGENCY
L-2087, P-89

REPUTED OWNER
FRANK'S VACUUM TRUCK SERVICE
L-2362, P-255

REPUTED OWNER
5335 RIVER ROAD, INC.
L-3118, P-293

REPUTED OWNER
ELKEM METALS COMPANY

METAL BLDG.
CONCRETE PAD
DEMOLITION DEBRIS
PAVED
SHED
BLOCK BLDG.
CLAY BLOCK BLDG.
GATE
GRAVEL
FRAME BLDG.
FIBERGLASS BUILDING
CHAIN LINK FENCE
HYD.

BH10-08
BH11-08
PZ-01-04
PZ-01-05
BH9-08
BH14-08
BH19-08
BH21-10
PZ-01-06
BH7-08
BH8-08
PZ-01-08
BH13-08
BH15-08
BH1-08
MW-88-2A(R)
MW-88-7OB(R)
BH22-10
BH23-10
BH24-10
BH25-10
PZ-01-07
BH17-08
BH12-08
BH16-08
BH2-08
BH6-08
BH30-10
BH31-10
BH26-10
BH27-10
MW-01-1OB
BH28-10
PZ-01-10
BH29-10
BH87-4B
(DESTROYED)
BH18-08
BH4-08
BH3-08
BH33-10
PZ-01-11
BH5-08
BH32-10
BH20-08
PZ-01-12
GP-01-08

ROYAL AVENUE
47th STREET
6' x 5' NEW ROAD SEWER TUNNEL (UNLINED)
7' x 6' FALLS ST. SEWER TUNNEL (UNLINED)
SOUTHSIDE INTERCEPTOR SEWER TUNNEL (72-INCH DIAMETER)
DIVERSION/REGULATOR 8 WEIR

N

0 50 100ft

LEGEND

- PROPERTY LINE
- PZ-01-06 MONITORING WELL/BOREHOLE LOCATION
- SOURCE AREA SOIL 6 to 8-FT. INTERVAL

SOURCE: E & E, 2002

figure 6

SOURCE AREA SOIL
6 TO 8FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(010)GN-WA006 DEC 9/2011

SOURCE: E & E, 2002

figure 7

SOURCE AREA SOIL
8 TO 10 FT.

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 8

SOURCE AREA SOIL
10 TO 12 FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(010)GN-WA008 DEC 9/2011

REPUTED OWNER
NIAGARA JUNCTION RAILWAY COMPANY

REPUTED OWNER
NIAGARA COUNTY INDUSTRIAL DEVELOPMENT AGENCY
L-2087, P-89

REPUTED OWNER
5335 RIVER ROAD, INC.
L-3118, P-293

REPUTED OWNER
FRANK'S VACUUM TRUCK SERVICE
L-2362, P-255

REPUTED OWNER
ELKEM METALS COMPANY

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CONCRETE PAD
DEMOLITION DEBRIS
PAVED
SHED
BLOCK BLDG.
CLAY BLOCK BLDG.
GATE
CHAIN LINK FENCE
FRAME BLDG.
GRAVEL
FIBERGLASS BUILDING
HYD.

BH10-08
BH11-08
PZ-01-04
PZ-01-05
BH9-08
BH14-08
BH19-08
BH21-10
PZ-01-08
BH13-08
BH15-08
BH1-08
PZ-01-06
BH7-08
BH8-08
MW-88-7OB(R)
MW-88-2A(R)
BH22-10
BH23-10
BH24-10
BH25-10
PZ-01-07
BH17-08
BH12-08
BH16-08
BH2-08
BH6-08
BH30-10
BH31-10
PZ-01-10
BH29-10
BH26-10
BH27-10
MW-01-10B
BH28-10
BH87-4B
(DESTROYED)
BH4-08
BH3-08
BH33-10
BH18-08
PZ-01-11
BH5-08
BH32-10
BH20-08
PZ-01-12
GP-01-08

6' x 5' NEW ROAD SEWER TUNNEL (UNLINED)
47th STREET
ROYAL AVENUE
7' x 6' FALLS ST. SEWER TUNNEL (UNLINED)
SOUTHSIDE INTERCEPTOR SEWER TUNNEL (72-INCH DIAMETER)
DIVERSION/REGULATOR 8 WEIR

0 50 100ft

LEGEND

- PROPERTY LINE
- PZ-01-06 MONITORING WELL/BOREHOLE LOCATION
- SOURCE AREA SOIL 12 to 14-FT. INTERVAL

SOURCE: E & E, 2002

figure 9

SOURCE AREA SOIL
12 TO 14 FT.
Frontier Chemical Site - Niagara Falls, New York

REPUTED OWNER
NIAGARA JUNCTION RAILWAY COMPANY

REPUTED OWNER
NIAGARA COUNTY INDUSTRIAL DEVELOPMENT AGENCY
L-2087, P-89

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L-2362, P-255

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FIBERGLASS BUILDING
FRAME BLDG.
CHAIN LINK FENCE
GATE
HYD.

BH10-08
BH11-08
PZ-01-04
PZ-01-05
BH9-08
BH14-08
BH19-08
BH21-10
PZ-01-08
BH13-08
BH15-08
BH1-08
PZ-01-06
BH7-08
BH8-08
MW-88-7OB(R)
MW-88-2A(R)
BH22-10
BH23-10
BH24-10
BH25-10
PZ-01-07
BH17-08
BH12-08
BH16-08
BH2-08
BH6-08
BH30-10
BH31-10
BH26-10
BH27-10
MW-01-10B
PZ-01-10
BH28-10
BH29-10
BH87-4B
(DESTROYED)
BH18-08
BH4-08
BH3-08
BH33-10
PZ-01-11
BH5-08
BH32-10
BH20-08
PZ-01-12
GP-01-08

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47th STREET
6' x 5' NEW ROAD SEWER TUNNEL (UNLINED)
7' x 6' FALLS ST. SEWER TUNNEL (UNLINED)
SOUTHSIDE INTERCEPTOR SEWER TUNNEL (72-INCH DIAMETER)
DIVERSION/REGULATOR 8 WEIR

N

0 50 100ft

LEGEND

- PROPERTY LINE
- PZ-01-06 MONITORING WELL/BOREHOLE LOCATION
- SOURCE AREA SOIL 14 to 16-FT. INTERVAL

SOURCE: E & E, 2002

figure 10

SOURCE AREA SOIL
14 TO 16 FT.
Frontier Chemical Site - Niagara Falls, New York